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WEATHER RISK DISCLOSURES: RATING EUROPEAN ENERGY COMPANIES

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BACKGROUND

Foreword

Retail managers have long known that weather conditions have a direct impact on the sales of many products and services. Weather influences what consumers buy, where, when and in what quantities. Some products or services will sell more, others will sell less, or will simply not sell at all if weather conditions are not right. For other products, specific weather conditions may trigger sales that would not have existed otherwise.

So long as the weather is normal, businesses know how to plan their production and sales cycles. Abnormal weather, also called unseasonal weather, disrupts the activity and affects operating cash-flows and profitability of many businesses exposed to weather variability.

Weather does not have to be extreme to have an impact. The accumulation of adverse weather days over several weeks or an entire season is enough to lead to lower sales, higher inventories, higher production costs, profit warnings, significant financial losses, and even financial distress especially in the case of small businesses.

In retail, the effects of unseasonal weather on consumers and sales are easily measurable. They are almost visible. When it comes to weather variability exposure, the retail sector is only the tip of the iceberg. In fact, many activity sectors are exposed to the weather. Not just retailers, but also wholesalers and manufacturers. With climate change, weather variability has increased and is expected to continue to do so.

The accumulation of unseasonal weather patterns over the past decades has led academic research to try to understand and assess the extent to which weather affects the economy. The award of the 2018 Nobel Prize in Economics to William Nordhaus for his work on an integrated quantitative assessment model to characterize the relationship between climate and the economy attests to the importance given to this growing field of research.

There may be a debate on the relative importance that abnormal weather has on companies' results depending on their activity or geographical location. However, the fact that the production and distribution of energy depends on weather conditions should not be the subject of much debate.

Demand for electricity and natural gas is seasonal, with higher demand during the months of October to March in cold weather. The longer and colder the winter, the higher the heating demand, and the higher the sales for energy suppliers.

Whereas energy consumption by industrial businesses is primarily affected by the development of the economy, households' energy consumption is strongly influenced by the weather. The higher the outdoor temperatures, the less energy is needed for heating purposes. This implies that there is therefore a risk that a milder than normal winter may cause a drop in financial profitability.

The weather also influences electricity generation. The production of wind farms and hydroelectric power plants is dependent on wind and precipitation quantities that may vary from one year to the next.

In 2010, an academic study reviewed annual reports of utilities across Austria, Germany, France, the UK and Switzerland for inter-country comparisons. The authors found that 90% of all annual reports contained some information about weather of which only 40% explained the weather dependency clearly. However, according to the authors, only one in three annual reports disclosed weather risk, and just one in ten reports described weather risks clearly.

Since then, much has happened in the field of climate and the economy, thanks to research, access to more data, better technologies to exploit them, but also because of the increase in weather variability and the more visible consequences it has had on the results of many companies in a wide range of sectors.

Investors are more than ever looking for transparent communication that facilitates the assessment of the climate-related risks associated with an asset in order to estimate the corresponding expected return.





In June 2017, the Task Force on Climate-related Financial Disclosures (TCFD) introduced a reporting framework for companies to develop more effective, standardized, climate-related financial disclosures. The TCFD recognized the challenges associated with measuring and disclosing information on risks related to climate change, just as there are challenges in measuring and disclosing information on risks related to weather.

The observations underlying the TCFD's recommendations have some similarities with the information disclosed by companies on weather risks: the majority of companies exposed to weather risks talk about weather but the financial consequences are rarely disclosed; few companies provide useful information to enable stakeholders to analyze the consequences of multiple weather scenarios; practices differ from one country to another; finally, weather-related information is often scattered among annual reports, financial filings, press releases or presentations to analysts.

There are no clearly defined rules or requirements to report weather risks. It is up to the companies to provide information that they consider relevant and useful to their shareholders.

The Companies Act (2006), the report on the review of the financial position and performance (SBA, 1993; 2003; 2003; 2006) and the IASB Management Commentary (IASB, 2010) require or recommend that listed companies provide information on risk factors that are considered *material* to their business. The various guidelines also agree that the information provided by companies must be *useful* to users of annual reports.

Weather is an important risk factor in the energy sector, so it is legitimate to expect that the information provided to investors and analysts will be *useful* and of high quality.

This means that financial information on weather conditions must allow investors and lenders to have access to a complete description of the weather risks to which the company is exposed, normally in the risk factors section of the annual report, as well as a sensitivity analysis to assess how a change in weather conditions affects sales and EBITDA.

Annual reports must also provide an analysis of the results that specifies the contribution, positive or negative, of weather conditions, and discuss weather-adjusted performance year on year and against forecasts.

“ We propose to use TCFD’s framework approach as a basis for evaluating company reports on adaptation to climate variability. ”



Finally, the *normal* weather conditions on which financial budgets, forecasts and forward-looking information are based must be explicitly defined.

In September 2018, 457 companies, many large energy companies, and 56 other organizations (e.g., industry associations, governments, and financial regulators) had adopted TCFD's reporting recommendations.

Just under 300 financial firms responsible of nearly $100 trillion are already using TCFD's climate-related risk disclosures to price risk and make efficient capital-allocation decisions.

Today, TCFD's reporting recommendations are becoming reporting standards for companies with revenues in excess of USD 1 billion.

The TCFD reporting framework focuses on the long-term adaptation strategy to climate change. We propose to use the TCFD framework approach to assess the consideration and management of climate variability by company executives, by analyzing the content of weather-related financial disclosures in annual reports and other public documents made available to shareholders and investors.

Drawing upon a panel of listed European energy companies for empirical evidence, the overall objective of this study is to rate the current status on weather-related risks reporting and discuss how to improve weather risk reporting by public listed companies exposed to weather variability so that the information can be *useful* and used.

Executive Summary

Hot or cold, wet or dry, weather conditions affect sales, production costs and profits of 70% of companies in almost all industries. So long as the weather remains normal, stable and therefore predictable, businesses are able to plan for the seasonality of their activity, and organize sales, production, inventories, and marketing strategies accordingly. However, unexpected deviations from normal weather conditions are disruptive, and the accumulation of adverse abnormal weather patterns over weeks or entire seasons can result in significant shortfalls in cash-flows.

With climate change, the intensity and frequency of abnormal weather patterns has risen. The uncertainty and the financial losses caused by adverse weather conditions that did not appear large enough to have an impact or to require management decades ago, have become significant.

Weather variability has emerged as a *material* risk that has changed the risk-return profile of many companies. Among the sectors of activity affected by weather conditions, there is a wealth of academic and empirical evidence that shows that the energy sector is one of the sectors most exposed to weather risks.

Companies present *material* risks in a dedicated section of the annual report for the benefit of shareholders, potential investors, lenders and other stakeholders. Material risks are also explained in the form of discretionary financial disclosures that specifies the company's sensitivity to each type of risk and how each risk has affected past performance.

Many academic studies based on a dozen theories have sought to assess the quality, relevance, and *usefulness* of financial disclosures in their ability to make informed investment decisions, and to contribute to improving the transparency of financial market information. However, there are no such studies that address weather risks.

Whether we measure a company's ability to absorb the costs of complying with the changes required to slow down climate change, or the company's ability to absorb weather variability related to climate change, we are looking at the same issue that gives rise to risks that both need to be priced.

Based on the work of the Task force on Climate-related Financial Disclosures, we have developed a methodology for assessing the added value of Weather-related Financial Disclosures.

Using a panel of 47 European Energy companies for empirical evidence, we analyzed publicly accessible narrative and numerical contents in annual reports, registration documents, analysts packs and shareholders presentations.

In particular, we assessed the extent to which users of documents published by energy companies are informed about the nature of the weather risks involved, the financial contribution of weather to sales or EBITDA, and the sensitivity of financial results to weather variability.

To the best of our knowledge, this is the first time a rating and ranking on Weather-related Financial Disclosures is produced. Key takeaways are listed on the right-hand side of this page.

Despite the *material* nature of weather risks for energy companies, our results show that much progress still needs to be made for weather risk disclosures to contain more *transparent* and *decision-useful* information. Today, the current status is such that potential investors, lenders, regulators, asset managers and shareholders cannot price weather risk and make informed, efficient risk assessment and portfolio management decisions.

The evaluation criteria presented in this study should enable the different stakeholders of a company exposed to weather risks to engage in a discussion on a subject that remains largely unaddressed, and encourage weather-sensitive companies to adopt a more open and proactive approach to weather risk management.


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Key takeaways
• Rising weather variability has become a *material* risk that has changed the risk-return profile of many businesses, including energy companies
• 80% of European energy companies in our panel make weather-related financial disclosures in the annual report
• 47% of European energy companies do not report weather risks in the risk factors section of the annual report
• Disclosures on weather risks are often disseminated in several reports or documents
• Over 90% of companies in our panel do not disclose any estimate of the consolidated financial implications of weather risks
• Our rating shows that only 10% of companies disclose weather risk information whose content can be considered useful to shareholders
• EDF and ENGIE come 1st and 2nd in the weather-related financial disclosures rating
• Current weather risk reporting does not allow potential investors, lenders, regulators, asset managers and shareholders to price weather risk and to make informed, efficient risk assessment and portfolio management decisions

THE STUDY



Introduction

The annual report is an essential document that is used primarily by shareholders, investors, analysts and lenders to assess the company's retrospective and prospective financial performance and to put this profitability into perspective, taking into account the significant risks associated with it.

The annual report consists of an accounting section, governed by precise rules, and an explanatory section written by the managers, the content and organization of which follow the IASB's recommendations. The IASB requires that the management report be *neutral*, that it be a f*aithful* representation of the company's situation, and that it be *useful* for making investment decisions. In particular, the IASB requires that material risks that affect results be clearly explained and documented.

The IASB is not alone in advocating these recommendations. Many international best practice guides such as those issued by CESR, IOSCO, ICGN, etc. are also explicit on the responsibility of managers to provide high-quality and *useful* information that enables the company's partners and shareholders to understand the financial situation, predict the future situation, with the overall common objective of improving the transparency of information on financial markets.

The material risks to which a company is exposed are normally listed and explained in a dedicated section of the annual report. They are also present in the form of discretionary financial disclosures to specify the company's sensitivity to each type of risk and to explain how each risk has affected past performance.

While the consequences of financial risks such as fluctuations in exchange rates, interest rates or commodity prices are relatively well documented, the same cannot be said for climate-related risks.

Climate risks are often understood as the costs of transitioning from fossil fuels to cleaner energies, or the costs related to complying with greenhouse gas emissions regulations. These risks relate to the potential consequences of business activity on climate.

But climate risks are not one-sided. They also refer to the consequences climate may have on business activity, short-term and long-term. Short-term weather risks are related to weather variability, long-term climate risks are related to climate change.

Weather risks are non-catastrophic, unseasonal weather events, such as deviations from normal conditions of unusual duration or intensity, that can have a significant financial impact on sales, production costs or profits of companies in a wide range of activity sectors. The weather parameters most concerned are temperature, rainfall, snowfall or wind speed.

In this study, we differentiate weather risks from risks relating to extreme events such as tornados, hurricanes, flooding the impact of which is well understood.

With climate-change, weather variability has risen and prospective studies on climate change suggest that this has only just began.

The efforts of researchers and market regulators have so far focused mainly on the risks associated with climate change, i.e. the long-term trend. Our study focuses on the risks associated with climate variability, i.e. the short-term standard deviation of the long-term trend.

While a few decades ago, the weather fluctuated moderately each year around an average that was also stable, the impact on businesses remained tolerable and did not require special attention.

Today, the average is shifting, the amplitude of variations around the average is increasing, and the impact on many companies has become *material* in the accounting and economic sense of the term.

Research shows that nearly 70% of all sectors of activity are exposed to weather variability. Among them, the energy sector is the one for which the impact of weather is undoubtedly a *material* risk. This is the very sector that initiated the first weather-indexed hedging instruments in 1997, to protect US energy distributors from the financial consequences of an unusually mild winter.

Climate change, increasing weather variability and the rapidly developing market for weather hedging instruments have changed the way weather risk must now be considered and valued.

Drawing inspiration from the work of the Task force on Climate-related Financial Disclosures, we have developed a methodology for assessing and rating weather-related disclosures, and applied it for empirical evidence to European energy companies.

The study is organized as follows. First we review the literature on weather risks and the economy, discretionary financial disclosures theories, and rating methodologies. Next, we present and discuss the results, and conclude in the last section.

Research has mainly focused on the risks associated with climate change, i.e., the long-term trend. Our study focuses on the risks associated with weather variability, i.e., the standard deviation.



Weather risks

Weather is a powerful and widespread force that affects production and consumption of 70% of businesses worldwide, in a variety of activity sectors, most particularly agriculture, energy, food and beverages, tourism, transportation, entertainment, mining, apparel, construction and retail.

The risk to which businesses are exposed is the risk that abnormal or unseasonal weather patterns develop and directly affect consumers' behavior in terms of what products they buy, where, and in what quantity, or indirectly affects the price of commodities through unexpected high or low yields.

Abnormal weather on any given day is the difference between observed weather on that day and its normal value. The normal value is the average value of weather observations, also called normal seasonal value, and meteorologists calculate it by

averaging observation values such as temperature or precipitation quantities on a given day over a 30-year period.

The current calculation period for normal weather is 1981–2010 (World Meteorological Organization). Consequently, since seasonal weather is known, businesses are able to plan for the seasonality of their activity and organize sales, inventories, marketing and production accordingly, and so long as the weather remains normal, weather does not disrupt business activity.

Unexpected deviations from normal weather conditions, referred to interchangeably as abnormal or unseasonal weather conditions, can disrupt the business, reduce cash-flows, result in financial losses, and even cause financial distress or business failure. For example, above-normal temperatures in winter reduce demand for heating and adversely impact the revenues of energy companies, whilst below-normal precipitations decrease agricultural yields, and may drive sales of tourism and outdoor activities higher.



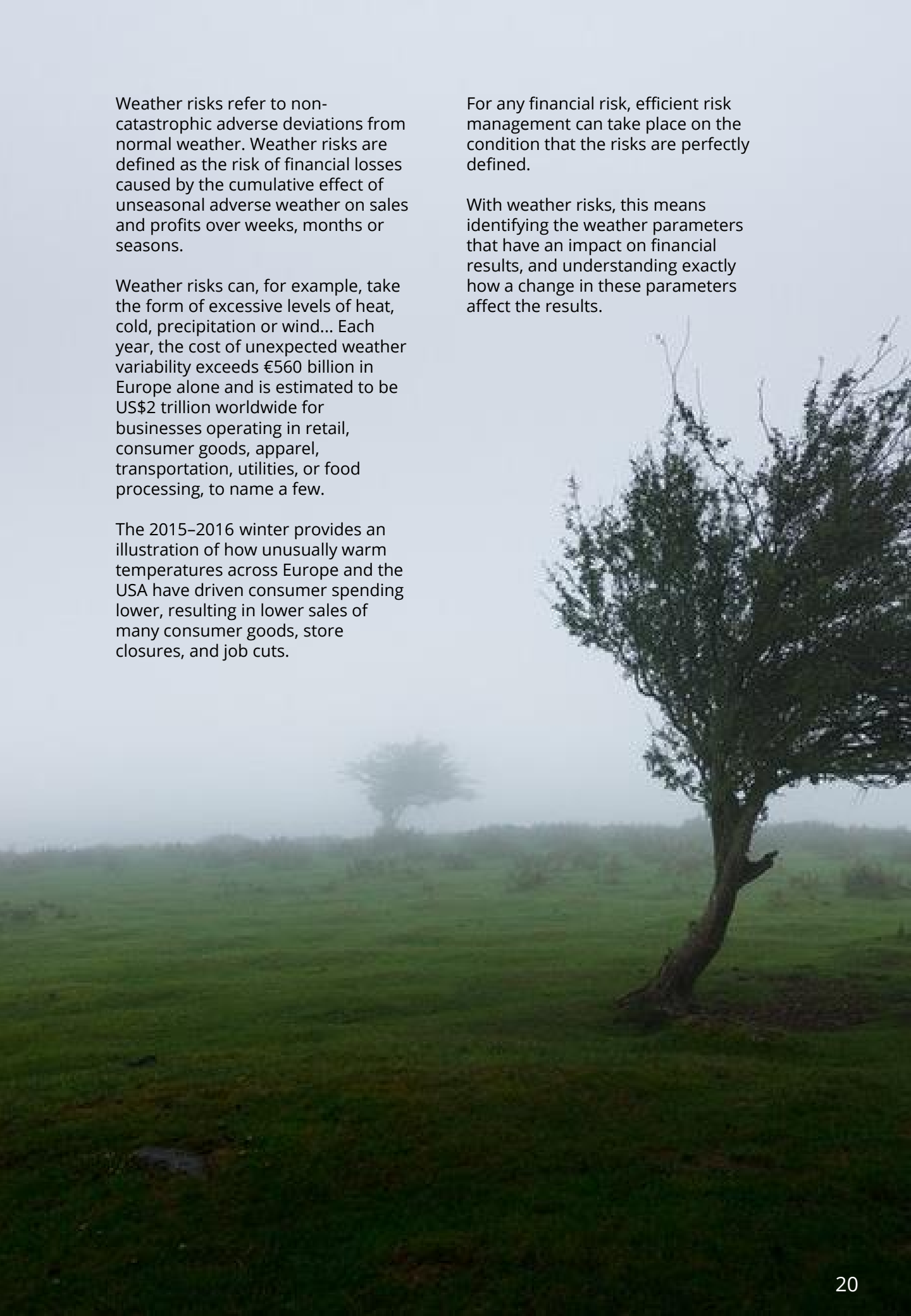
Weather risks refer to non-catastrophic adverse deviations from normal weather. Weather risks are defined as the risk of financial losses caused by the cumulative effect of unseasonal adverse weather on sales and profits over weeks, months or seasons.

Weather risks can, for example, take the form of excessive levels of heat, cold, precipitation or wind... Each year, the cost of unexpected weather variability exceeds €560 billion in Europe alone and is estimated to be US$2 trillion worldwide for businesses operating in retail, consumer goods, apparel, transportation, utilities, or food processing, to name a few.

The 2015–2016 winter provides an illustration of how unusually warm temperatures across Europe and the USA have driven consumer spending lower, resulting in lower sales of many consumer goods, store closures, and job cuts.

For any financial risk, efficient risk management can take place on the condition that the risks are perfectly defined.

With weather risks, this means identifying the weather parameters that have an impact on financial results, and understanding exactly how a change in these parameters affect the results.



Identifying and quantifying weather risks of a business unit, a division or a group can be challenging. Whilst weather mostly affects the volume of activities and therefore the quantity of goods sold or produced, there are situations where weather affects both volumes and prices.

The potential effects of weather on sales are specific to each product or product category, and may change with the time of the week or the time of the year, the city, the region or the country in which products are sold or produced.





In many situations, the relationship between weather and business activity is easy to establish. However, there may be instances where the influence of weather is not easy to determine, in which case it may be necessary to produce an extensive range of weather variables and test their correlation with business activity, in order to select the most influential one(s) and to find the most relevant relationship between sales and weather.

Weather variables include "continuous" variables that measure the accumulation of deviations from average conditions on various time periods, and "critical day" variables that measure the accumulation of days for which specific thresholds or conditions are observed.

From a methodological point a view, the weather-sensitivity relationship is established through correlation or regression analysis. One of the first academic work on weather-sensitivity was published in 1951. This seminal work consisted of observing the sales of a department store in Iowa and performing a multiple regression analysis with sales as a dependent variable and whatever explanatory weather variables were needed to fully express the weather situation.

Today, there is a lot more data and technology available to model the relationship between weather and business activity.

Modeling serves to determine the most relevant weather index (one or more influential weather variables) and the sensitivity coefficient(s) that measure changes in business activity based on the change in the weather index.

Once the weather-sensitivity relationship is known, a company can determine the contribution of weather to financial performance for each period considered. It can also measure its weather risk by introducing historical trend-adjusted weather observations into the weather-sensitivity models to calculate the value-at-risk, and the probabilities of occurrence associated with different levels of losses due to adverse weather.



Weather risk management

When the managers of a company have a perfect knowledge of the specific weather conditions that affect their company, and the losses that could be generated if these weather conditions are unfavorable, they are in a position to choose operational or financial strategies to reduce weather risks and limit the level of loss to a level that is acceptable to shareholders and lenders.

Financial hedging can be achieved using weather-index instruments in the form of derivatives or insurance. Weather index-based financial instruments were initially introduced in the USA in 1997 for the benefit of energy distribution companies, so that they would get a compensation for lost sales caused by warmer than normal winter temperatures.

Standard contracts based on temperature were later launched on the Chicago Mercantile Exchange during the summer of 1999 to address weather risks in a city or a region, and contracts based on snowfall, frost and rain were introduced several years after. However, the vast majority of weather hedging contracts are bespoke OTC contracts, and respond to the specific needs of each company and each business situation.

Weather index-based instruments work like any other traditional financial instruments except that the index on which they are settled is a weather index. Swaps, puts and calls can be structured to protect against the consequences of adverse weather in a way that is consistent with the risk management objectives of each company. The payout is triggered by and linked to the weather index, not the actual financial loss incurred by the business.

Hedging instruments that combine weather indices with other financial market indices can also be structured. In the weather market, these types of instruments are called quantos.

Hedging efficiency very much depends on the quality of risk identification and quantification, which in the case of weather risks means that the selection of the right weather parameters is key to success.

There are no official statistics on the consolidated transaction volume of weather derivative or insurance products, or the sector of activity of the companies that use them. However, we know that for many years, the cost of transacting was traditionally high, as many players existed along the supply chain between the potential buyer of a hedge and the risk taker, each requiring fees and commissions (e.g., brokers, weather data providers, weather-sensitivity analysts, product structurers, lawyers, risk capacity providers and insurers if the product was packaged as an insurance instead a financial instrument).



Today, prompted by better access to reliable historical weather data, and by more powerful technology, new players have entered the weather market, and existing players got more sophisticated, to help companies structuring and implementing hedging products that have become a lot more cost effective.

Some players have developed web-based underwriting and pricing platforms to provide easy access for businesses of any size to cover weather risks almost anywhere in the world, for any amount, for any period. Moreover, through these platforms, the pricing of weather derivatives has become more transparent for every user.

While many factors have contributed to the significant growth of the weather market in recent years, one of the factors that has particularly contributed to the increase in transaction volumes is the weather itself. With climate change, weather volatility has risen, and the effects of adverse weather have become more visible.

Weather volatility is now comparable and often higher than the volatility of other financial indices (e. g., foreign exchange rates, commodity prices, interest rates) for which companies have long had hedging programs in place.

When all other risk factors are under control, the financial impact of adverse weather become obvious, as the last unmanaged risk.

When all other risk factors are under control, the financial impact of adverse weather becomes obvious, as the last unmanaged risk.

Risk reporting requirements

A company holds two types of information: financial information, i.e., accounting documents such as balance sheets and profit and loss accounts, and non-financial information, which would include information on weather risks.

Financial information from accounting documents follows precise accounting standards. They are reliable, allow easy comparisons between companies and countries, and leave little room for approximations and interpretations.

In contrast to mandatory financial information, non-financial information is by nature more discretionary. Nevertheless, international regulators require non-financial information to comply with a number of conditions.

Companies are expected to disclose *useful* information to a wide range of user groups, including shareholders, financial partners, analysts and potential investors. The *usefulness* of information is defined in its ability to assist the shareholder in analyzing risk and profitability. The information must be comparable, verifiable, timely and understandable.

According to the IASB, these qualities cannot be achieved without *relevance* and *faithfulness*. The relevance of the information must allow shareholders to make decisions based on its predictive or confirmatory nature; the faithfulness of the information is measured by its complete, neutral and error-free content.

Companies must also disclose any *material* information. The International Financial Reporting Standards (IFRS) defines the concept of *material* items that, if omitted or misstated, they could, individually or collectively, influence the economic decisions that users make on the basis of the financial statements.

From 2020, the definition will evolve. The information will be considered *material* if omitting, misstating or obscuring it could reasonably be expected to influence the decisions that the primary users of general purpose financial statements make on the basis of those financial statements.

The work of standard setters in reporting non-financial information is not simple. If the rules are too prescriptive, disclosures are likely to contain boilerplate statements that carry very little specific and useful information. Hence, investors and analysts rely on companies' managers themselves to voluntarily disclose non-financial information they consider *useful* and *material*.


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The risk factors section should clearly state the risks and explain how the risks specifically affect the company.

With respect to risk disclosure, regulations such as The Companies Act (2006) require directors' reports to contain a business review which must itself contain a description of the principal risks and uncertainties facing the company. The SEC requires that the risk factors section should clearly state the risk and explain how the risks specifically affect the company.

The Accounting Standard Board adds that a best practice report on risk disclosure should provide some context to the risk to help investors understand whether the risk is increasing or decreasing, and the probability of the risk to materialize.

Overall, financial reporting standards play a key role in providing information to investors to better understand the company's underlying fundamentals and to minimize the misprice of the risk.

On the basis that information and transparency are at the heart of the efficiency of the economy and financial markets in particular, one can expect voluntary discretionary disclosures to be of high quality.

Indeed, a well-functioning financial market, i.e., a market in which information is *accurate*, *complete*, *useful*, and circulates freely, allows value to be transferred over time, and allows risk to be transferred or distributed from one economic agent to another at the right price.

The latent function of reporting is to provide *complete* and *timely* information on both the expectations of economic agents and the value of assets.

With the increasing focus on forward-looking information in corporate annual reports from regulators and various stakeholder bodies (i.e. IASB, ASB, Chartered Accountants, etc.), a number of studies have attempted to examine the relevance of narrative and numerical discretionary disclosures. Traditionally, researchers have looked at the quantity of information disclosed but there is a plethora of real-life examples to demonstrate that the quality of information is much more relevant than the quantity.

Despite a growing interest in risk disclosure analysis from scholars, the topic of the quality of financial disclosures is still one of the most unexplored areas of corporate disclosure.

Yet, studies published by researchers who focus on the content of risk disclosures seem to concur that current risk reporting is mostly *unhelpful*, conveys little meaning, and does not change much from one year to the next. Their studies highlight non-specific, boilerplate, very general and not sufficiently forward-looking practices, whereas disclosure information is meant be both specific to the company and regularly updated.

One study in particular points out that managers are unsure about which position to adopt in relation to risk disclosure: most companies are likely to have risk management systems in place, but they are reluctant to disclose information which they feel is commercially or politically sensitive, and that competitors may use in ways that would be harmful to their interests.

In addition, another study reveals that companies are unlikely to voluntarily disclose an information that is not disclosed by major competitors, even if this information can be considered *material* or *useful*.

Risk disclosure research refers to a wide variety of theories to explain the empirical reality revealed in annual reports. The most frequently used theories are agency, signaling, legitimacy, stakeholder and institutional.

Other theories include contingency, information relevance, impression management, and proprietary costs, the latter being quite frequently mentioned. The main principle of proprietary cost theory is that the decision to disclose or not to disclose information depends on the financial consequences that disclosure could have.

The topic of the quality of financial disclosures is still one of the most unexplored areas of corporate disclosure

In particular, this theory explains that corporate executives are reluctant to disclose in a spontaneous and transparent way the "bad news" that could discourage shareholders and potential investors, and result in reduced cash flows or financial performance.

As a result, financial disclosures tend to be very general and similar from one company to another.

Among a dozen theories identified in a study published in 2014, the one that dominates this field of research is agency theory.

Agency theory implies that the reason why managers provide discretionary narrative information to overcome information asymmetries between firm insiders and outsiders, is to lower the cost of capital, thereby enhancing share performance, and thus increasing managerial compensation.

Whilst most research that refers to agency theory mostly focuses on companies that underperform the market, signaling theory focuses on the behavior of managers in well-performing firms who signal this advantage by better transparency in their disclosure and presentation of information.

The legitimacy theory is usually used to change and often embellish the perception that stakeholders may have about the reputation of a company or industry.

Institutional theory suggests that firms may adopt processes and social norms that become authoritative guidelines. Institutions emulate other institutions in order to reduce attention from economically powerful stakeholders.

Finally, the stakeholder theory views risk disclosure strategy as a response to the pressure and demands of different stakeholders, from employees to customers, regulators, and governments.



In addition, there are two prevailing schools of thought in the field of risk disclosure: the first one assumes that managers prepare disclosures that convey *value-relevant* information aimed at improving investor decision making; the second one assumes that the choices made by managers are opportunistic and constitute *impression management*.

Again, within *impression management*, researchers distinguish two types of behaviors: *attribution*, which consists in shifting the blame for negative outcomes away from the managers, and *concealment*, which consists in emphasizing positive outcomes and obfuscating negative ones.

Given the predominantly narrative nature of discretionary disclosures, much research is based on this theory of impression management rooted in social psychology.

These works examine the conscious or unconscious ways in which managers manipulate or distort accounting reality to positively influence the company's stakeholders.

Applied to weather-related financial disclosures, impression management would lead to statements such as "...despite particularly unfavorable weather conditions, the commercial strategy implemented by the company has made it possible to stabilize and even strengthen our market share in some areas...", or could lead other managers to omit the impact of favorable weather on improved results from one year to the next, or to focus on year-on-year growth when the previous year's weather had a particularly large impact on results.

In the next section, we discuss the specific case of climate-related financial disclosures.



From TCFD to Weather-related Financial Disclosures

International and national accounting regulators have defined a framework and rules (e.g., IFRS 9 Financial Instruments and IFRS 13 Fair Value Measurement) for the type of information that listed companies must communicate to their shareholders.

Given the *material* nature of the consequences that climate change has on the economy as a whole and on companies in particular, it can be expected that a significant proportion of disclosures will be devoted to it: companies' risk profiles and their strategic positioning are directly affected by global and local changes in temperature, severe and extreme weather events.

Research on climate-change disclosures demonstrates that vulnerability and adaptive capacity are not usually covered, and there is no robust consolidated approach to financial risk assessment of climate change.

In fact, for many years, corporate disclosures on climate change and its consequences have mainly served to illustrate what the very definition of a boilerplate statement was.

The accumulation of severe and extreme events and the increase in their financial and human costs have gradually drawn attention to the fact that the cost of climate change in the cost of corporate capital had been neglected.

Not only had climate change not been included in the calculation of the value of many publicly traded companies, but the information available did not allow stakeholders to price climate risks under any circumstances.


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London Stock Exchange welcomes
ELITE UK companies
ELITE
WORLD INDICES
FTSE 100 7297.56 -6.48 (-0.09%)
FTSE 250 20358.50 -17.36 (-0.09%)
FTSE 350 4083.52 -3.60 (-0.09%)
FTSE Small Cap 5800.86 7.11 (0.12%)
FTSE All Share 4034.86 -3.25 (-0.08%)
FTSE AIM 1099.68 0.16 (0.01%)
FTSE MIB 20961.90 76.44 (0.37%)
Nikkei 225 23094.70 273.35 (1.20%)
AEX-25 540.69 0.17 (0.03%)
PSI-20 5293.46 8.14 (0.15%)
CAC 40 5339.41 -13.16 (-0.25%)
SGX 3135.53 -25.89 (-0.82%)
FTSE Australia 511.55 1.55 (0.30%)
FTSE Canada 585.38 0.00 (0.00%)
FTSE USA 1223.48 -0.00 (-0.00%)
FTSE Germany 389.38 -2.03 (-0.52%)
Dow Jones 26154.70 8.68 (0.03%)
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In response to this concern, climate change risk disclosure frameworks consisting of various initiatives designed to standardize, measure and communicate these risks to investors emerged. For instance, in 2012, the Climate Disclosure Standards Board released its Climate Change Reporting Framework, which outlined how reporting organizations could measure the impacts of climate change risks on their company and communicate those risks to investors.

But none of these approaches really bore fruit, and clearly none allowed investors to make better and more informed capital allocation decisions, until the initiative led by the Financial Stability Board came out.

In April 2015, the G20 Finance Ministers and Central Bank Governors asked the Financial Stability Board to convene public- and private-sector participants and review how the financial sector can take account of climate-related issues.

To help identify the information needed by investors, lenders, and insurance underwriters to appropriately assess and price climate-related risks and opportunities, the Financial Stability Board established an industry-led task force: the Task Force on Climate-related Financial Disclosures (the Task Force or TCFD).

The TCFD was mandated to create a voluntary framework for companies to report climate-related risks in a way that would be *useful* to all stakeholders such as investors, lenders and insurance underwriters.

The task-Force has a broad mandate and is accountable to the G20. It draws on the expertise of 31 members covering all stakeholders, from investment funds to asset managers, accounting and consulting firms, pension funds, banks, insurers and rating agencies.

The main purpose of TCFD's framework is to allow financial markets to price climate risks and therefore allow informed capital allocation decisions.

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According to the TCFD, investors will make better decisions when they are aware of relevant climate change risks and exposures of companies over the short, medium and long-term.

At the end of June 2017, the TCFD released its final report containing its recommendations on climate-related Financial Disclosures.

Recommendations are designed to fit all organizations, to encourage forward-looking, decision-useful information on financial impacts, bridge the gap between long-term and short-term horizons, and emphasize information on risks and opportunities related to the transition to a lower-carbon economy.

The typical categories of climate-related risks and opportunities are displayed in **Figure 1**.

The actual recommendations are geared around the corporate risk management cycle which starts at the identification of a risk and goes all the way to the implementation of risk mitigation strategies, risk quantification and risk management policy.



Market and Technology Risks

- Policies and investments to deliver a low carbon emissions economy
- Reduced market demand for higher carbon products/commodities
- Increased demand for energy-efficient, lower carbon products and services
- New technologies that disrupt markets

Reputational Risks

- Growing expectations for responsible conduct from shareholders, including investors, lenders and consumers
- Opportunity to enhance reputation and brand value
- Risk of loss of trust and confidence in management

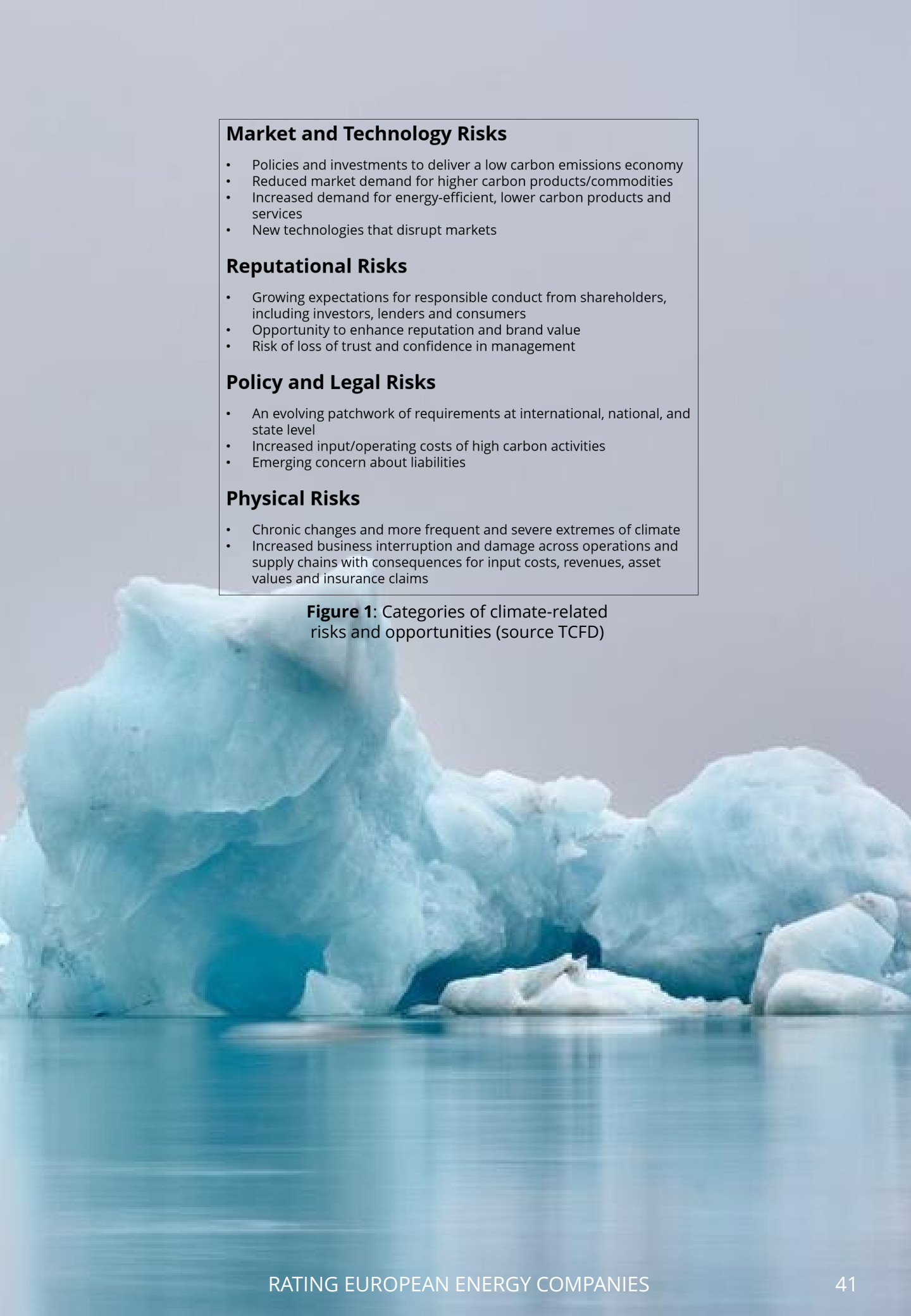
Policy and Legal Risks

- An evolving patchwork of requirements at international, national, and state level
- Increased input/operating costs of high carbon activities
- Emerging concern about liabilities

Physical Risks

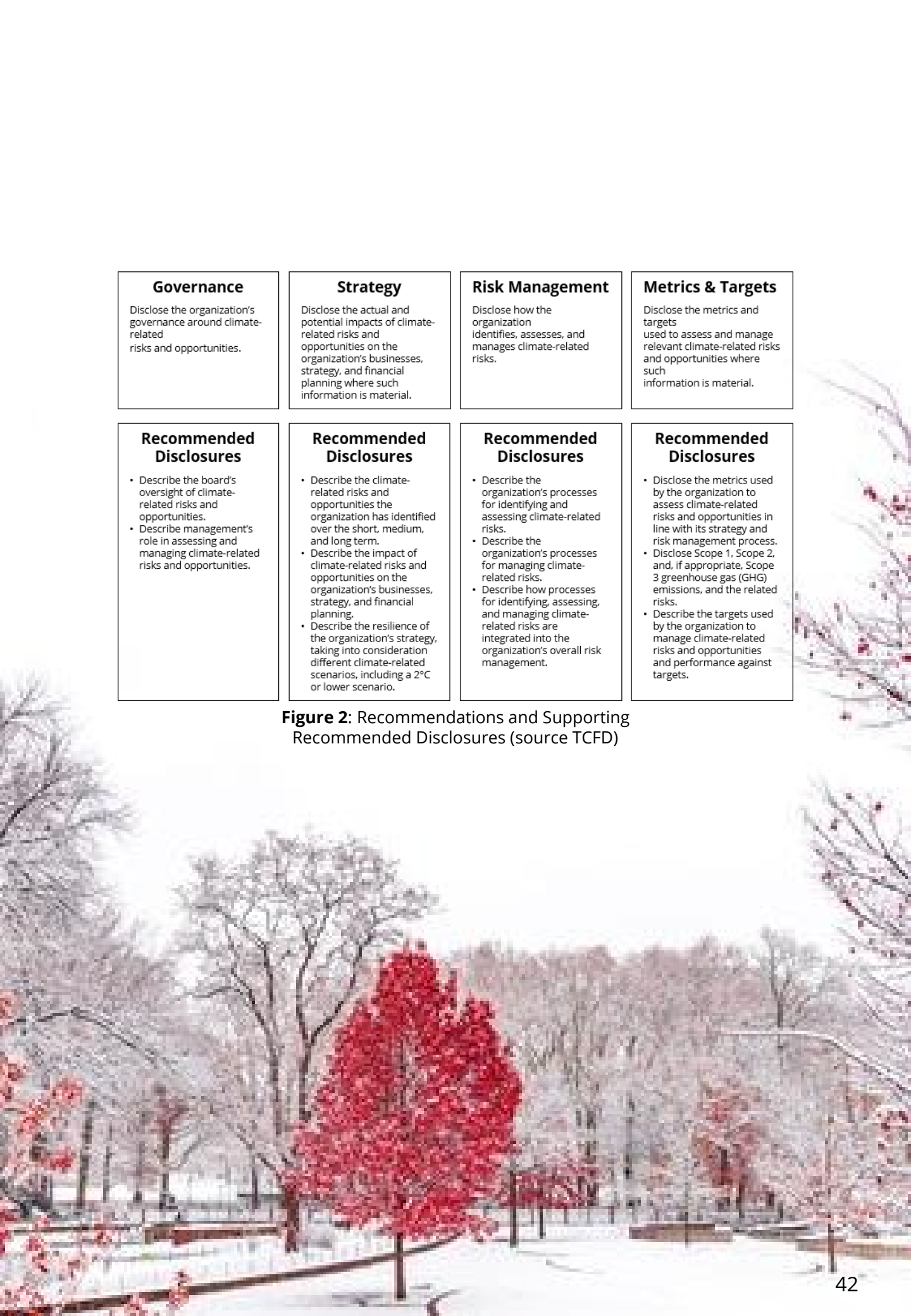
- Chronic changes and more frequent and severe extremes of climate
- Increased business interruption and damage across operations and supply chains with consequences for input costs, revenues, asset values and insurance claims

Figure 1: Categories of climate-related risks and opportunities (source TCFD)



Governance	Strategy	Risk Management	Metrics & Targets
Disclose the organization's governance around climate-related risks and opportunities.	Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.	Disclose how the organization identifies, assesses, and manages climate-related risks.	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.
Recommended Disclosures • Describe the board's oversight of climate-related risks and opportunities. • Describe management's role in assessing and managing climate-related risks and opportunities.	**Recommended Disclosures** • Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term. • Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning. • Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	**Recommended Disclosures** • Describe the organization's processes for identifying and assessing climate-related risks. • Describe the organization's processes for managing climate-related risks. • Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	**Recommended Disclosures** • Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process. • Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks. • Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.

Figure 2: Recommendations and Supporting Recommended Disclosures (source TCFD)



Specifically, the four thematic areas for which TCFD provides recommendations on disclosures are Governance, Strategy, Risk Management, and Metrics and Targets. (**Figure 2**). The Task Force recommends that preparers of climate-related financial disclosures provide such disclosures in their mainstream annual financial reports.

The Task-Force recognizes that in some cases companies may prefer to report climate-risk in a separate document, in which case, it would be expected that the principles that apply for preparing the annual report should also apply for climate-related disclosures.

On the basis that most accounting and legal frameworks require publicly listed companies to disclose *material* items, TCFD expects most companies to disclose climate-related risks, as "the Task Force believe climate-related issues are or could be *material* for many companies, and its recommendations should be useful to companies in complying more effectively with existing disclosure obligations".

In addition, the TCFD believes that financial risks should be considered as an integral part of the internal governance procedures that apply to other financial risks. They should therefore be placed under the responsibility of the CFO and/or the audit committee, depending on the company.

Finally, the TCFD recommends that climate-related financial disclosures to be effective must comply with seven principles:

1. Disclosures should represent relevant information;
2. Disclosures should be specific and complete;
3. Disclosures should be clear, balanced, and understandable;
4. Disclosures should be consistent over time;
5. Disclosures should be comparable among companies within a sector, industry, or portfolio;
6. Disclosures should be reliable, verifiable, and objective;
7. Disclosures should be provided on a timely basis.

2018 Status Report

Task Force on Climate-related Financial Disclosures: Status Report

TCFD | TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

September 2018

Climate change is the trend, weather variability is the standard deviation, and the speed at which climate changes causes weather variability to increase.

In September 2018, the TCFD issued a new report that evaluates the adoption of the proposed climate-related financial disclosure framework. TCFD's recommendations are actually becoming reporting standards for companies with revenues in excess of USD 1 billion. 513 companies had already adopted the reporting framework, including 287 financial firms, managing assets of nearly $100 trillion.

Although the results are encouraging and the adoption rate of the reporting framework is progressing rapidly, the flip side of the coin is that financial implications are often not disclosed.

Very few companies disclose the financial impact of climate change, be it short-term or long-term. Few companies describe how their strategy makes their company resilient in any of the climate change scenarios.

The TCFD survey also highlights the differences and inconsistencies in the way climate-related risks are reported across industry sectors and regions.

Finally, the TCFD report notes that disclosures are scattered across a number of reports (annual reports, financial filings, sustainability reports, etc.), which does not facilitate comparisons and analysis.

Yet, it is fair to say that the TCFD is the most successful initiative to date when it comes to proposing a decision-useful reporting framework of climate risks.

It is important to realize that the TCFD's framework was prepared to bring future climate risks to present. In other words, adapting to climate-related risks mostly refers to adjusting "to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities".

Although the TCFD's reporting framework does not specifically mentions weather risks, it does not take much of a stretch to make the connection between climate change and weather variability.

The State of the Climate reports from the World Meteorological Organization and the reports published the Intergovernmental Panel on Climate Change over the years attest to the increase in the frequency and the intensity of abnormal weather events.

Climate change is the trend, weather variability is the standard deviation, and the speed at which climate changes causes weather variability to increase.

At the risk of oversimplifying, one could say that dry periods are dryer, wet periods are wetter, hot periods are hotter, and long adverse weather conditions last longer.

Weather does not have to be extreme to have a significant impact on business activity. The accumulation of adverse weather days over several weeks or months is enough to result in lower sales, profit warnings, and at times significant financial losses.

Research showed that the Weather Value-at-Risk in many sectors exceeds the Value-at-Risk for other traditional financial risks such as foreign exchange, commodity prices or changes in interest rates.

This study intends to address some of the questions that emerged out of the literature review:

- With climate change and rising temperatures, does it make sense for analysts and shareholders to continue to accept earnings forecasts based on a normal weather conditions, especially in the energy sector?
- What is normal weather anyway?
- How sensitive is the company to weather variability?
- How resilient is the company to a succession of consecutive adverse seasons?
- How are earnings affected by weather variability in the long run?
- How does the company adapt to weather variability?
- Isn't adapting to weather variability the first step to adapting to climate change?
- Could weather variability be the missing link between climate change long term risks that are difficult to price and short-term weather risks that are quantifiable?
- What should the weather risk premium be?
- Is the company properly valued?

This study aims to apply, extend, and in fact complement the methodology developed by the TCFD for disclosures of climate risk to risks related to weather variability.

Just as until the proposal of the TCFD there was no framework, no standard for disclosing climate risks in a way that would be *useful* to the different stakeholders in a company, there is currently no framework for weather risks. It is this gap that this study aims to fill.

Isn't adapting to weather variability the first step to adapting to climate change?





Rating Methodology

Content analysis is used to evaluate the nature and the quality of weather-related financial disclosures.

There are two ways to analyze the content. The first method, called *objective*, focuses on the form of the weather-related disclosures. The second method, called *subjective*, consists in analyzing the meaning of the disclosures. Despite its subjective nature, the latter approach of analyzing the meaning of disclosures provides much richer results.

A weather-related disclosure is defined as information that describes the company's exposure to unseasonal weather conditions, and provides its financial impact on past and future performance.

This includes forward-looking information that helps shareholders, analysts and potential investors evaluate, estimate or amend future cash flows and forecasts that result from a change in weather conditions, information on weather variability surrounding forecasts of the company's financial performance that allows stakeholders to understand the maximum potential losses caused by adverse weather, and more generally all weather-related information that affects the non-diversifiable risk that should be included in the calculation of the cost of equity.

In addition, weather-related disclosure includes information about the actions taken to mitigate weather risks, the risk management policy and processes, the hedging instruments and their efficiency in reducing risks, and forward-looking information on hedging programs in place or considered to manage weather risks.

We search for weather-related financial disclosure in all information that firms publicly provide in their annual reports, sustainability reports, financial statements, presentations of results, management reports, press releases, and more generally all information related to the financial statements that are publicly available.

Within the annual reports, we make a distinction between weather-related content presented in the risk factors section and references to weather discussed in relation to financial performance in the Management Commentary section.

Figure 3 displays the conceptual framework of our study. We build from the five main theories that are assumed to have an influence on the actual disclosures (agency, signaling, legitimacy, stakeholder and institutional).

In this study, we do not evaluate potential biases in discretionary disclosures that may result from impression management. Instead, we focus on the analysis of the value-added elements of weather-related financial disclosures to determine the *usefulness* of the information provided to stakeholders and rate the quality of disclosures in their ability to estimate the cost of weather risk.

In evaluating the degree to which weather-related disclosures are *useful*, we classify their content into five thematic groups and then assess a number of criteria derived from valuation and risk management theories in each of these groups.

In particular, we study the *clarity* of explanations regarding weather dependence, the *usefulness* of information related to weather risks, the presence of elements to value these risks and to establish financial simulations, the risk management policy in place, and finally the way in which managers integrate weather into operational and financial comments in annual reports.
Figure 4 provides the analysis grid.

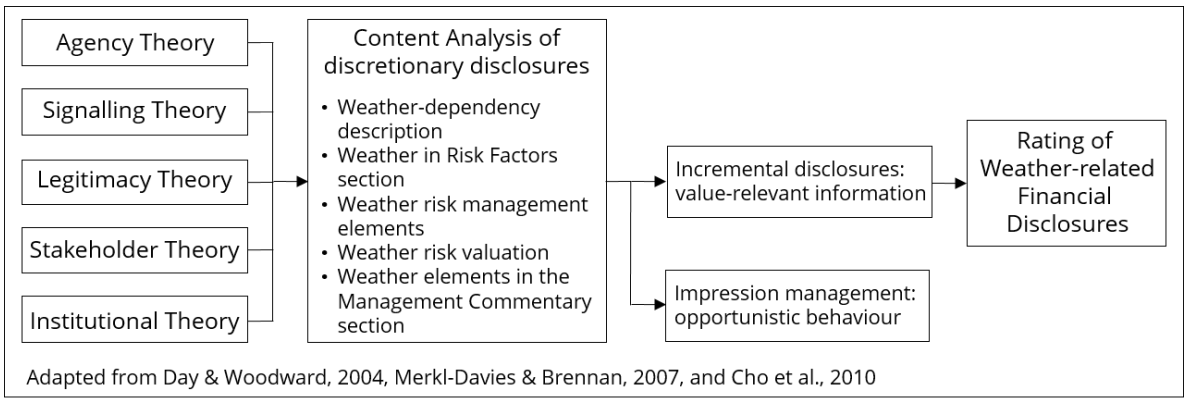


Figure 3: Conceptual framework

Weather-Dependency description

- There is a specific statement in the annual report that describes the relationship between weather and financial performance
- Weather is mentioned as a possible explanatory factor in the volatility of financial performance
- Specific weather parameters are mentioned as a possible cause of business fluctuation (temperature, rain, wind, etc.)
- A clear statement on what weather metric affects what and how (abnormally cold temperatures in winter months generate more demand for heat and have a positive effect on sales, etc.)
- Both positive and negative effects of weather on financial performance are discussed

Weather Risks description in the Risk Factor section

- There is a specific risk factor section in the annual report
- There is a reference to abnormal weather in the risk factor section
- Weather is specifically mentioned as a risk factor
- Weather risk is clearly defined in the annual report (drop in demand caused by the positive deviation from normal weather, etc.)
- Normal weather that serves as a base for outlook statements is clearly defined
- A distinction is made between abnormal weather, severe weather and extreme weather is made
- Financial items exposed to weather are clearly specified (sales, volumes, costs, results, etc.)
- Weather risk metrics are stated (temperature, precipitation, wind, solar radiations, etc.)
- A clear explanation on what metric affects what and how is provided (warmer than normal temperatures in winter months lead to lower demand; abnormally low precipitation has a negative effect on hydroelectric production; etc.)
- Climate change is mentioned in reference to the increasing meteorological risk it represents due to the increase in the number, duration and intensity of abnormal meteorological events

Weather Risk Management

- There is a specific statement in the annual report that mentions how weather risks are managed
- A description of a risk management policy with respect to weather risks is provided
- Weather risks that are the subject of a risk management policy are listed
- Mitigation strategies, whether operational or financial, are discussed
- Risk management objectives are clearly specified (responsibilities, what exposures are considered, hedging ratio, time horizon, benchmark, etc.)
- Hedging instruments to mitigate the effects of weather are listed and explained
- Hedging efficiency is discussed
- Risk management policy review process is discussed

Weather Risk Valuation

- The effects of weather (positive or negative) on financial performance are mentioned
- The effects of weather on financial performance are discussed in relation to the normal weather on which financial forecasts and outlook are established
- The effects of weather on financial performance are discussed in relation to previous year
- Numbers in TWh or currencies related to the impact of weather on financial performance, whether by country or group's division, are provided
- The consolidated effect of weather on group's financial results is provided
- A forward-looking sensitivity analysis to allow analysts and investors to anticipate the effects of weather on financial performance is provided
- A Weather Value-at-Risk analysis is provided
- Weather risk valuation methods are explained

Weather in Management Commentary

- A reference is made to weather
- Weather is mentioned whether its influence on financial performance is positive or negative
- Explanations on the influence of weather are clear and quantified (what is affected and to what extent)
- The effects of weather are analyzed against expected results and/or against previous year
- Number of references to weather in the annual report

Figure 4: Weather-related financial disclosures analysis grid



We divide the analysis grid into 5 categories. In each category, we evaluate disclosures contents in:

1. their ability to explain in a clear and understandable manner the *dependency* of the company to weather conditions;
2. their presence and relevance of weather elements in the *risk factors* section of the annual report and official public documents;
3. the way they describe *risk management policy* related to weather risks , including roles and responsibilities, list of exposures to be managed, hedging objectives and benchmarks, operational and/or financial hedging techniques, and hedging efficiency;
4. their ability to *value* weather risk, provide enough elements to understand the sensitivity of sales or EBITDA to weather, the loss probability distribution, and the adjustments to forecast as a function of weather conditions; and
5. the way they explain how weather *contributed* to past performance, positively or negatively.

Each element in each category is numerically rated, and we calculate the total rating for each category. The global weather-related financial disclosure rating is calculated using the same weight for each of the five content categories. Some users, such as analysts, potential investors or lenders, may decide to place more emphasis on some categories (e.g., ability to value risk, ability to understand how weather contributed to financial performance).

Weather-related financial disclosure ratings are expressed as a percentage of what we consider to be the reference levels for *useful*, *accurate* and *relevant* information on weather risks.

Database: European Energy companies

The energy sector, for which weather risk is considered *material*, provides an ideal empirical basis for the application of our weather-related financial disclosures rating methodology.

For the purposes of this white paper, we have limited our analysis to 47 European companies (see **Figure 5**). We also have limited ourselves to analyzing the content of the most recent financial documents, namely those of 2017.

These documents range from annual reports to analyst packs, including general meeting presentations, sustainable development reports, registration documents and any additional reports made available to shareholders and potential investors.

For each company and document, we conducted a keyword search (e. g., weather, climate, temperature, wind, rain, etc.) to identify all narrative and numerical disclosures, and have compiled each disclosure and the context in which it fits into a database, specifying the document, page and section in which the disclosure appears.

AXPO	ENGIE	MOL	RUBIS
BKW GROUP	ENI	MVV ENERGY	RWE
BP	E-ON	NATIONAL GRID	SARAS
CENTRICA	EQUINOR	NATURGY	SNAM
DCC	FORTUM	NESTE	SSE PLC
DIRECT ENERGIE	GASTERRA	OMV	SUEZ
EDF	GAZPROM	ORSTED	TOTAL
EDP	GRUPA LOTOS	PGE	UNIPER
ENAGAS	HELLENIC PETROLEUM	PKN ORLEN	VATTENFALL
EnBW	HERA	PPC	VEOLIA
ENEL	IBERDROLA	REPSOL	VERBUND
ENERGIE STEIRMARK	INNOGY	ROYAL DUTCH SHELL	

Figure 5: Panel of European Energy companies considered in this study

Figure 6 provides a snapshot of the descriptive statistics of the database. France and Germany are the most represented countries in our sample with a total of 13 companies. Spain and Italy are next with 12 energy companies, followed by the UK (4 companies), Austria and Poland (3 companies each). In total, 17 countries are represented. In our sample, almost 80% of companies reported 2017 sales between 1 and 50 billion euros, 79% of companies make references to weather, while as many as 47% do not list weather as a risk factor.





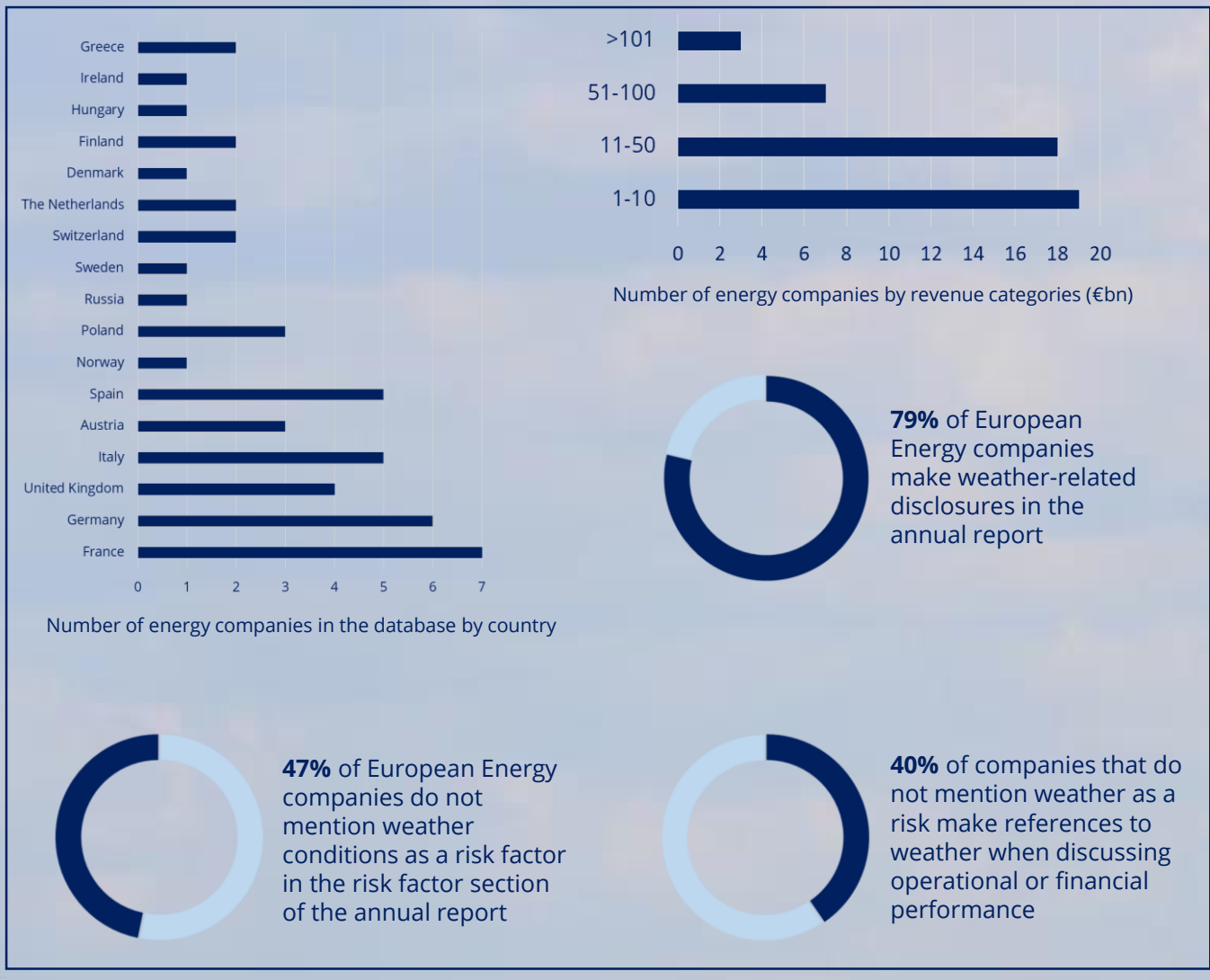


Figure 6: Database descriptive statistics

RESULTS



Rating Weather-related Financial Disclosures

Table 1 provides the global rating and ranking of the 47 European energy companies considered in this study.

Ratings are expressed as a percentage of the optimal level of information for each dimension of weather risk disclosures.

The global rating evaluates the degree to which information on weather risk is *useful* and *adds value*. Five dimensions were measured and rated:

- The dependency to weather;
- Weather as a risk factor;
- The weather risk management policy;
- Weather risk valuation;
- Weather in the Management Commentary section.

EDF, the French Electricity producer and distributor comes first in the ranking of the weather-related financial disclosures rating of European energy companies.

EDF, with a global rating of 67.5% is slightly ahead of **ENGIE,** another French power, natural gas and energy services provider, with a global rating of 65%.

The top places in the ranking are monopolized by French and German companies (7 in the top 10), whose communication regarding weather risks ranks above average.

This is consistent with the results of the study published by University of St. Gallen in 2010, which noted that "risk reports of utilities domiciled in Germany and France show significantly more information about weather risk than companies from other countries". In line with the results of the same study, we note that Swiss companies in our sample "reports significantly less information about weather risk".

For investors and shareholders, the degree of *usefulness* of companies' annual reports depends on the quality of narrative communication in the non-financial sections of annual reports.
In the next sections, we analyze the narrative content of disclosures, to identify strengths and weaknesses of the existing reports, as well as areas for improvement.

Rank	Company Name	Global Rating	Country
1	EDF	67,5%	France
2	ENGIE	65,0%	France
3	MVV ENERGY	51,3%	Germany
4	VEOLIA	50,0%	France
5	SSE PLC	47,5%	United Kingdom
6	INNOGY	46,3%	Germany
7	FORTUM	42,5%	Finland
	UNIPER	42,5%	Germany
9	VERBUND	40,0%	Austria
10	RWE	38,8%	Germany
11	HERA	37,5%	Italy
12	ENEL	35,0%	Italy
	E-ON	35,0%	Germany
	ROYAL DUTCH SHELL	35,0%	The Netherlands
	VATTENFALL	35,0%	Sweden
16	ENI	32,5%	Italy
17	EnBW	27,5%	Germany
18	SNAM	27,5%	Italy
19	BP	25,0%	United Kingdom
	ENAGAS	25,0%	Spain
	NATIONAL GRID	25,0%	United Kingdom
	PGE	25,0%	Poland
23	ENERGIE STEIRMARK	22,5%	Austria
	MOL	22,5%	Hungary
	REPSOL	22,5%	Spain
	RUBIS	22,5%	France
	SARAS	22,5%	Italy
28	EDP	20,0%	Spain
	EQUINOR	20,0%	Norway
	GRUPA LOTOS	20,0%	Poland
	HELLENIC PETROLEUM	20,0%	Greece
	TOTAL	20,0%	France
33	CENTRICA	17,5%	United Kingdom
	PPC	17,5%	Greece
35	NESTE	15,0%	Finland
	ORSTED	15,0%	Denmark
37	AXPO	12,5%	Switzerland
	DCC	12,5%	Ireland
	GAZPROM	12,5%	Russia
	NATURGY	12,5%	Spain
	SUEZ	12,5%	France
42	IBERDROLA	7,5%	Spain
43	DIRECT ENERGIE	5,0%	France
	OMV	5,0%	Austria
	PKN ORLEN	5,0%	Poland
46	BKW GROUP	0,0%	Switzerland
	GASTERRA	0,0%	The Netherlands

Table 1: Global Rating and Ranking of European Energy companies

Rank	Company Name	Dependency
1	MVV ENERGY	90%
	INNOGY	90%
	RWE	90%
4	EDF	80%
	ENGIE	80%
	SSE PLC	80%
	UNIPER	80%
	E-ON	80%
	ENEL	80%
	VATTENFALL	80%
	ENI	80%
	NATIONAL GRID	80%
13	FORTUM	60%
	HERA	60%
	ROYAL DUTCH SHELL	60%
	SNAM	60%
	EnBW	60%
	ENAGAS	60%
	PGE	60%
	TOTAL	60%
21	VEOLIA	40%
	VERBUND	40%
	BP	40%
	ENERGIE STEIRMARK	40%
	MOL	40%
	REPSOL	40%
	RUBIS	40%
	SARAS	40%
	EQUINOR	40%
	EDP	40%
	HELLENIC PETROLEUM	40%
32	GRUPA LOTOS	20%
	CENTRICA	20%
	PPC	20%
	NESTE	20%
	ORSTED	20%
	AXPO	20%
	DCC	20%
39	GAZPROM	0%
	NATURGY	0%
	SUEZ	0%
	IBERDROLA	0%
	PKN ORLEN	0%
	OMV	0%
	DIRECT ENERGIE	0%
	BKW GROUP	0%
	GASTERRA	0%

Table 2: Rating and Ranking of Weather-dependency contents

Rank	Company Name	Risk factor
1	MVV ENERGY	70%
	EDF	70%
	ENGIE	70%
	SSE PLC	70%
	UNIPER	70%
	ENI	70%
	FORTUM	70%
	EnBW	70%
9	INNOGY	60%
	VATTENFALL	60%
	ROYAL DUTCH SHELL	60%
	VEOLIA	60%
13	E-ON	50%
	HERA	50%
	ENAGAS	50%
	TOTAL	50%
	EQUINOR	50%
18	RWE	40%
	PGE	40%
	VERBUND	40%
	BP	40%
	REPSOL	40%
	RUBIS	40%
	GRUPA LOTOS	40%
	NESTE	40%
26	ENEL	30%
	SNAM	30%
	SARAS	30%
	EDP	30%
	PPC	30%
	ORSTED	30%
	SUEZ	30%
33	NATIONAL GRID	20%
	MOL	20%
	HELLENIC PETROLEUM	20%
	CENTRICA	20%
	AXPO	20%
	DCC	20%
	IBERDROLA	20%
	PKN ORLEN	20%
41	ENERGIE STEIRMARK	10%
	GAZPROM	10%
	NATURGY	10%
	DIRECT ENERGIE	10%
45	OMV	10%
	BKW GROUP	0%
	GASTERRA	0%

Table 3: Rating and Ranking of weather references as a risk factor

Rating weather-dependence disclosures

Table 2 rates the quantity and the quality of explanations of the relationship between weather and business activity in the annual report. Given the importance of weather in the energy sector, both in terms of production and demand, particularly from households, it can be expected that entire paragraphs of annual reports should be devoted to the weather. This is far from being the case.

In our panel of European energy companies, 19% of companies do not provide any explanation at all on the relationship between weather conditions and their business activity.

Others provide boilerplate statements. For example, here is a non-exhaustive list of disclosures that do not provide *useful* information:

- "*The Group companies are also exposed to changes in volumes associated with weather conditions (for example, temperature impacts the consumption of gas and power)*" (**ENEL**);
- "*Weather conditions influence our turnover with district heating and gas, particularly in the heating period from October to April.*" (**MVV ENERGY**);
- "*The weather is an important contributor to business performance that is strongly interconnected to identified Principal Risks such as Energy Affordability, Commodity Prices and Energy Infrastructure Failure*" (**SSE PLC**);
- "*Weather conditions can affect financial performance* (**NATIONAL GRID**)";
- "*Energy business lines are subject to seasonal changes and weather uncertainty* (**VEOLIA**)".

Some statements provide more information about both the weather parameter that influences business activity and how it influences it. For instance,

- **E.ON** explains that "*the demand for electric power and natural gas is seasonal, with* [their] *operations generally experiencing higher demand during the cold-weather months of October through March and lower demand during the warm-weather months of April through September*";
- **UNIPER** writes that "*due to cold weather periods, demand for electricity and gas can lead to increased sales volumes*";
- **INNOGY** states that "*whereas energy consumption by industrial enterprises is primarily affected by the development of the economy, households' energy consumption is strongly influenced by the weather*" and adds that "*the higher the outdoor temperatures, the less energy is needed for heating purposes and vice-versa*."
- **ENI** explains that *"in colder years, demand for natural gas and refined products is higher*".

ENGIE does not provide explanatory disclosure in the core of annual report, but provides clearer information than other companies in the appendices to the annual report, in a section entitled "*Impact of weather in France*".

The diagram proposed by **ENGIE** explains that positive temperature deviations from average climate (warmer than normal) lead to a financial loss versus budget, and negative deviations from average climate (cooler than normal) mean additional profit.

The level of explanation regarding the influence of weather on energy production is better than that of demand. In the case of renewable energy, it must be said that the link between weather and production is of course much more obvious.

Nevertheless, the explanations are rather minimalist. Here are some examples:

- "*The generation of electricity from the wind and sun is dependent on the weather*" (**EnBW**)
- "*The volume of electricity fed in from renewable energies plants, such as wind turbines or photovoltaics systems, for example, fluctuates in line with weather conditions and the time of day.*" (**MVV ENERGY**)
- "*In addition to energy consumption, the generation of electricity - particularly from wind farms - is also subject to weather-related influences.*" (**RWE**)
- "*Wind and sun are not available around the clock and in all weather conditions, which means that the energy supply can fluctuate considerably*." (**UNIPER**)
- "*Run-of-river power stations are also subject to weather conditions. Their electricity production depends on precipitation and melt water volumes.*" (**RWE**)
- "*The output of wind farms and hydroelectric power plants is curtailed in particular by low wind and precipitation levels. However, favorable weather conditions can also drive up electricity production.*" (**INNOGY**)

Rating weather risk disclosures

For an energy company, not to mention weather, even superficially or very generally, in the dedicated list of risk factors that could affect financial performance or forecasts seems inconceivable.

In our sample, 4 of the 47 energy companies (9%) did not have a separated risk factors section in their annual report. Of all companies with a risk factors section, 47% of them did not report weather as a risk factor in the risk factors section of the annual report, and 40% of companies who did not mention weather as a risk nevertheless made reference to weather when discussing operational or financial performance.

Table 3 ranks the quantity and quality of references made to weather as a risk.

In some cases, weather risks are listed among many other risk factors. This is the case for **ENI**, which states that "*ENI's operating results, cash flow and rates of growth are affected by volatile prices of crude oil, natural gas, oil products and chemicals. Prices of oil and natural gas have a history of volatility due to many factors that are beyond ENI's control. These factors include among other things: (...) weather conditions",* where weather conditions are the 6th bullet point in a list of eleven bullet points.

It is also the case for **SSE,** which includes "adverse weather" in a list of 8 *material* influencing factors, in a risk category presented as a "*risk of harm to people, property or the environment from SSE's operations*".

47% of companies do not report weather as a risk factor in the risk factors section of the annual report.

In other cases, references briefly describe weather risks. **CENTRICA**, for instance, explains that "*the Group's supply activities are also exposed to volumetric risk in the form of an uncertain consumption profile arising from a range of factors, including the weather".* **E.ON** states that *"sales and results of operations for all of* [their] *energy operations can be negatively affected by periods of unseasonably warm weather during the autumn and winter months".*

"[E.ON] *expects seasonal and weather-related fluctuations in sales and results of operations to continue."*

Finally, very few companies provide an exhaustive description of weather risks and how they affect business activity. One such example is **EDF**. **Figure 7** displays the complete paragraph on weather risk that EDF publishes in the risk factors section.

The Group is exposed to risks related to weather conditions and seasonal variations in the business.

Electricity consumption is seasonal and depends to a great extent on weather conditions. For example, in France, electricity consumption is generally higher during winter months. Furthermore, available power may also depend on weather conditions. Thus, low water levels or heat waves may limit nuclear power generation due to the requirement that rivers downstream of facilities not exceed maximum temperatures. Hydropower generation is also sensitive to rainfall (quantity and annual distribution) and snowfall with respect to mountain ranges (see section 1.4.1.5.1 "EDF New Energies"). Similarly, power generated by wind power or solar plants depends on wind conditions or hours of sunshine at the sites where such facilities are installed (See section 1.4.1.5.3 "New renewable energies"). The service activities may themselves depend on peak periods, in winter and in summer. Therefore, the Group's results reflect the seasonal character of the demand for electricity and may be adversely affected by exceptional weather conditions or by rain, snow, wind or sunshine conditions that are less favourable than anticipated. For example, the Group may have to compensate the reduced availability of economical power generation means by using other means with higher production costs, or by having to access the wholesale markets at high prices.

Figure 7: Source: **EDF** Reference Document 2017, Section 2: RISK FACTORS AND CONTROL FRAMEWORK (page 110)



Rating Weather Risk Management disclosures

The risk premium associated with a given company depends, of course, on the risks to which it is exposed, but also and above all on the way these risks are identified, quantified and managed. The risk premium has an impact on the cost of equity, and therefore on the Weighted Average Cost of Capital (WACC), which is nothing more than the cost of the resources the company needs to invest and grow. In general, financial theories imply that the higher the risk premium, the higher the WACC, and the lower the profitability of the company. Similarly, the higher the risk premium, the more investors are entitled to demand a higher return, which also leads to a higher cost of equity for the company.

Risk management is about risk identification, risk quantification, risk policy, risk mitigation, and risk policy efficiency.

Identifying a risk means knowing the type of exposures (sales, production, volume, price), the start dates, the maturity dates, and the benchmarks that apply (volume at average weather conditions, average forward price, etc.).

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Quantifying the risk means knowing the volatility that applies to each metrics to estimate the sensitivity to a change in the risk metrics, and the potential losses caused by adverse conditions.

The risk management policy defines the exposures that are supposed to be managed, the hedging instruments, the hedging ratios, the expected objectives, and of course the roles and responsibilities of managers and controllers.

Risk efficiency measurement is the last step of risk management. It makes it possible to verify the relevance and effectiveness of the risk management policy in place. It also allows it to be compared with other strategies, and to change the existing policy if necessary.

The previous paragraphs justify the importance of risk management disclosures.

If an investor has no information on how a risk is identified, quantified and managed, he can only assume that the risk is not managed, or worse, that it is neither identified nor quantified. In this case, the very minimum risk premium that applies is the average risk premium for the sector.

Thus, an investor who knows that the entire energy distribution sector is exposed in the event of an abnormally mild winter, will review downwards the results of all companies for which he or she does not have specific information.

Yet, some companies may have a portfolio of mainly industrial customers, and be less exposed than those that distribute their energy mainly to households. Without specific information on risk identification, expected results will be revised downwards for everyone without discrimination.

Other companies may be more exposed than average companies in the sector, but have hedging contracts in place to compensate for the financial effects of a mild winter. Without specific information, an analyst can only but assume that there is no hedging in place, and therefore these companies' expected results will also be uniformly revised downward.

Poor quality of risk management disclosures can only but result in a misprice or the risk premium: the company is either unfairly or more penalized by an investor than it should be.

It would therefore be logical to expect, in accordance with disclosures theories, that companies would be particularly attentive to the quality of risk management disclosures in order to avoid being penalized.

However, empirical evidence contradicts theories: the analysis of information concerning weather risk management disclosures leads to one clear conclusion: they are uniformly of poor quality for all the companies in our panel.

Table 4, which examines and rates both the quantity and quality of information on weather risk management disclosures**,** shows that 70% of energy companies in the panel do not disclose any information on how weather risks are managed.

Poor quality of risk management disclosures can only but result in a misprice or the risk premium



Some companies discuss operational risk reduction strategies. For instance, they mention that they use weather forecasts or big data to reduce errors in renewable consumption and production (**EDF**, **ENEL, MVV ENERGY, SSE, VATTENFALL, VERBUND**), or the use of thermal assets or batteries to respond to low renewable output (**SSE, VATTENFALL**).

ENI provides a very broad statement on how risks are identified and managed: "*The analysis is carried out using an integrated and cross-cutting approach which involves specialist departments and business areas and considers both aspects correlated with energy transition (market scenario, regulatory and technological developments, reputation issues) and physical aspects (extreme/chronic weather and climate phenomena), as described in the Strategy section*".

INNOGY is one of the few companies to mention weather risk management hedging instruments, without disclosing the context or the way they are used: "*Level 3 derivative financial instruments essentially consist of weather derivatives to hedge temperature-dependent fluctuations in demand. The valuation of such depends on the development of temperatures in particular. As a rule, all other things being equal, rising temperatures cause the fair values to increase and vice-versa*".

Only two companies (**EDF** and **ENEL**) make explicit reference to weather derivatives.

EDF does not explain how they use weather derivatives to manage their own risks but they do state that the company "*is a recognized leader and provider of risk management products in the European weather market*."

ENEL does not explicitly discuss if and how they use weather derivatives either.

Rank	Company Name	WRM
1	EDF	38%
	SSE PLC	38%
	VERBUND	38%
	ENEL	38%
5	MVV ENERGY	25%
	FORTUM	25%
	INNOGY	25%
	VATTENFALL	25%
	HERA	25%
	RUBIS	25%
	NATIONAL GRID	25%
	MOL	25%
13	ENI	13%
	NATURGY	13%
15	ENGIE	0%
	UNIPER	0%
	EnBW	0%
	ROYAL DUTCH SHELL	0%
	VEOLIA	0%
	E-ON	0%
	ENAGAS	0%
	TOTAL	0%
	EQUINOR	0%
	RWE	0%
	PGE	0%
	BP	0%
	REPSOL	0%
	GRUPA LOTOS	0%
	NESTE	0%
	SNAM	0%
	SARAS	0%
	EDP	0%
	PPC	0%
	ORSTED	0%
	SUEZ	0%
	HELLENIC PETROLEUI	0%
	CENTRICA	0%
	AXPO	0%
	DCC	0%
	IBERDROLA	0%
	PKN ORLEN	0%
	ENERGIE STEIRMARK	0%
	GAZPROM	0%
	OMV	0%
	DIRECT ENERGIE	0%
	BKW GROUP	0%
	GASTERRA	0%

Table 4: Rating and Ranking of Weather-dependency contents



7 out of 10 companies do not disclose anything on weather risk management

In fact **ENEL** discloses two accounting statements in the annual report that lead to believe that weather derivatives are used, but no detail is provided:

- "*The "Other" category includes hedges using weather derivatives.* " (page 297 of the annual report)

- "*The fair value of derivatives on commodities classified as level 3 regards the measurement of hedging derivatives on weather indices (weather derivatives). For these contracts, measurement uses certified historical data on the underlying variables. For example, an HDD*

("Heating Degree Days") derivative on a given measurement station indicated in the derivative contract is measured at fair value by calculating the difference between the agreed strike and the historical average of the same variable observed at the same station." (page 300 of the annual report).

While weather risks are inherent to energy companies, our study clearly demonstrates the lack of information on how risks are identified and managed.

No company has an acceptable reporting: the highest rating does not reach 40%, and 6 out of 10 companies, with a rating of 0%, seem to consider that knowing the strategy for managing a rising *material* risk does not concern shareholders, lenders or potential investors.

Given the market awareness of climate change issues and costs, it is likely that the lack of information on the risk management strategy that is currently the consensus among companies in the energy sector will quickly be called into question.



Rating Weather Risk Valuation disclosures

Disclosures about the valuation of weather risks are probably the most essential in the eyes of analysts and financial partners. The most important pieces of information concern (1) the sensitivity to changes in weather conditions expressed in volume or monetary units (2) the contribution of weather in an accounting period and (3) the risks of maximum losses expressed, for example, in the form of Value-at-Risk.

First, weather risk valuation disclosures provide a better understanding of the effects of weather on the company's performance. They also make it possible to anticipate and change financial performance forecasts according to the evolution and accumulation of weather anomalies, in order to avoid excessive corrections on the financial markets caused in particular by weather-related profit warnings.

Once again, almost all companies have chosen to face potential financial market sanctions for not disclosing weather risk valuation information, whether in their annual reports or in their communications to analysts and investors (**Table 5**). However, three French companies have made a different choice: **EDF**, **ENGIE** and **VEOLIA**.

VEOLIA does not have a specific section dedicated to weather risk valuation disclosures, but it is one of the very few companies that provide the contribution of weather to EBITDA in the annual report: " *Weather impact on EBITDA was -€24 million, with the impact of an extremely mild second quarter in Central Europe (-€13 million for the semester) and significant rain in France (drop of volume by -€11 million) "* (Update to Annual Report, page 19*).*

In the next paragraphs, we highlight the communication of the best in class in the weather risk valuation disclosures category, namely **ENGIE** and **EDF.**

Rank	Company Name	Valuation
1	ENGIE	85%
2	EDF	77%
3	VEOLIA	69%
4	VERBUND	31%
	MVV ENERGY	31%
	INNOGY	31%
	RWE	31%
8	SSE PLC	23%
	HERA	23%
	UNIPER	23%
	ENERGIE STEIRMARK	23%
12	ENEL	15%
	FORTUM	15%
	ROYAL DUTCH SHELL	15%
	E-ON	15%
	BP	15%
	SNAM	15%
	SARAS	15%
	HELLENIC PETROLEUM	15%
	CENTRICA	15%
21	MOL	8%
	ENI	8%
	EnBW	8%
	PGE	8%
	REPSOL	8%
	GRUPA LOTOS	8%
	EDP	8%
	PPC	8%
	GAZPROM	8%
30	VATTENFALL	0%
	RUBIS	0%
	NATIONAL GRID	0%
	NATURGY	0%
	ENAGAS	0%
	TOTAL	0%
	EQUINOR	0%
	NESTE	0%
	ORSTED	0%
	SUEZ	0%
	AXPO	0%
	DCC	0%
	IBERDROLA	0%
	PKN ORLEN	0%
	OMV	0%
	DIRECT ENERGIE	0%
	BKW GROUP	0%
	GASTERRA	0%

Table 5: Rating and Ranking of weather references as a risk factor

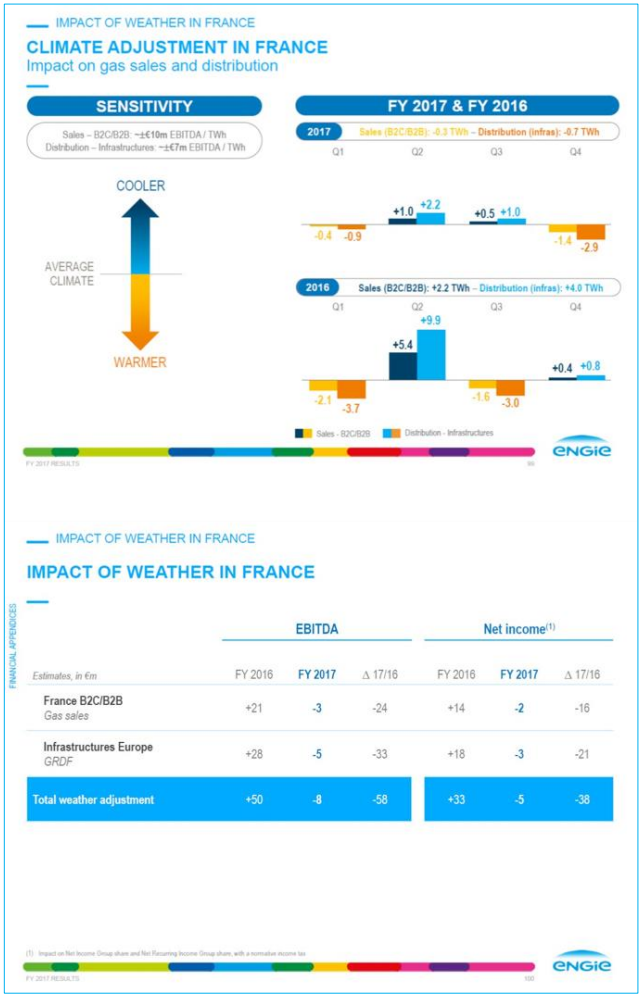


Figure 8: ENGIE Appendices FY 2017 Results, March 8th, 2018, pages 99-100

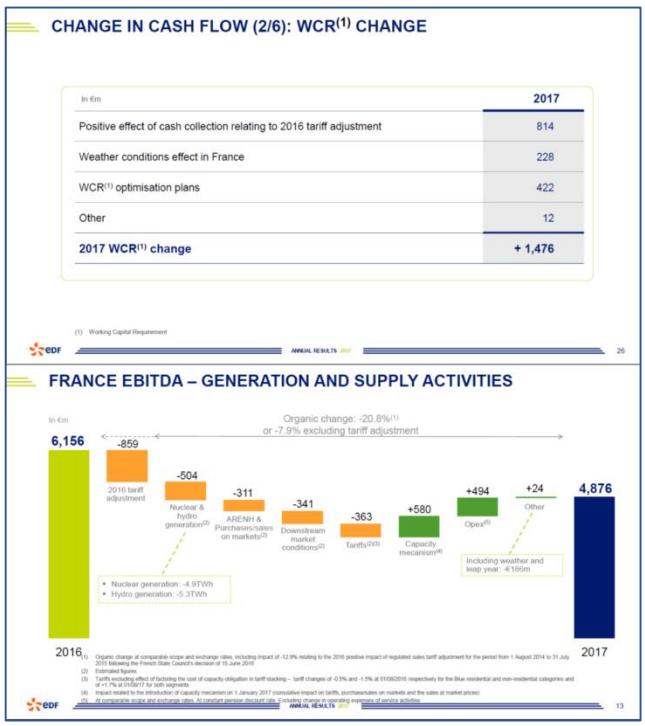


Figure 9: EDF, Presentation annual results 2017, Slides #13 and #26

The case of ENGIE

Figure 8 is taken not from the annual report, but from the appendices in which **ENGIE** has devoted a complete chapter entitled "Impact of Weather in France".

As far as sensitivity is concerned, the diagram shows that abnormally warm temperatures generate losses compared to forecasts (orange arrow), and conversely that abnormally cold temperatures generate profits (blue arrow). In addition, it provides numerical information: although the unit change in temperature does not appear on the diagram, ENGIE states that the sensitivity to temperature is approximately €10m / TWh and €7m/ TWh in EBITDA for the sales and distribution divisions respectively.

The contribution of weather conditions to the 2017 financial performance are also explicitly communicated.

In the upper part of Figure 8, the impact of weather is expressed for each division of the company both quarter by quarter and for the full year, for the years 2017 and 2016, which facilitates comparison.

In the lower part of Figure 8, the impact of weather on EBITDA and Net Income is expressed in millions of euros for each division of the company and for the group, again for the years 2017 and 2016, which allows a quick comparison between the two accounting periods.

The case of EDF

Like ENGIE, **EDF's** information on the valuation of weather risk is not included in the annual report or in the appendices, but in the support for the presentation of the annual results.

Overall, it can be said that EDF provides a large amount of narrative and numerical information about the contribution of weather to the company's financial performance. However, the information is more dispersed and less synthetic than in the case of ENGIE.

For example, in the lower part of **Figure 9**, EDF provides a waterfall diagram of the 2017 EBITDA that shows an amount of €186m which includes "weather and leap year" in a category called "other".

The upper part of Figure 9 displays a positive contribution of €228 in a split analysis of the change in Working Capital Requirements. In the same presentation (slide #32 and #34 not displayed), the evolution of EBITDA from 2016 to the 2018 forecast is analyzed "at comparable exchange rate and "normal" weather conditions"

In section 5 of the annual report, temperature and water flow coefficient graphs are used to discuss the group's operational performance, but no information on sensitivity is provided by the company.

The importance of stating what "*normal* weather" actually means.

All companies in the energy sector build their forecasts and analyze their operational or financial performance based on normal weather conditions. But very few companies, in any document or presentation, specifiy what these normal conditions are.

The analysts' work consists in assessing operational and financial performance at constant weather conditions, as they do at constant exchange rates or constant perimeter, so that they can set objectives for the value of the stock and publish their recommendations.

How do analysts do this if the company does not specify what *normal* weather conditions are? Do they know which *normality* reference is used by each company? Is it the same from one company to another?

Assuming that each company uses the meteorological definition of *normality*, i.e. the 30-year average, **Figure 10** shows that the amount of heat to be supplied during the winter in France is not the same, depending on whether the WMO definition or the last 30 years are used. Therefore, the analysis of a performance deviation from *normal* may be biased if the *normality* reference is not known to all.

With climate change, the question that arises is that of the most relevant *normality*? Is it relevant to consider that the *normal* winter 2017 is still the average of the last 30 winters? Figure 10 shows the impact on the amount of heat to be provided during the winter in cases where a normal winter is the average of the last 10 winters or the average of the last 5 winters.

If companies do indeed make their operational forecasts on a 30-year basis, climate change and the variability it induces may result in an accumulation of disappointments and profit warnings, as winters gradually become milder.

For a more accurate assessment of performance and its variability, companies and analysts therefore have a common interest in communicating clearly and quickly about what a "normal" climate is.

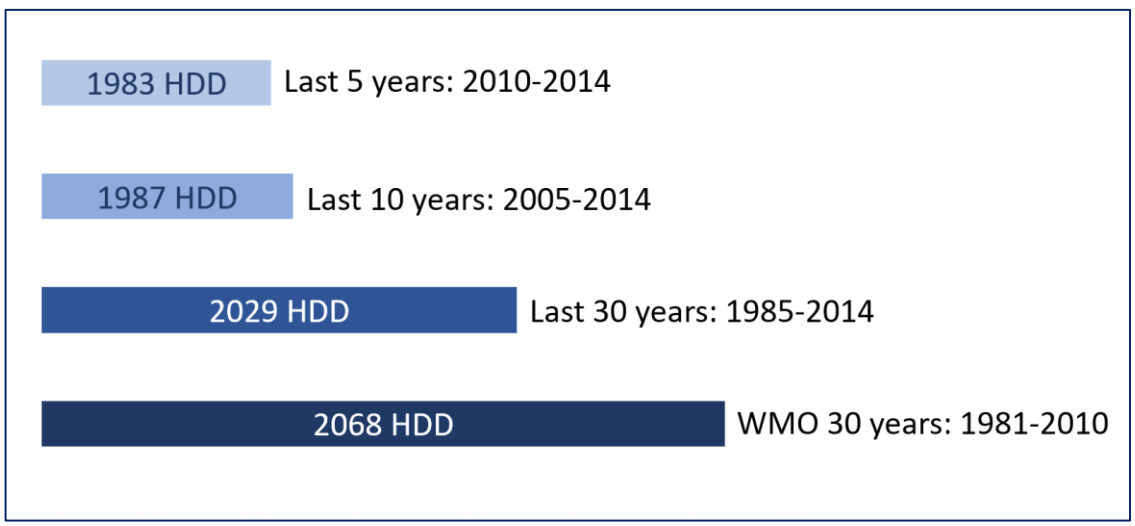


Figure 10: Sensitivity analysis of normal winters in France in HDD



Rating Weather in the Management Commentary section of the annual report

The Management Commentary is written by the company's directors. It complements the financial report in the registration document and allows investors to put into perspective and interpret the company's financial health, performance and cash flows. It also allows investors to better understand the objectives of the management team and the strategies put in place to achieve them. The Management Commentary is essential for shareholders and potential investors to assess the company's growth potential and the associated risks.

The IASB provides a methodology and a common framework for preparing the management report that accompanies financial documents prepared in accordance with IFRS international accounting standards. The general philosophy is that it is up to managers to decide how best to apply the procedures for preparing the management report, taking into account the specific characteristics of their company and sector of activity. In other words, the IASB designed guidelines not rules for the preparation of a key document that exists in particular to remedy the asymmetry of information between executives, and shareholders or other creditors and partners of the company.

Aware of the limitations and shortcomings in the quality of information and concerned to improve the "*neutral*", "*faithful*" and "*useful*" nature of the management commentary for investors, the IASB sought the views of market participants in 2010.

One question in particular attracted the attention of the Weather Risk Management Association (WRMA), the trade association representing the global market of weather risk management professionals.

WRMA commented on the Exposure Draft of Proposed Amendments to Management Commentary (ED/2009/06), the full answer to which is available in the Appendices section of this report (page 105). The question was:

“ Do you agree with the Board’s decision to develop a guidance document for the preparation and presentation of management commentary instead of an IFRS? If not, why? “

At the time, WRMA pointed out existing shortcomings in the way *material* risks such as weather risks were disclosed, weather risks being explicitly defined as non-catastrophic weather events which can have a profound financial impact i.e., the impact of changes in temperature, rainfall, snowfall or wind speed, etc.

WRMA's response was based in particular on two studies, one from the University of St. Gallen already mentioned in this white paper, and another study carried out as part of a doctoral thesis. The latter study analyzed 5 years of annual reports from the 120 largest market capitalizations of companies listed on the Paris stock exchange.

The study revealed that in the Management Commentary section, many companies referred to the weather to explain the financial performance of the reporting entity.

In the food and beverage sector 80% of companies made references to the weather. The percentage was 71% in utilities, 43% in construction or 25% in tourism and leisure.

Yet, three out of five companies which made references to weather did not provide information on the financial consequences or the risk management policy related to weather risks, and only one in four had a dedicated paragraph and clear explanation on weather risks in the “risk factors” section. The study also showed that references to weather risks were mostly used to justify disappointing financial performance.

WRMA’s response to the IASB stated that “Climate risks are not limited to the financial consequences of new laws and regulations but extend to physical changes in the weather or weather patterns that have the potential to have a material effect on a company’s business and operations.”

Climate change can only but amplify the already significant dependency on existing weather variability of those companies in weather dependent industries.

Eight years later, where do we stand with regard to the useful, faithful and neutral aspects of Management Commentary?



8 out of 10 European Energy companies make weather-related disclosures in the annual report.

Table 6 rates both the quantity and the quality of references to weather in the Management Commentary section of the annual report, and provides an indication of the road ahead to achieving "useful" information quality.

The number of references to weather in the 2017 annual reports ranges from none to 16 (**INNOGY**).

If a vast majority of European energy companies make reference to the weather in one way or another, very few actually discuss the effects of weather from one year to the next, or with reference to normal weather conditions. A minority of companies make references to “weather-adjusted EBITDA”, although some of them do not even mention weather conditions as a risk.

In this white paper, our objective is not to provide an exhaustive review of all types of weather contents in the Management Commentary sections, but to provide an overview of contents and an indication on their added value.

There are three main families of disclosures in the Management Commentary section of the annual reports, for which we provide some illustrations in the next paragraphs.

Content analysis shows that many companies use and sometimes hide behind comments that refer to weather as if it were an act of God, against which it is not possible to implement risk reduction strategies, explaining that the company's performance was achieved or exceeded *despite* the weather, declined *because of* the weather, or even sometimes improved *thanks to* the weather.

Rank	Company Name	MC
1	ENGIE	100%
2	MVV ENERGY	75%
	EDF	75%
	UNIPER	75%
	FORTUM	75%
	ROYAL DUTCH SHELL	75%
	VEOLIA	75%
	E-ON	75%
	RWE	75%
	VERBUND	75%
	SNAM	75%
	ENERGIE STEIRMARK	75%
	GAZPROM	75%
	NATURGY	75%
15	SSE PLC	50%
	INNOGY	50%
	VATTENFALL	50%
	HERA	50%
	ENAGAS	50%
	PGE	50%
	BP	50%
	REPSOL	50%
	GRUPA LOTOS	50%
	ENEL	50%
	SARAS	50%
	EDP	50%
	PPC	50%
	ORSTED	50%
	SUEZ	50%
	NATIONAL GRID	50%
	MOL	50%
	HELLENIC PETROLEUM	50%
	CENTRICA	50%
	AXPO	50%
	DCC	50%
36	EQUINOR	25%
	RUBIS	25%
	NESTE	25%
	IBERDROLA	25%
	DIRECT ENERGIE	25%
	OMV	25%
42	ENI	0%
	EnBW	0%
	TOTAL	0%
	PKN ORLEN	0%
	BKW GROUP	0%
	GASTERRA	0%

Table 6 : Rating and Ranking of weather references in the Management Commentary section



A first category of weather-related disclosures used to justify the company's operational or financial performance cites weather conditions as part of a combination of causes. Here are some illustrative examples

- "*Energy gross margin reduced by 4%, reflecting the impact of warmer weather, lower customer account holdings and the implementation of the prepayment cap.* " (**CENTRICA**)

- " *The principal reasons were a weather-driven decline in sales volume and higher costs in the United Kingdom along with extraordinary items, lower gas sales prices, and persistently intense competitive and margin pressure in Germany.* " (**E.ON**)

- "*Increased revenue allowances under new rate cases, the benefit of capex trackers and over-recovery of allowed revenues due to cold weather were partly offset by lower commodity cost recoveries.* " (**NATIONAL GRID**)

A second category of weather-related disclosures explicitly states weather as the main reason for over or under performance:

- "*Driven by the increase in installed capacity, wind power generation benefited from favourable weather conditions at the end of the summer and especially in December.*" (**EDF**)

- "in Europe demand expanded by around 1% compared with the previous year, thanks to especially hot weather during the summer and cold temperatures in the latter part of the year. " (**ENEL**)

- " *In 2017, the total gas consumption in Russia was 468.0 bcm, which is 2.5% higher than in 2016. Growth consumption is mainly due to colder weather conditions in the first half of 2017.* " (**GAZPROM**)

- " *Total demand in the Siberian price zone is down slightly by 0.7% due to mild temperatures in the winter months of January and February as well as in autumn months of October and November."* (**UNIPER**)

The last category of weather-related contents carries more value-added information. Of course, there are fewer examples, especially numerical examples.

In the panel of annual reports considered, here are two illustrations of disclosures that digitally comment on the company's financial performance:

- " *Change in Working Capital: (...) favourable weather effects in France (+€228 million) (...) The difference between the 2016 and 2017 change in working capital (+€3,411 million) is explained by the effect of the 2014 French regulated sales tariff adjustment (+€1,753 million) and a favourable weather effect in France (+€963 million).* " (**EDF**)

- " *Commerce and Volumes: an unfavorable weather impact in Energy of -€22 million in Central Europe in the second quarter.* " (**VEOLIA**).

Despite the undeniable role of weather in the performance of energy companies, the limited information available and the limited progress made in eight years since WRMA's response to the IASB consultation does not bode well for companies in other weather-sensitive sectors, for which the influence of weather is less directly observable.

CONCLUSIONS

Concluding remarks

Following the work of the Task force on Climate-related Financial Disclosures, we developed a methodology for assessing and rating weather-related contents, and applied it for empirical evidence to European energy companies. To the best of our knowledge, this is the first time a rating on weather-related financial disclosures is produced.

We analyzed narrative and numerical weather-related contents of annual reports, registration documents, press releases, shareholders' presentations, and financial documents for analysts of 47 companies to rate the added value of information on the dependency to weather, the weather risk description as a risk factor, the weather risk management policy, the valuation of weather risk, and the use of weather references in the Management Commentary section of the annual report.

Our results show that only 4 companies out of 47 have a rating that exceeds 50%, threshold above which the rating can be considered satisfactory in its ability to provide *useful* information.

Despite the *material* nature of weather risk in the energy sector, less than one in two companies mentions weather risk in the risk factors section of the annual report, which does not stop 4 out of 5 companies from referring to weather risk when commenting on the company's financial performance.

Moreover, as with the results of the TCFD study, we find that information on the financial consequences of weather are very rarely mentioned, whether it is the positive or negative contribution on past financial performance, or the sensitivity of the results to weather.

From one company to another, and from one country to another, the content of weather-related financial disclosures varies considerably. However, it should be noted that French and German companies provide better quality information. For example, EDF, ENGIE and VEOLIA, all French companies, are the only ones to quantify in monetary units the influence of weather on cash flows and EBITDA.

The analysis of weather-related financial disclosures by criterion shows that 30% of annual reports in our panel do not provide any explanation that describes the influence of weather conditions on the company's activity. While some companies content themselves with a boilerplate statement, almost half of the companies explain in a relatively precise way how the weather influences their activity.

The results are disappointing regarding the way weather is described as a risk factor. 47% of companies do not report weather risks in the risk factors section. Only one-third of companies have a rating that exceeds 30%, while another third does not exceed 20%.

- **How sensitive are the company's results to the weather?**
- **What is the contribution of the weather to the company's results?**
- **What is the company's performance excluding the weather effect?**

Three essential questions to which every shareholder and investor is entitled to *useful* answers.

Information about how risks are managed is one of the two most important items for investors, analysts and lenders. A company that identifies and quantifies its risks methodically, and hedges itself creates value for shareholders. Its results are less volatile. It is less sanctioned by the financial markets when the weather is unfavorable. On this evaluation criterion, no company exceeds a rating of 40%. Worse, 70% of companies do not provide any information about how weather risks are managed.

Information on the valuation of weather risk is the second essential information. How sensitive are the company's results to the weather? What was the contribution of the weather to the company's results? What is the company's performance excluding the weather effect? These are the essential questions to which every shareholder and investor is entitled to *useful* answers.

Three of the 47 companies in the panel precisely quantify the impact of the weather, either in euros, TWh or both. Only two companies provide truly high-quality information (ENGIE and EDF). Eighteen companies do not provide any information, and apart from the three companies whose communication meets expectations, no company exceeds the rating of 31% on this criterion.

It should be noted that no company specifies the definition of the *normal* weather on which the financial forecasts that are communicated to the company's stakeholders are based. Given climate trends and the influence it has on what we should consider a *normal* winter today, the absence of such information is surprising and disturbing.

Finally, the last criterion rated in this study was the weather-related content within the Management Commentary section. 75% of companies use comments whose assessment of the contents is equal to or greater than 50%. Yet, in many reports, weather is cited only among a list of factors that explain the results, without the Management Commentary user being able to distinguish among these factors the one whose relative weight explains the increase or decrease in the results compared to the forecasts. It is also regrettable that some companies continue to refer to the weather conditions experienced by the company as an act of God against which nothing can be done. Managers cannot change the weather, but they can manage its consequences.

Climate change and weather variability are closely linked. The time horizon of climate change generally exceeds that of companies' long-term strategic plans, and the lifetime of a CEO. The time horizon of weather variability is more in line with an horizon that the company is used to managing. Adapting to climate variability means integrating climate into risk mapping and adapting to climate change.



Implications, limits and future research

This study has important implications for corporate weather risk management and discretionary financial disclosures research as it brings into focus the importance of considering increasing non-catastrophic weather risks as a new *material* risk that can generate financial losses and uncertainty in cash flows likely to affect the value and risk premium of many businesses exposed to weather variability.

The rating methodology we propose is a blueprint which marks an important milestone with respect to weather risk valuation and management for non-financial companies.

One major innovation of this research is that the evaluation elements on which the rating is based take into account the entire value chain of corporate risk management, from weather risk identification to the use and recognition of hedging products and the estimation of the contribution of weather to the bottom line, and these evaluation elements are explained in a transparent manner.

Our study of weather-related financial disclosures in the European energy sector shows the limits of a voluntary and guideline-based approach to financial communication concerning a risk that is considered *material* by all market participants.

We show that the current quality of weather content issued by European energy companies, be it in the annual report or in any public financial document, does not allow potential investors, lenders, regulators, asset managers and shareholders to price weather risk and to make informed, efficient risk assessment and portfolio management decisions.

Our findings demonstrate in particular the scarcity of numerical contents related to weather risk management activities, including for companies that are known to use weather derivatives.

Finally, This study provides tangible elements that should enable the different stakeholders of a company exposed to weather risk to engage in a discussion on a subject that remains largely unaddressed, and to encourage the company to adopt a more open and proactive approach to weather risk management, thanks to the development of weather index-hedging products.

The current quality of weather content issued by European energy companies, does not allow potential investors, lenders, regulators, asset managers and shareholders to price weather risk and to make informed, efficient risk assessment and portfolio management decisions

Whether we measure a company's ability to absorb the costs of complying with the changes required to slow down climate change, or the company's ability to absorb weather variability related to climate change, we are looking at the same issue that gives rise to risks that both need to be priced.

There are limitations to this study as we considered only one sector in a single geographical area and only for the year 2017. However, given the sensitivity of this sector to climate variability, the energy sector can be considered as a benchmark against which to compare how companies in other weather-sensitive sectors of activity disclose the weather risks they face.

Weather has evolved to become an emerging risk that increasingly impacts corporate sales and profits in many economic sectors. Companies that have integrated weather risks in their risk mapping system, and that have mitigation strategies in place should consider improving their financial communication and align it with IASB standards related to *material* risks.

Failure to comply with this obligation can only but result in a higher risk premium and cost of equity than they should be, which is unfair to existing shareholders and potential investors who cannot distinguish between companies that have done everything possible to adapt to weather variability and those that have not.

While research on corporate climate-related risks has been mostly one-sided, focused on trying to estimate the cost of transitioning away from fossil energies on corporates or activity sectors, our study opens new horizons and bridges a gap. Using weather-related financial disclosures, our rating measures a company's ability to understand how weather variability affects its business, to implement operational and financial strategies to mitigate risks, and to adapt and improve its resilience to climate change.

The rating framework we use to measure company's exposure to weather variability complements TCFD's approach on climate-related risks.

Whether we measure a company's ability to absorb the costs of complying with the changes required to slow down climate change, or the company's ability to absorb weather variability related to climate change, we are looking at the same issue that gives rise to risks that both need to be priced. Both approaches *support more appropriate pricing of risks*.

With the development of weather index-hedging products, corporate risk managers can now take a proactive attitude toward managing the consequences of adverse weather and create the conditions to adapt to weather variability.

Future research should repeat the exercise on European energy companies for 2018 and the years to come to measure improvements in ratings and evaluate how companies manage and adapt to weather variability. It would also be advisable to replicate the rating methodology to companies based in the United States, Asia and Australia to allow cross-country comparisons. Finally, we should consider extending the rating to companies operating in the 70% of weather-sensitive sectors.

As climate variability continues to rise, we expect growing interest from academia and practitioners to improve knowledge and transparency on corporate weather risk issues.

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About the Author

Jean-Louis Bertrand is Professor of finance and head of a Master's degree specializing in financial markets at ESSCA School of Management. His research has focused on corporate risk management, and specifically on corporate weather risk management for nearly a decade. On this subject, he is the author of books published by the Revue Banque in France and Oxford University Press in the United Kingdom. He has also published numerous articles in peer-reviewed international journals, such as European Journal of Operational Research, Applied Economics, Journal of Business Research, Harvard Business Review, Journal of Operations Management, Journal of Asset Management, to name a few. He has also participated in and led international research initiatives on climate-related projects.

From time to time, Jean-Louis Bertrand advises companies on weather risk management issues and acts as a business angel in the field of Fintech and Insurtech. Before starting his academic career, he spent most of his working life trading and selling foreign exchange and interest rate derivative instruments in trading rooms in London. In addition, he held several positions in large companies as Treasurer and Head of treasury operations in Paris, San Francisco and Brussels. He also co-founded a start-up company specialized in designing and selling bespoke weather hedging instruments.

He is a member of the Weather Risk Management Association (WRMA), and of Treasurers' Associations in France (AFTE) and Luxembourg (ATEL). He holds an engineering degree, an MBA, and a PhD from University of Paris-X.

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APPENDICES

Weather Risk Management Association
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Sir David Tweedie
Chairman
International Accounting Standards Board
30 Cannon Street
London EC4M 6XH
United Kingdom

11 February 2010

Dear Sir,

Exposure Draft of Proposed Amendments to Management Commentary

We appreciate the opportunity to comment on the above exposure draft on behalf of the Weather Risk Management Association. We respond below to question 1 posed in the exposure draft.

The Weather Risk Management Association (WRMA) was founded in 1999 by leading participants in the weather market as the industry association for the weather risk management business. Its purpose is to foster public consciousness of weather risk and its management.

WRMA welcomes the IASB's initiative to improve the usefulness and the relevance of the information provided in the management commentary which supplements financial statements in the annual reports. We agree with the approach of the Committee of European Securities Regulators (CESR) and the International Organization of Securities Commissions (IOSCO) which is to support the publication of a management commentary which will serve as a guidance document. This will increase transparency and help capital providers make better informed investment decisions.

Question 1

Status of the final product

The exposure draft proposes a framework for the preparation and presentation of management commentary. The Board believes that its proposals provide a basis for the preparation and presentation of management commentary that will be useful to the users of ***financial reports. However, the Board intends to publish a guidance document, not an International Financial Reporting Standard (IFRS).***

Do you agree with the Board's decision to develop a guidance document for the preparation and presentation of management commentary instead of an IFRS? If not, why?

Answer 1

The Board states that financial statements as they exist today do not provide all the information that users need to make economic decisions because the financial statements largely portray the financial effects of past events (BC2). The Board further recognizes that capital providers require additional information to place financial statements in context and to evaluate future return and associated risks. The Board believes that financial and non-financial information which complement financial statements should be made available to capital providers in Management Commentary as a separate document. In the annual reports, material risks which are pertinent to investors are therefore disclosed under the heading "risk factors" and are further discussed and analyzed to fill the gaps of financial statements and provide information on the potential variability of earnings and cash-flows.

WRMA would like to draw the Board's attention to existing shortcomings in the way material risks such as weather risks are disclosed. We are especially keen to emphasize that weather risks include non-catastrophic weather events which can have a profound financial impact. These may relate to the impact of changes in temperature, rainfall, snowfall or wind speed. We differentiate here from weather risks relating to extreme events such as tornados, hurricanes, flooding the impact of which is well understood

Weather risks can have a material effect on sales volumes, cash-flows and earnings of many companies in a range of activity sectors such as energy, utilities, food, beverage, retail, textile, agriculture, transportation, tourism and leisure. About one third of the GDP of industrialized countries is weather-sensitive. The cumulated turnover of companies exposed to weather risks amount to trillions of US dollars. Furthermore, weather risks are specific risks which are identifiable, measurable, and the effects on the performance of an entity can be quantified. Weather risks can also be managed and mitigated by integrating the relevant weather risk variables into operational management or by hedging the economic and financial consequences using financial instruments on exchange-cleared or OTC markets. For some companies, weather risks can have greater financial consequences than the foreign exchange or interest rate exposures.

A recent study on the "Disclosure of weather risks of European utilities" [7] showed that nine in ten annual reports contained some reference to the weather but only one in three disclosed weather as a risk, and a mere one in ten reports described weather risks clearly. In addition, the quality of disclosures was not consistent from year to year. There was significantly more information in the year 2007 than in 2008, which is largely explained by the mild spring 2007 which had a negative impact on most utilities sales versus 2008 weather which was much more favourable to the utility sector. This observation is itself testament to the existence of a significant weather dependency in the sector. WRMA would argue that this should be reported consistently and not be offered when required as a "convenient excuse"

A study on the disclosure of weather risks of NYSE/Euronext-traded companies of the French SBF 120 index over five years shows that one in six annual reports made reference to weather conditions to explain the performance of the reporting entity [8]. In the food and beverage sector 80% of companies made references to the weather. The percentage was 71% in utilities, 43% in construction or 25% in tourism and leisure. The French stock market authority (AMF) requires that material risks be disclosed in the "risk factors" section of the annual reports and recommends the disclosure of more detailed information in the body of the annual report for principal risks [4]. The study showed that three out of five companies which make references to weather did not provide information on the financial consequences or the risk management policy related to weather risks, and only one in four had a dedicated paragraph and clear explanation on weather risks in the "risk factors" section. No report provided information on the percentage of performance attributable to weather, (positive or negative), nor did any provide information on performance on a constant weather conditions basis. Again, the study showed that references to weather risks are mostly used to justify disappointing financial performance

The Securities Exchange Commission's new guidance provides a first attempt to address financial consequences of climate change risks. The commission guidance document requires companies to evaluate the effects of climate change when disclosing risks to investors [5].

Climate Change risks are not limited to the financial consequences of new laws and regulations but extend to physical changes in the weather or weather patterns that have the potential to have a material effect on a company's business and operations. It is logical that any climate change will amplify the already significant dependency on existing climate variability of those companies in weather dependent industries.

The primary focus of Management Commentary is to meet the information requirements for investors and as such should include all material risk exposures, plans and strategies for bearing or mitigating those risks and the effectiveness of risk management strategies must be disclosed to provide users with complete, relevant and useful information. WRMA therefore proposes there is room for improvement when it comes to the disclosure of weather risks.

To achieve the objective of improving the overall quality of information, the Board's decision is that Management Commentary should not be an IFRS but instead should be prepared in accordance to a guidance document for the preparation and presentation of its content. While WRMA is not qualified to agree or disagree that a guidance document is preferable to an IFRS we wish to stress the need for improved disclosure procedures of weather risks for companies operating in weather-dependent sectors. The services provided by WRMA members and others in the industry over the last decade make it possible to assist companies in both identifying and hedging the financial consequences of weather risks to match the standards of quality reporting displayed in other areas such as foreign exchange and interest rate exposures.

We hope that you found our comments to be both useful and constructive and would welcome the opportunity to discuss them in further detail if needed.

Once again we thank the Board for the opportunity to comment on the proposed amendment in an area which is of great importance and concern to all of our members. If you have any questions in relation to this letter please do not hesitate to contact Martin Malinow, President of the WRMA (+1 212-382-1482) or Jean-Louis Bertrand, ESSCA (+33 2-41-73-47-47)

Yours faithfully

WRMA

About WRMA:
Since 1999, WRMA has represented those organizations providing services relating to non-catastrophic weather risk. WRMA has made major contributions to standardizing documentation of weather transactions, developing ISDA confirmation templates for the most common weather transactions, and establishing credit standards and margining procedures. WRMA has worked with governments to introduce weather risk management into national regulatory frameworks and foster education of markets and public consciousness of weather risk and its management through conference activity and working groups.

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