

Climate change

ESG

Sustainability Research

Demystifying climate effects



Sustainability Research

METEOPROTECT[®]

This report is co-authored with
Meteo Protect:

Jean-Louis Bertrand, PhD,
Head of R&D, Meteo Protect, professor
of Finance, ESSCA

Maxime Fortin,
Meteorologist, R&D, Meteo Protect

Financial performance: don't be fooled by the weather

Climate change is aggravating naturally occurring climate variability and YOY temperature variability is on the rise in Europe. The consequences for investors are twofold: more weather-related profit warnings, and greater difficulty reading underlying trends. This report, written together with weather insurance company Meteo Protect, provides tools for quantifying weather impacts.

Too easy to blame it on the weather: mitigation options exist

Weather risk disclosure remains relatively poor for a factor that explains 40-85% of changes in demand in some sectors, and can have a greater impact on P&Ls than forex. We identify Verbund, Carlsberg, Lindt, Gerry Weber and Nokian as companies with highly weather-sensitive businesses in their respective sectors. We show why geo diversification as a hedge has its limitations and point out ways to increase resilience to climate variability, such as supply chain optimisation. Financial coverage through weather insurance is also on the rise.

Further climate swings ahead... room for investor engagement

We think the best option for investors is to base their assumptions on normalised climate scenarios. Companies failing to do so in their guidance face a higher risk of weather-related profit warnings. The abnormally cool temperatures and high wind and hydro resources across Europe in H1 2013 have created challenging comps for many utilities. On the other hand, a climate normalisation scenario would play in favour of brewing, construction and clothing names.

ESG team

Erwan Créhalet (author)

ecrehalet@keplercheuvreux.com
+33 1 5365 57 60

Stéphane Voisin (coord.)

svoisin@keplercheuvreux.com
+33 1 7081 5762

Sudip Hazra

shazra@keplercheuvreux.com
+33 1 7081 5762

Samuel Mary

smary@keplercheuvreux.com
+44 20 7621 5190

Robert Walker

rwalker@keplercheuvreux.com
+44 20 7621 5186

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Adaptation:
Underwriting risks for (re)insurers



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Count with more than +2°C and increased vulnerabilities
The +2°C scenario is out of reach and climate change is likely to bring new weather extremes challenging the resilience of companies' operating results and assets. Hurricane Sandy was only an early signal of future changes: studies point to a ~70% upside risk in storm damage potential in Europe and the US. As part of our 'Adaptation series', we assess exposure of European (re)insurers to underwriting risks in a changing climate.

We map climate change exposure of European (re)insurers
We first identify insurance lines and countries the most adversely exposed to climate change impacts, and propose an in-house risk exposure rating, based on companies' business and geographical exposures. Property insurance in the UK notably appears as a hot spot. Pure life insurers are much less concerned.

And test the financial resilience of reinsurers
In the long term, we expect reinsurers to benefit from increased retrocession of weather risks from insurers. Despite projected increase in EU and US hurricane damage of 70%+ under climate change scenario, the risk of default for European reinsurers remains low in our view, especially for Hannover Re - the least exposed.

Sustainability Research team

Ewan Créhalat (author)
ecr@keplercheuvreux.com
+33 (0) 1 5635 51 50

Stéphane Voisin (coord.)
svois@keplercheuvreux.com
+33 (0) 1 5635 51 50

Sudip Hazra
shaz@keplercheuvreux.com
+33 (0) 1 5635 51 50

Samuel Mary
smar@keplercheuvreux.com
+33 (0) 1 5635 51 50

Catharina Saponar
csapon@keplercheuvreux.com
+33 (0) 1 5635 51 50

Robert Walker
rwal@keplercheuvreux.com
+33 (0) 1 5635 51 50

IMPORTANT: Please refer to the last page of this report for "important disclosures" and analyst(s) certifications

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Adaptation: Underwriting risk for (re)insurers [Document link](#)

Prior reports include:

Climate change: The ETS Spring [Document link](#)

Climate change: Adaptation- Utilities: profits reined in by less rain? [Document link](#)

This report was written together with Meteo Protect

“Meteo Protect is the European leader in weather risk management solutions. Meteo Protect combines Big Data, climatology, and proprietary pricing models to protect companies and institutions from financial losses caused by unfavorable weather conditions.

Meteo Protect provides advisory services to companies and institutions to analyze the sensitivity to weather and to determine the relevant weather index and its relationship to sales, costs or profits for any company in any country, any sector.

Meteo Protect structures, manages and distributes weather financial coverage contracts to companies and institutions. These contracts are index-base and provide a predefined payout when specific weather conditions are observed during a defined period of time on a defined territory. Weather cover can be packaged as derivatives or as insurance depending on local tax and accounting regulations.

Meteo Protect is a registered broker in insurance or reinsurance and works with first tier insurance and reinsurance companies.”

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Don't be fooled by the weather

While many investors are looking for signs of a pickup in European economies, capricious weather has significantly blurred the lines in many sectors in 2013 and climate normalisation in H1 2014 is likely to again create significant distortions for the quarterly sales performances of companies in weather-sensitive sectors.

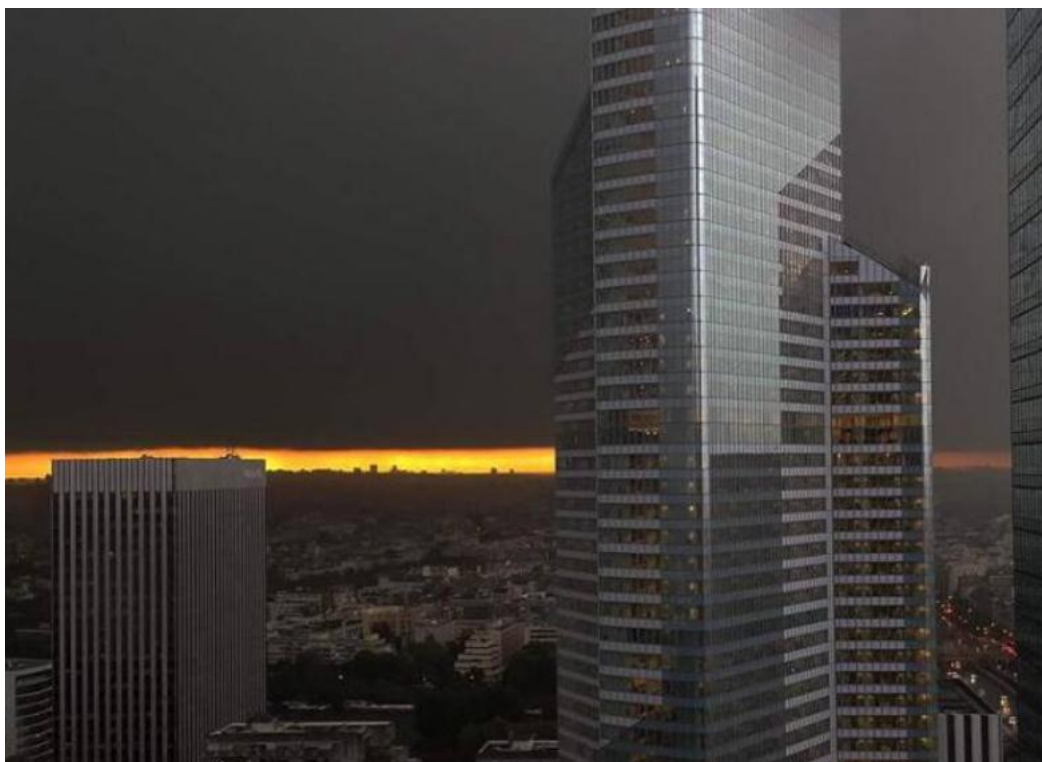
To demystify weather effects on companies' results, this reports attempts to answer legitimate questions, such as:

- How much did the cooler weather actually impact sales of electricity, gas, clothes, beer, etc? Having the data to answer this this question will enable investors assess claims by companies that adverse weather was a factor in poor sales development.
- How much can adverse weather effects in one quarter put full-year guidance at risk? What is the catch-up potential?

The report aims to help investors to understand weather effects to make informed investment choices when weather blurs underlying trends. It thus provides tools to better quantify how weather anomalies and weather extremes can impact the P&L of companies in weather-sensitive sectors.

Demystifying the weather

Looking beyond the clouds - Paris, June 2013, around 10am, view from La Défense



Source: Anonymous

Rise in climate anomalies and extremes

Although average temperatures are gradually rising, the recent severe winters in Europe in 2009, 2010, and 2013, along with the cold spring of 2013 remind us that the shift towards a new climate identified by IPCC scientists may take the form of a weather rollercoaster of extremes rather than a smooth and linear increase in mean temperatures.

Climate change not a smooth path towards a new normal

Climate change is often regarded by investors with a short-term investment horizon as an issue impacting only the very long term. However, apart from the normal long-term climate cycle (30-year average), climate change can have an impact now in two other ways:

- **An increase in weather variability.** The WMO (World Meteorological Organisation) stressed in its Annual Climate Statement 2012 that climate change is aggravating naturally occurring climate variability and has become a source of uncertainty for climate-sensitive economic sectors. An increase in anomalies would probably lead to higher year-on-year revenue and EBITDA swings for many companies where demand and/or supply are affected by changes in weather patterns.
- **An increase in extreme events.** The IPCC (Intergovernmental Panel on Climate Change) has just released an update on climate science which confirms that an increase in extreme events such as hot days and extreme precipitations is likely for the early 21st century.

Europe particularly exposed to climate variability

Companies operating in Europe are particularly exposed to climate variability. We find that the YOY temperature volatility has increased over the past 20 years (higher standard deviation). In France for instance, if we compare 1993-2002 and 2003-2012, we find that the monthly standard deviation has considerably increased in spring, summer and winter.

Table 1: Change in YOY temperature variability in Europe over 2003-2012 vs 1993-2002

	Spring	Summer	Autumn	Winter
Change in variability	38%	51%	-26%	19%

Source: Meteo Protect

While the US does not show a similar trend, it's worth noting that North America, like Asia, has been experiencing a sharp rise in weather-related natural catastrophes.

Europe is the region that has faced the widest inter-annual temperature swings in recent years: temperature variability reaches up to $\pm 2^{\circ}\text{C}$ every quarter (YOY), with maximum volatility in Q1 and Q4.

Table 2: YOY temperature swings in Europe since 1985

	Q1	Q2	Q3	Q4
Average	1.4	0.9	1.0	1.1
Max	3.6	2.1	2.0	2.6

Source: Meteo Protect

WMO: "Climate change is aggravating naturally occurring climate variability and has become a source of uncertainty for climate-sensitive economic sectors"

Companies operating in Europe are particularly exposed to climate variability

Looking at the evolution of average temperatures in Q1, Q2, Q3 and Q4 in Europe¹, we find that the inter-annual quarterly temperature variability has increased between last decade and the previous decade, except in the autumn. The increase in variability is particularly true for Q1 and Q2.

We find that the YOY temperature variability has increased in the last decade, except in Q3

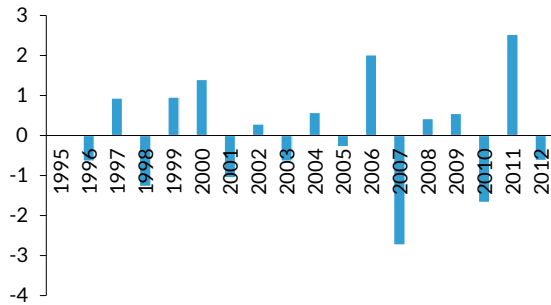
The trend is also apparent when looking at the last five years versus the last ten years. Temperature variability is up every quarter (YOY) with significant increases for Q1 and Q4.

Table 3: Change in inter-annual temperature variability by quarter in Europe

	Q1	Q2	Q3	Q4	Average
2002-2012	1.41	1.01	0.87	1.37	1.16
2007-2012	1.60	1.15	0.80	1.66	1.30
Change	13%	13%	-7%	22%	12%

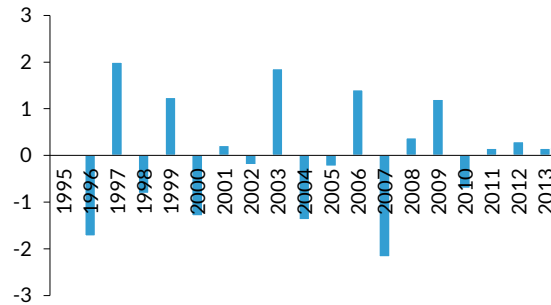
Source: Meteo Protect

Chart 1: Temperature trend in Q4 in W. Europe (YOY)



Source: Bloomberg, Kepler Cheuvreux

Chart 2: Temperature trend in Q3 in W. Europe (YOY)



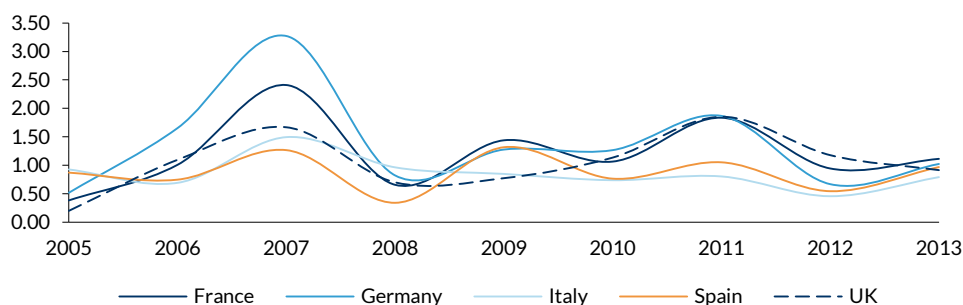
Source: Bloomberg, Kepler Cheuvreux

Within Europe, Nordic countries tend to show higher temperature variability, with an average quarterly YOY swing 25% higher than the European average. Q1 and Q4 exhibit the most volatile YOY swings. This is also true of East European countries: Poland for instance is 33% above the European average. Germany with average quarterly temperature swings of 1.30°C ranks 17% above average whilst France is within the European average of 1.1°C. 2011 and 2007 were the years with the highest temperature swings in the last 30 years. This was particularly true in Nordic countries, Benelux, Germany and the UK, which experienced its highest swing in 2011.

In Europe, the Nordics usually see greater temperature variability

¹ Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Switzerland, UK

Chart 3: Trend in inter-annual temperature variability by European country



Source: Meteo Protect

US: lower variability but weather-related nat cats on the rise

In recent years, temperature variability in the US has generally been much lower than in Western Europe. In the US, average quarterly temperature swings are 43% lower than in Europe and rarely exceed $\pm 1^\circ\text{C}$ in each quarter. This is partly explained though by the fact that the surface area of the US is twice the size of the EU and averages tend to flatten things out. If we simply look at the East Coast, we see that temperature swings tend to be greater, especially in Q2.

In the US, average quarterly temperature swings are 43% lower than in Europe and rarely exceed $\pm 1^\circ\text{C}$ in each quarter...

Table 4: YOY temperature swings in the US and the US East Coast

	Q1	Q2	Q3	Q4
Average - US	1.1	0.6	0.6	0.3
Average - US East Coast	1.3	0.8	0.8	0.4
Max - US	3	1.5	1.4	1
Max - US East Coast	3.3	2.9	1.95	1.3

Source: Meteo Protect

The largest temperature swings of 3°C were experienced during the last two winters with temperatures in 2012 some 2.6°C above normal. If we exclude the last two years, we find no sign that the volatility has significantly increased over the past years. On the contrary, variability in Q4 was much lower in 2007-2012 than in 2002-2007.

Table 5: Change in temperature variability in the US

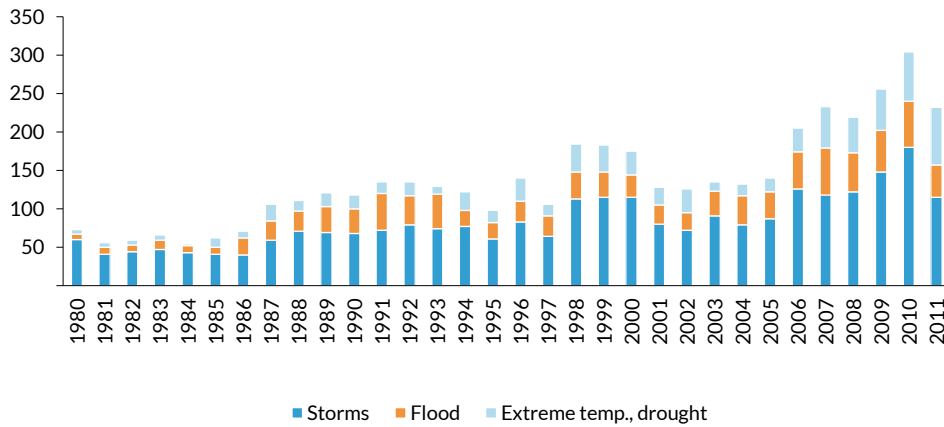
	Q1	Q2	Q3	Q4	Average
2002-2012	0.99	0.57	0.74	0.22	0.63
2007-2012	0.94	0.49	0.57	0.16	0.54
Change	-6%	-14%	-22%	-30%	-18%

Source: Meteo Protect

However, North America, and the US especially, has been experiencing a significant increase in extreme events (storms, floods, extreme temperatures, droughts), according to Munich Re's database.

...but North America, especially the US, has seen a sharp rise in extreme events

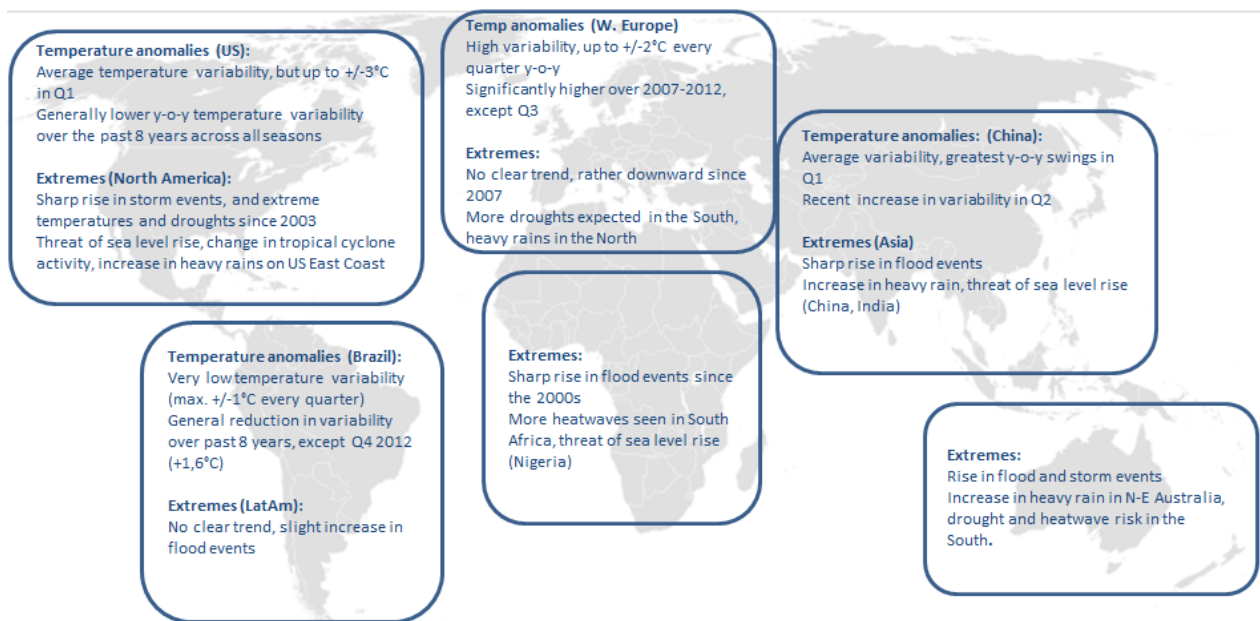
Chart 4: Number of weather-related natural catastrophes in North America



Source: Munich Re

The chart below compares different weather patterns (temperature variability and climate extremes) across the globe.

Chart 5: Global climate and weather impact risks map



Source: Kepler Cheuvreux, Munich Re NatCatServices, Bloomberg

P&L volatility to increase

The business of a company can be directly impacted by climate at different levels.

- **Demand.** Revenue and income may be squeezed by lower demand stemming from unfavourable weather conditions. Cooler or milder temperatures, drier or wetter conditions can have significant financial impacts on weather-sensitive products and services such as bottled water, beer, clothes, electricity for cooling/heating, etc.
- **Supply chain risk.** Climate hazards such as persistent rain, drought or snow can hamper the sourcing of key inputs for the production process, with potential impacts ranging from higher procurement costs in the event of tensions in agro-commodities due to crop failures, to potential disruption of the supply chain if production of key raw materials/components is concentrated in a single area (see our agro-commodity weather-sensitivity scoring tool in the appendix).
- **Production.** Renewable energy producers depend entirely on weather and any unfavourable deviation from normal weather can translate into a financial loss. Droughts reduce the availability of power generation capacities (hydro) and disrupt the production of water-intensive industries, cold snaps in winter hamper construction activities and increase production costs for energy-dependent companies, etc.
- **Infrastructure/fixed assets and stocks.** Extreme weather events such as tornados, hails or floods can cause destruction or damage (eg T&D assets of utilities, telecom equipment, real estate, carmaker inventories).

Potential losses of business caused by climate variability are referred to as weather risks. These are non-catastrophic weather events that have a financial impact on company sales or profits. They relate to any measurable variation in a definable benchmark such as changes in temperature, rainfall, snowfall, windspeed, etc, against normal levels or previous periods.

Understanding and integrating weather risks

Weather exposure is the amount of revenues or costs at risk from changes in weather conditions. Many businesses experience some form of seasonal pattern in their activity. Electricity consumption is generally higher in winter than in summer, ice cream sales are stronger in summer than in winter, etc. Business managers can execute their plans as long as the weather is “normal”. Potential gains or losses arise when weather conditions unexpectedly deviate from their normal values. Meteorologists refer to these deviations as weather “anomalies”. Because they are unexpected, weather anomalies have the potential to change the financial performance of a firm.

Normal weather conditions are calculated as the average weather over 30 years. The average weather is in fact the climate. Climate variability is the extent to which actual weather differs from climate. It is climate variability that causes potential disruption in economic conditions. How much less will the company sell if the temperature is lower than normal? We define a product as being weather-sensitive if weather anomalies can explain a percentage of the change in sales: in other words, the stronger the relationship, the greater the sensitivity to weather.

We list below the different climatic patterns of the most weather-sensitive sectors.

A product is weather-sensitive if it is possible to establish a statistically significant relationship between weather anomalies and change in revenues

Weather risks: non-catastrophic weather events with a financial impact on company sales or profits

Unexpected deviations from normal weather create potential gains or losses

Climate variability = how far “actual weather” differs from “climate”

Products are “weather-sensitive” if part of the change in sales stems from weather anomalies

Table 6: Weather-sensitive patterns of most weather-sensitive sectors

		Main weather risks	Most sensitive quarters	Weather risk assessment	Sensitivity characteristics
Beverages	Beer	Low temperatures / long-lasting rainy periods	Q2 / Q3	High	Demand is mostly affected by lower than usual temperatures. Each °C can cause a drop of 2% to 7% of sales depending on the country and the time of year. The relationship is almost linear between 20°C and 30°C. Thresholds: sensitivity reduces with high and low temperatures.
		Shortage/excess of rain heat shortage / high temperatures	N/A	High	Cost of production may rise as a result of low quality/scarcity of crop. Plants need a minimum quantity of heat and water to reach acceptable levels of quality and quantity. High geographic concentration of production is an additional concern.
	Soft drinks	Low temperatures / long-lasting rainy periods	Q2 / Q3	Moderate to High	Demand is mostly affected by lower than usual temperatures. Each °C can cause a drop of 2% to 15% of sales depending on the type of drink, the country and the time of year. The temperature range for which sensitivity relationship applies is greater than the range for beer consumption.
	Alcohol/ spirits	Low temperatures	Q2 / Q3	Low	Low sensitivity to weather with the exception of specific summer/holiday drinks such Pernod/Ricard and more generally cocktail-related drinks.
	Waters	Low temperatures	Q2 / Q3	High	Water consumption reduces with lower-than-usual temperatures during spring and summer months. Unlike soft drinks and alcohol beverages, water is a physiological drink for which demand grows with unusually high temperatures.
Food	Ice-cream	Low temperatures	Q2/Q3	Very High	Demand is extremely sensitive to changes in temperatures and to thresholds levels. 1°C can translate into 15 to 20% incremental sales.
	Chocolate	High temperatures	Q2	High	Demand decreases rapidly with high temperatures. High concentration of sales around Easter.
		Shortage/excess of rain heat shortage / high temperatures	N/A	High	Cost of production is affected by cocoa production, which is highly concentrated.
	Coffee	Shortage/excess of rain heat low / high temperatures	Q1 through Q4	Low (demand) High (production)	Cost of production is affected by cocoa production, which is highly concentrated. On the demand side, coffee and chocolate have a similar weather risk profile.
	BBQ food	Low temperatures	Q2 / Q3	High	Consumption of crisps, sausages, salads and corn fall rapidly with low temperatures and persistent rain. The sales decline ranges from 2% to 5% per °C
Retail	Food / generalist	Temperatures/ snow	Q1 through Q4	Moderate to Low	Consumption of seasonal products is highly sensitive to unusual weather conditions. These products are often high-margin. Risk of shortages. Hard winters may prevent customers from coming to retail outlets.
	Clothing / Apparel	Temperatures/ snow	Q1 through Q4	High	Spring and autumn are difficult seasons to manage in the clothing retail industry. Cooler than usual springs and warmer than usual autumns lead to drops in revenues and margins. Drops in volumes range from 3% to 6% per °C. Late cold signals also penalise winter sales. Hard winters may prevent customers from coming to retail outlets.
Construction	Extraction	Frost	Q1/Q4	High	Excavating is not possible when temperatures fall below a certain freezing threshold, usually around -5°C. Installations have to be shut down and restarts can be costly.
Utilities	Constr'n Energy	Frost/rain/snow Temperatures/ rain/wind	Q1/Q4 Q1/Q4	Moderate High	Hard winters imply stoppages and delays. ±1°C can translate into up to ±2% of electricity sales depending on the month and market. Hydro and wind conditions impact cash margins but also interfere with achieved prices.
Tyres	Winter tyres	Lack of snow	Q1/Q4	Moderate	Demand for snow tyres in certain countries with no specific winter tyre regulations is highly correlated to the number of snow days.

Source: Meteo Protect

Weather risk disclosure still relatively poor

There are currently shortcomings in the way material risks such as weather are disclosed. This is particularly true for non-catastrophic weather events, which can have a profound financial impact. Weather risks can have a material impact on the sales volumes, cash flow and earnings of many companies in sectors such as energy, utilities, food, beverages, retail, textiles, agriculture, transportation, tourism and leisure. Furthermore, weather risks are specific risks that are identifiable and 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 study on the “Disclosure of weather risks of European utilities”² 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 described weather risks clearly. In addition, the quality of disclosures was not consistent from year to year. There was significantly more information in 2007 than in 2008, which is largely explained by the mild spring of 2007, which had a negative impact on most utilities’ sales, compared with 2008, 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. We believe weather risks should be reported consistently and not be offered when required as a “convenient excuse”. A study on the disclosure of weather risks by 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 entity³. In the food and beverages sector 80% of companies made references to the weather. The percentage was 71% in utilities, 43% in construction and 25% in tourism and leisure.

The study showed that three out of five companies that made reference to weather did not provide information on the financial consequences or their risk management policy for 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. 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.

There are currently shortcomings in the way material risks such as weather are disclosed

For some companies, weather can have a greater impact than FX or interest rates

Weather risks should be reported consistently, rather than offered when the company needs a “convenient excuse”

Three out of five companies that made references to weather did not provide information on the financial consequences or the risk management policy related to weather risks

² Institute for Accounting, Controlling and Auditing of the University St. Gallen and CelsiusPro Ltd, (2010), Disclosure of weather risks of European utilities, January 2010

³ Bertrand J.-L., (2010), La gestion du risque météorologique en entreprise, ESSCA/Université Paris Ouest Nanterre La Défense Thèse soutenue le 11 Juin 2010

It is logical that any climate change will amplify the already significant dependency on existing climate variability of companies in weather-dependent industries. The primary focus of management commentary is to meet the information requirements for investors and as such we believe it should include all material risk exposures, plans and strategies for bearing or mitigating such risks and the effectiveness of risk management strategies must be disclosed, in order to provide users with complete, relevant and useful information.

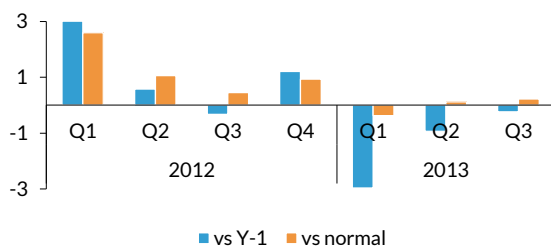
A quick win to better anticipate weather-related profit warnings

Knowing whether a company makes its budget assuming normal weather conditions or if it is simply based on Y-1 results (including Y-1 weather effects) enables investors to better anticipate potential profit warnings.

For example, two companies with different budgeting practices would have had the same risk on guidance due to weather in Q1 2012 but only the company budgeting on the basis of Y-1 weather conditions would face a significant risk of deviation from the guidance in Q1 2013. Assuming that a sensible position is to factor in a return to normal weather in the following year, a profit warning may be less likely for companies budgeting on normal weather conditions.

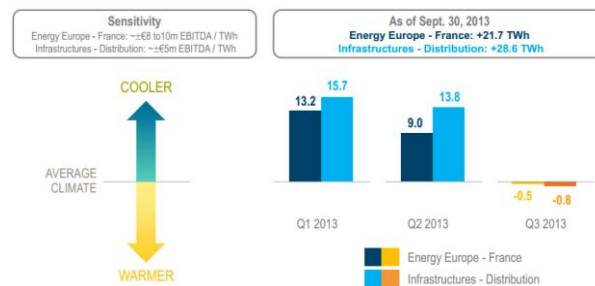
Knowing whether a company draws up its budget assuming normal weather conditions or whether it simply bases it on Y-1 results (incl. Y-1 weather effects) helps investors to better anticipate potential profit warnings

Chart 6: Temperature swings and anomalies in the US



Source: Meteo Protect

Chart 7: GDF-SUEZ reports vs normal weather



Source: GDF-Suez

Weather risk mitigation levers

When it comes to traditional financial risks such as foreign exchange or interest rates, audit committees, performance committees and finance executives have developed sophisticated procedures and expert management techniques to mitigate their impact on the bottom line. Identifying these risks is not always easy, but the computation of the impact of a stronger dollar or higher interest rates on consolidated sales or profits is relatively straightforward. This is not the case when it comes to weather risks as weather effects involve more than one dimension (temperature, precipitation, sun, wind, and other meteorological factors), are often non-linear and have thresholds, saturation and resistance levels. Weather risk management requires knowledge of all weather variables and their interactions, access to all historical weather variables worldwide and the ability to identify and integrate all business, economic and financial variables together with relevant weather variables and provide individual contributions for each factor to global business performance in one single system.

Weather impacts are often non-linear and have thresholds, saturation and resistance levels

Weather risks arise from changes in weather conditions which have a financial impact (gain or loss) on business and key performance indicators over a period of days, weeks or months depending on the sector in which the company operates. Operational managers tend to have a very good practical understanding of what weather conditions can do to the business, although the relationship between weather and business performance is rarely formalised.

Killing a myth: geographical diversification far from the ultimate hedge

Geographical diversification allows for a reduction of risk in the sense of portfolio theory, but there is no symmetry between weather patterns in Europe and the US. Looking at the period 1985-2013, we find that quarterly temperature swings are in the same direction between Europe and the US: 72%, 28%, 31% and 46% of the time respectively for Q1, Q2, Q3 and Q4.

Table 7: Comparison of symmetry between temperature swings in Europe and the US

	Q1	Q2	Q3	Q4
Temperature swings in the same direction in Europe and the US over 1985-2013	72%	28%	31%	46%

Source: Meteo Protect

Moreover, when temperature swings move in the opposite direction, the potential offset between favourable and unfavourable weather conditions is very partial. If we consider that there is natural offset when temperatures move in the opposite direction in a range of 70-100%, it only occurs 25%, 38%, 15% and 30% of the time respectively for Q1, Q2, Q3 and Q4. All in all, the “natural hedge” through geographical diversification in Europe and the US actually works well only 27% of the time.

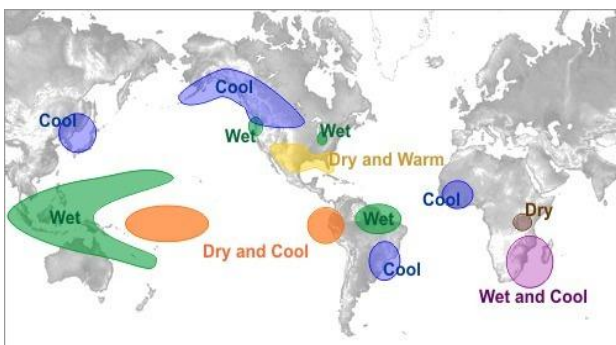
In addition, a company operating in a region of low climate variability could increase its exposure to weather impacts by increasing its exposure to Europe, for instance, where weather variability is high.

Nor is geographical diversification an ultimate hedge against potential supply chain/production disruption due to weather effects. Natural variability phenomena such as the ENSO oscillation (El Niño/La Niña) drive similar weather patterns in very different parts of the globe (see the chart below left). The strong La Niña event in 2010/11 is said to have caused droughts and flooding, which pushed cotton and coffee price to historical highs.

Operational managers tend to have a very good practical understanding of what weather conditions can do to the business, although the relationship between weather and business performance is rarely formalised

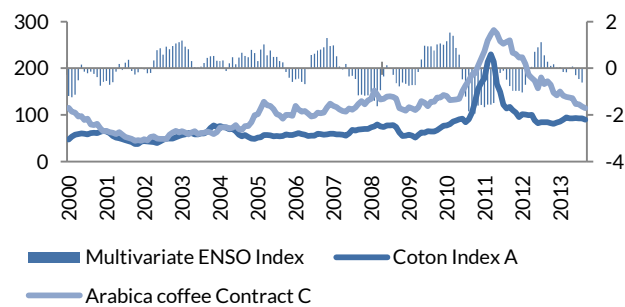
All in all, the “natural hedge” through geographical diversification in Europe and the US actually works well 27% of the time

Chart 8: La Niña effect in December-February



Source: NOAA

Chart 9: Trend in ENSO, and cotton and coffee prices



Source: Meteo Protect

Becoming “weather competitive”: interview with an expert

Although weather can hardly be anticipated beyond two weeks, integrating weather forecasts into operational management can help mitigate adverse weather impacts and/or avoid missing business opportunities. We interviewed Harilaos Loukos, founder of Climpact (now Climpact-Metnext), an information and service firm specialised in weather operational optimisation.



Harilaos Loukos
Founder, Climpact

What is weather planning? In practical terms, could you give a few examples of actions to avoid weather-related losses or to seize potential opportunities?

Although weather can affect business operations in various ways, I will leave aside extremes events and business continuity issues which are by definition rare, to focus on the influence of weather fluctuations on consumer purchasing behaviour on day-to-day operations.

The energy sector is well known as weather-sensitive because outside temperature modulates the need of building heating and cooling. Electricity or natural gas providers and network operators use weather forecasts in order to produce accurate daily consumption forecasts. In Europe, the ongoing liberalisation of the energy market increases the need for accuracy. For example, by 2015 gas operators will need to balance their network daily by selling or buying on spot markets any lack of or any excess of gas received from providers, making accurate forecasts essential to avoid overheads from market prices.

Less known is a similar approach in the consumer packaged goods industry. Like heating or cooling, demand for seasonal products (like ice creams, sodas, mineral water, chips, or ready-made dishes, etc.) can double from one week to another according to weather conditions, while demand planning for these products is evaluated weeks in advance. This leaves room for optimisation by using two-week-ahead weather forecasts converted to future product demand through analytics (to establish the relation between weather conditions and sales). For industry and retail actors this is sometimes done in-house (e.g. Sainsbury's in the retail sector) but mostly through specialised providers like Climpact-Metnext. The gain in forecast accuracy improves sales and operations planning in various ways (such as inventory reduction, production optimisation, delivery efficiency, store replenishment, or sales opportunities) making the company more weather-competitive.

As in stores, weather has also an influence on online shopping behaviour. Online sales/promotions and advertising can be more/less efficient under beneficial/adverse weather conditions through search and banners. For example, during snowfall events there are peaks of online search for snow tyres and similarly banner ads for snow tyres show a higher sales conversion ratio. There are potential high benefits in optimising online marketing actions according to the weather.

From your experience, what proportion of weather-sensitive companies use this kind of weather optimisation management tools? Are some sectors ahead / lagging behind?

Only a minority of weather-sensitive companies are “weather-competitive” because using weather information is not yet mainstream. Of course, some sectors are more mature, as energy is compared to others, but rather than a question of sector it is more about how much data and/or analytics-driven the company is and at what stage of maturity its supply chain is. Indeed, analytics help improve forecast accuracy and maturity of the supply chain allows companies to benefit from this accuracy gain because it is not easy to deliver the right product, at the right place and at the right time.

Could you give a rough idea of the savings/benefits that can be achieved with such operational weather optimisation tools?

In the energy sector good forecasts can reduce by half the overheads or penalties related to forecasts that can be as high as the equivalent of 1% of a provider's annual revenue. In the consumer goods industry, the rule of thumb for better forecasting is +0.1% revenue for each 1% point gain in forecast (e.g. 1% more revenue when forecast accuracy goes from 70% to 80%), when it is common to see improvements in the range of 5% to 10% points.

The gain in forecast accuracy improves sales and operations planning in various ways (e.g. inventory reduction, production optimisation, delivery efficiency, store replenishment, sales opportunities) making the company more weather-competitive

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Financial cover increasingly used by non-energy companies

Weather financial cover is designed to provide cash flow to compensate for business lost to adverse weather. These take the form of options, swaps, or forward contracts and work exactly like traditional financial instruments, except that instead of being related to foreign exchange rates, interest rates or commodity prices, the index dictating the payout is a weather index. Weather cover can be packaged as derivative instruments or as insurance depending on local tax and hedging-accounting rules.

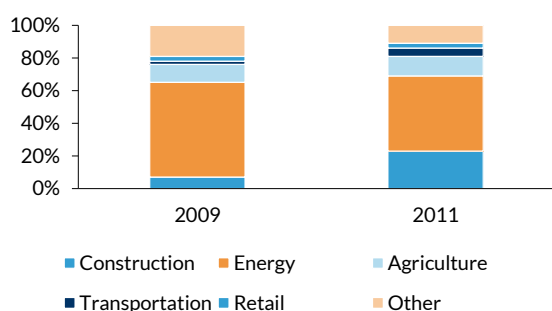
Pricing is based on a discounted value of the payoff from the contract. Historical weather data are used to generate the possible range of outcomes that determine subsequent payoffs. While weather futures contracts currently make up a relatively small proportion of trading in derivatives markets, the CME (Chicago Mercantile Exchange) notes that it is experiencing rapid growth, particularly as more companies recognise the correlation between weather and profit.

There is still little information available on the weather hedging market, as corporate end users are often reluctant to communicate on their weather hedging strategies, which they often view as a competitive advantage. The only available survey is the one provided by the Weather Risk Management Association. Their latest figures from 2011 show an increase of 20% in notional value versus 2009. There was a significant increase in OTC contracts in number (+150%) and value (+86%). Temperature contracts are the most utilised but it is interesting to note that the number of contracts based on temperatures other than CDD and HDD traditionally used by energy companies doubled in two years to represent about 50% of the hedging business. Close to 70% of the contracts reported in 2011 were for winter coverage (as opposed to summer).

Weather financial covers are designed to provide a cash flow to compensate for lost business due to bad weather

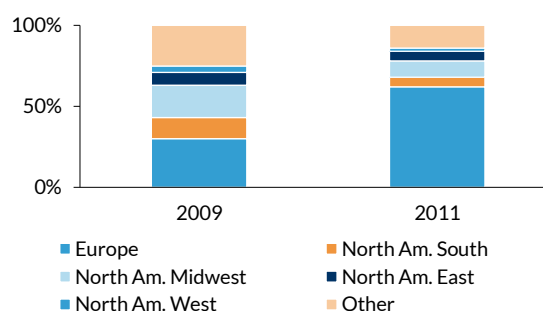
Figures from 2011 showed an increase of 20% in notional value from 2009; there was a significant increase in OTC contracts in number (+150%) and in value (+86%)

Chart 10: Inquiries about weather instruments



Source: PwC, WRMA

Chart 11: OTC contracts reported by region



Source: PwC, WRMA

According to Gabriel Gross, president of Meteo Protect, the largest European weather cover provider, 2013 saw a clear acceleration in the number of quotations and deals in a variety of sectors. The new element is that the market of weather index hedging has expanded from the traditional energy and agriculture sectors towards specialist retail, fast-moving consumer goods and food products.

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Limits to integrating climate risks into valuation models

One way to integrate climate change is to adjust the long-term normalised EBITDA used in a DCF model to derive a terminal value for a company.

A practical case with GDF-Suez shows that shaving the long-term EBITDA assumption by EUR476m (equivalent to the negative impact due to temperatures in France 1.6°C above normal in 2011) would cut our target price by only < 1%, or EUR0.2 per share.

Although this brings interesting results from a sensitivity perspective, there are clear limits to such an exercise, relating to the lack of detail in climate forecasts. Notably the temperature rise may be distributed in very different ways across one year. The impact of very hot summer months and only slightly warmer winter months would be lower for a gas distributor such as GDF-SUEZ than a scenario where most of the rise in temperature would happen in winter months where heating demand is concentrated.

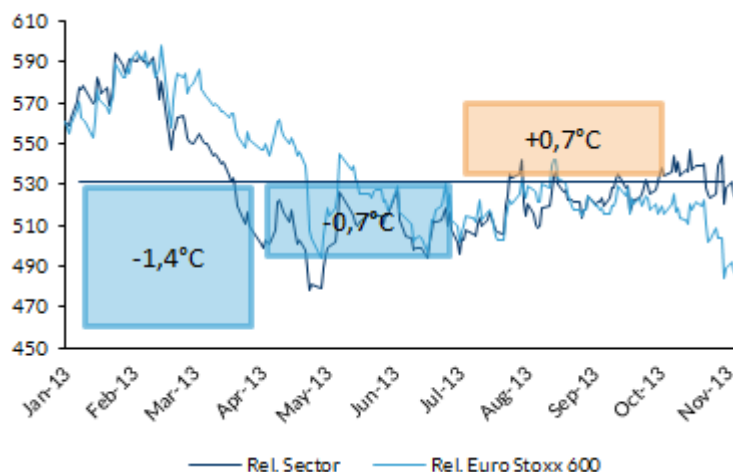
In addition, translating such an analysis for EDF could be even more complex as one could argue that if temperatures are set to increase gradually over time, the air conditioning equipment rate in France would also rise and push up electricity consumption in summer months, somewhat offsetting the adverse impact from lower electricity sales for electric heating during winter months.

Beverages

The materiality check

Apart from bad news on Russia’s lingering weakness, Carlsberg was also under significant pressure in H1 due to its high exposure to Europe (c86% of sales), as the market was anticipating poor results due to the unusually cold half-year in Europe.

Chart 12: Quarterly temperature anomaly in Europe and relative performance of Carlsberg



Source: Kepler Cheuvreux, Bloomberg

It remains unclear how educated the market is on weather effects and how well analysts had anticipated the back-to-normal trend in the US. The US indeed had close to normal temperature conditions in H1 2013, but brewers faced a challenging comparison base in this market due to above-normal temperatures in H1 2012. The YOY temperature swing was therefore much higher in the US than in Europe.

Temperature anomalies can explain up to 40% of sales trend

Temperature is a key factor in the beverage business. It determines not only the quantity consumed, but also the type of beverage: as temperatures rise, consumers drink more, initially for pleasure, but gradually to meet physiological needs. As a result, warmer than usual springs and summers boost sales of flavoured waters, beers, tonic drinks, syrups and any beverage that can be categorised as a “pleasure” drink. Temperature anomalies can explain up to 40% of changes in consumption. As the weather becomes hot and even sweltering, consumers tend to move away from sweet and low-alcoholic drinks towards sparkling or still waters.

Temperature anomalies can explain up to 40% of changes in consumption

Consequently, the weather-sensitivity relationship for the beverage sector is characterised by temperature thresholds. Around normal temperatures, the relationship is almost linear. Weather risk is local and as a result threshold levels and impact factors can vary from one region to another. In other words, the impact of 1°C is different in northern and southern

countries in Europe. The same applies to US states. Hence, we provide a range of typical temperature impacts per product family, which typically apply to Western Europe and US.

Consumption of beer and pastis (i.e. aniseed-based beverages) shows a relatively high sensitivity to weather patterns, which is already reflected in a pronounced seasonality of sales. Spirits (e.g. vodka, gin and whisky) and champagne, however, have little or no significant sensitivity to weather conditions. With high temperatures, consumers may switch from spirits to beer, though.

Beer and pastis consumption show relatively high sensitivity to weather patterns

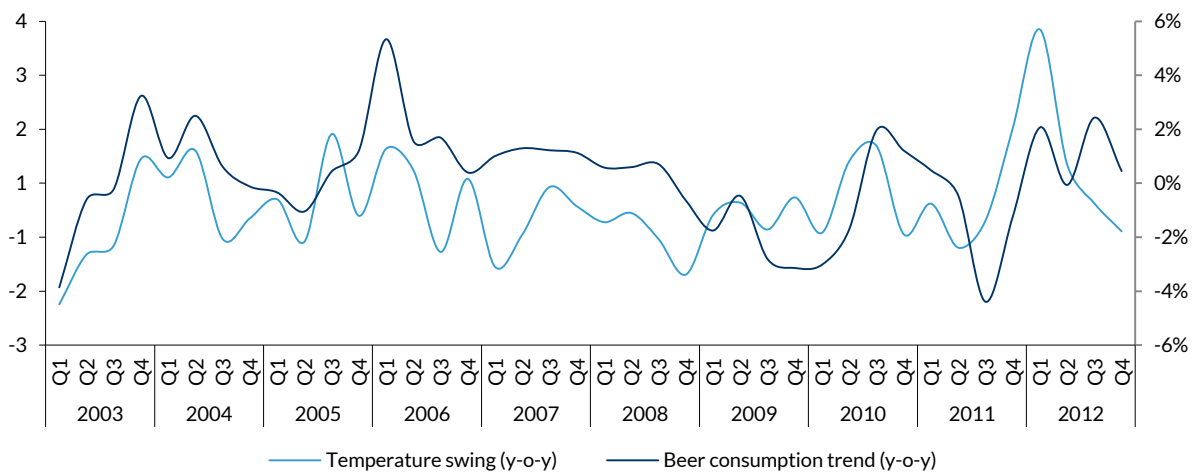
Table 8: Demand sensitivity of beverages to a +1°C variation

	Spring	Summer
Beer	4%-6%	5%-9%
Aniseed beverages	2%-4%	3%-7%
Spirits	none	none
Energy drinks	1%-2%	3%-4%

Source: Meteo Protect

As shown in the chart below, changes in temperature are a key driver of beer consumption. In the US, we find that the weather factor (temperatures) has been as important as the trend in personal expenditure for explaining changes in beer consumption.

Chart 13: Beer consumption as closely correlated to temperature changes as to personal expenditure trend



Source: Kepler Cheuvreux, Brewers Almanac, Bloomberg

Pernod Ricard’s anis brand had two years of decline in sales volumes with the company blaming excise tax and poor weather.

Carlsberg the most weather-sensitive

In the table below we rank companies in the beverage sector according to their exposure to weather-sensitive products (beer, aniseed beverages) and their level of geographical diversification: the higher the overall score, the higher the sensitivity to climate swings.

Table 9: Weather-sensitivity exposure scores

	Exposure to weather-sensitive products	Score	Geo mix	Mitigation factor	Overall score
Beer					
Carlsberg	100%	3	86% Europe (incl. Eastern Europe)	0.8x	2.4
AB InBev	100%	3	Two main markets North Am and LatAm (Brazil) make c75% of sales	0.6x	1.8
Heineken	100%	3	57% Europe	0.6x	1.8
SABMiller	100%	3	Well diversified (Latam, Africa, Europe, Asia)	0.4x	1.2
Spirits					
Diageo	Beer: 21%	1	Well diversified (main market North Am: 33% of sales)	0.4x	0.4
Pernod-Ricard	Ricard: c10% of top 14 brand vols, which make 62% of revs	0.5	Main market Europe: 33%	0.4x	0.2
Campari	Soft drinks: 7.4%	0	Europe: 58% Italy: 34,2%	0.6x	0
Rémy Cointreau		0	Americas: 33%	0.4x	0

Source: Bloomberg, Company data, Kepler Cheuvreux

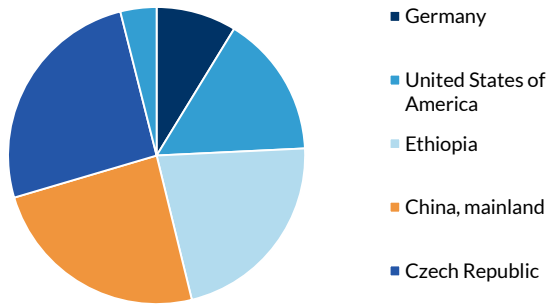
Weather-sensitivity in supply chain: water and crops

Malt is a significant cost item in brewers' production costs (c28% of variable costs). It is mainly produced from malting barley. Global barley production is relatively well spread across the globe with 18 countries account for 80% of global production. Barley is also used to feed animals and therefore competes with other cereals such as wheat, corn or soybean. Weather-related crop failure for any of these cereals can impact the price of barley through systemic effects.

Hops constitutes only a small share of raw material costs but securing the supply is key for maintaining beer quality. Hops production is highly concentrated, with only four countries accounting for more than 80% of global production. The main producer countries Germany, the US, Ethiopia and China are all prone to hailstorms. For instance, the hailstorm in Germany in June 2013 is estimated to have destroyed 3,000 tons (close to 8% of Germany's 2011 annual production) of hops.

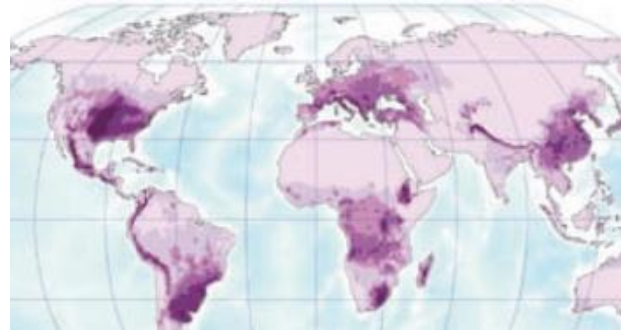
The main hops producing countries (Germany, the US, Ethiopia, China) are all prone to hailstorms

Chart 14: Top 5 hops-producing countries



Source: Kepler Cheuvreux, FAO

Chart 15: Frequency and intensity of hailstorms



Dark purple areas: High frequency and intensity of hailstorms

Source: Munich Re

Apart from hedging, actions to mitigate reliance on key raw materials include:

1. working with farmers to introduce best practice and research in drought-resistance seeds to reduce weather-sensitivity;
2. diversifying the supply base and extending it to new production areas; and
3. replacing barley by more water-efficient crops such as sorghum or cassava.

Water is also a key input for brewers and distillers. Best practices to avoid production disruption due to water shortage or quality issues include: carrying out group-wide water risk assessment to identify sites in areas at risk of water scarcity, setting water consumption-reduction targets and implementing action plans to reduce water risk exposure for these sites. We compare water management performance of beverage companies in the following table.

Diageo, for instance, estimates that 12 breweries in Africa representing c35% of the group’s global water use are located in water-stressed areas. Pernod-Ricard has a lower exposure to water-stressed basins at group level, as it identifies 13 sites with a potential risk of water scarcity but these represent only 5% of its total water consumption.

We compare the water management performance of beverage companies in the table below

Table 10: Water efficiency and water management performance and action plans

	Water-intensity (2012)	Target	Comment
Brewers			
AB InBev	3.5hl/hl: 18% cut in 3 years	n.a.	For AB InBev, water cost and availability issue are considered as a current and rather likely risk with potential significant impacts. Annual water risk assessments are carried out at beverage and other manufacturing facilities. Water risk assessment processes have been further integrated into management tools. In 2012, <8% of breweries were classed as high-risk through this process, with high-risk locations in North and South America and China. The company has had a strategic alliance with GE since 2012 to improve carbon and water savings at 11 facilities in China.
Heineken	4.2	Target: 3,7 by 2020 (eq. - 25% vs 2008).	Water scarcity under climate change is seen as a very high risk for the next five years, with potentially substantial impacts. The first water risk assessments were carried out in 2012 and the first water protection plans in stressed areas initiated in 2013 (target: 20 facilities to be covered by 2015).
SABMiller	3.7hl/hl: -20% since 2008	Target 2015: 3,5; -25% vs 2008.	The drought risk for water availability is seen as more likely than not in the long term (>10 years), with a potential high impact. Studies were made of climate change impacts on water supply for facilities. Water availability risk is assessed at most critical locations. Each country participating in the 'Water Futures' programme looks at a 10 to 15 year horizon. Partnerships have been formed with GIZ and WWF.
Carlsberg	3.3hl/hl: -6% since 2010	Target 2013: 3,2	Carlsberg sees potential disruption to production as already likely due to water availability issues in some locations but expects only low impacts from such risks. In Southeast Europe and Asia, Carlsberg already experiences water scarcity. Water risk assessments have been carried out at all sites.
Distillers			
Diageo	6.6: -19.5% since 2007, and -21% for water- stressed sites	2015: -30% for all sites; -50% for water-stressed sites	Diageo considers that changes in precipitation extremes and droughts already create a high risk to its production capacity. The group has already experienced production disruption due to water shortages in Ghana, Kenya and the Seychelles. Water risk assessments are carried out for both short and long-term horizons. Water scarcity issues are assessed for potential new acquisitions. 12 breweries in Africa are in water-stressed locations (35% of global water use). Sites in basins at risk of water shortage must cut process wastewater by 50%.
Pernod-Ricard	-23% vs 2008: -38% for sites in water-stressed areas	n.a.	Pernod Ricard expects a likely high impact risk on a 6-10 year timeframe arising from stressed water availability and prices in areas like Australia, India and Mexico. 13 production units in six countries have been identified as at potential risk of water shortage (only 5% of group water consumption). Water-saving programs have been launched in these areas.
Rémy Cointreau	11.6 l / std case in 2010/11 to 13.9 in 2012/13	n.a.	Water consumption is 13.9 litres per standard case (excl. Domaines Rémy Martin: 113.6 litres per hl of wine). French sites (Angers, Cognac) are not in water-stressed areas.
Campari	n.a.	n.a.	Each production plant has dedicated QHSE programs, which may include projects and targets for wastewater and rainwater reduction. One of the goals in 2012 and 2013 is to identify specific QHSE targets at global level.

Source: Company data, incl. CDP

Food

Bottled water and ice cream the most weather-sensitive

Bottled water and ice cream sales are positive correlated to temperatures. On the other hand, chocolate sales tend to benefit from cool weather. Other food products like soups (including Unilever Knorr, Nestlé Maggi brands) can also be impacted by a mild winter. And delicatessen or *traiteur* fresh products such as those marketed by Bonduelle can also be impacted by poor weather in the spring and summer (picnics).

Bottled water: sensitivity much higher in summer than in spring

Temperature is a key factor in the beverage business. It determines not only the quantity consumed, but also the type of beverage: as temperatures rise, consumers drink more, initially for pleasure, but gradually to meet their physiological needs. As a result, warmer than usual springs and summers boost sales of flavoured waters, beers, tonic drinks, syrups and any beverage that can be categorised as a “pleasure” drink. Temperature anomalies can explain up to 40% of changes in consumption. As the weather becomes hot or even sweltering, consumers tend to move away from sweet and low-alcoholic drinks towards sparkling or still waters.

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As the weather become hot and even sweltering, consumers tend to move away from sweet and low-alcoholic drinks towards sparkling or still water

The weather-sensitivity relationship for the beverage sector is characterised by temperature thresholds

Table 11: Demand-sensitivity of non-alcoholic beverages to +°C temperature swing

	Spring	Summer
Concentrated juice	4%-7%	15%-20%
Fruit syrups	3%-5%	10%-15%
Tonic	2%-4%	9%-12%
Sodas	2%-4%	5%-7%
Still waters	1%-3%	7%-9%
Sparkling waters	2%-4%	10%-13%
Flavoured waters	4%-6%	8%-11%

Source: Meteo Protect

Ice cream: each °C can translate into 5-10% of sales

Ice cream sales are extremely seasonal and very sensitive to unseasonal weather. Volumes are mostly concentrated in the spring and summer. Cooler than normal springs and summers can have devastating consequences for ice cream producers and even if the late summer or autumn is warmer than usual, it is generally not enough to compensate for lost spring or summer volumes. Depending on the time of the year and the region, each °C can translate into 5 to 10 percentage points of sales.

Chocolate sales tend to melt away when temperatures are too high

There are specific instances, however, where unfavourable weather will eat into margins. Chocolate is a good example. Easter is traditionally a very important event for the product, and depending on how late in the year it falls, and therefore how likely it is that temperatures may be high, sales may melt away as quickly as chocolate in the sun. During the winter, the consumption of chocolate is relatively stable and not sensitive to weather. During the summer, while it is generally understood that cold weather will boost chocolate sales whereas unusually warm weather will turn customers away, the rate at which high temperatures destroy percentage points of margin is greater than the positive effect of cooler weather on chocolate sales.

Food retailers relatively protected by compensation effects

Some food retailers and supermarkets have been using weather forecasts to decide what to order and what to stock on a weekly basis for some years now. Tesco, for instance, hired its own team of meteorologists and forecasters as early as 2006 to predict shopping patterns as a function of temperature and sun hours^[1]. Consumer demand for meat, crisps, corn and other barbecue items can change rapidly in the spring if the weekend is expected to be warm and sunny. Conversely, on such weekends, demand for soup and hot chocolate will drop. As a result, food retail sales are relatively protected as there are some compensatory effects between products, which is not to say that their EBITDA is, as margins differ between seasonal products and basics.

Pure chocolate names the most sensitive

Due to the low business diversification and the relatively higher exposure to Europe, Lindt & Sprüngli appears the most weather-sensitive at group level. The company often quotes weather as a driving factor for sales but does not quantify these effects. The cool and rainy H1 in Europe clearly gave a boost to chocolate sales, creating a challenging comparison basis for H1 2014.

Among the big three, Danone appears only slightly more exposed in relative terms, with 18% of group sales derived from water, but its well diversified geographical mix tends to dilute the financial impacts of weather swings at group level.

Should the temperatures stay 1°C above normal in all geographies across Q2 and Q3, we estimate that this would have (all else being equal) a 3.4% positive impact on water sales for the year. Assuming some margin enhancement from those extra sales, this would lead to a 4% impact on the water business EBIT.

On a groupwide basis (given water is less than 20% of group EBIT), this would equate to 0.7% positive uplift in group EBIT.

In its answer to the CDP questionnaire, Nestlé was one of the few to mention the potential benefit of increasing mean temperatures for its products, estimating that “increased demand for bottled water and ice creams as a result of temperature increase can result in additional sales of CHF350m per year and hence an increase in revenues”. However, we

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Food retail sales are relatively protected as there are some compensatory effects between products

Danone is relatively highly exposed with 18% of group sales derived from water

^[1] http://www.nytimes.com/2009/09/02/business/global/02weather.html?_r=0

point out that offsetting effects are likely to occur across businesses as abnormally warm temperatures in Q2/Q3 would benefit the water and ice cream businesses while at the same time weighing on the chocolate division. We have factored this into our rating below.

Table 12: Weather-sensitivity exposure scores

FOOD	Waters	Ice creams	Chocolate	Score	Geo mix	Mitigation factor	Overall score
Lindt & Sprüngli	0	0	100%	3.0	Europe c58%	0.6x	1.80
Barry Callebaut	0	0	100%	2.2	Europe 60+%	0.6x	1.30
Danone	18% of group sales			0.5	Well diversified	0.4x	0.22
Unilever	Refreshment: 19% (incl. Ice cream, lipton tea-based beverages and, weight management products)	0	0	0.5	Well diversified	0.4x	0.21
Nestlé	7,8% of total sales + Nestea	5%	8,20%	0.4	Well diversified	0.4x	0.16
Bonduelle	0	0	0	0.2	Europe 78%	0.6x	0.12
Orkla	0	Some indirect exposure (ind. division)	Confectionery: 1.8 bn NOK (chocolate, sugar, chewing gum)	0.1	Nordic	0.8x	0.10

Source: Kepler Cheuvreux

Cocoa and coffee yields likely impacted by climate change

Cocoa and coffee are two agro-commodities that are particularly sensitive to weather impacts.

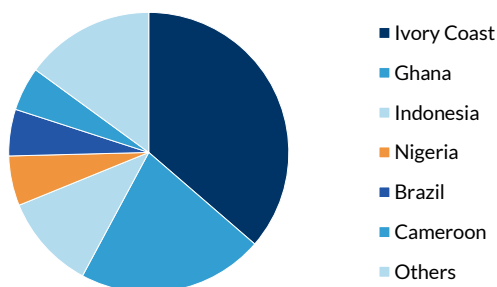
Cocoa: climate change may lower suitability of key producing countries

Global cocoa production is highly concentrated in Africa (72%) with Ivory Coast and Ghana alone representing 58% of global production. Some climate models predict that climate change effects will significantly reduce the suitability of these areas for cocoa production. For existing plantations, this suggests an increasing risk of lower yields.

Barry Callebaut sees a potential high impact risk of cocoa crop failure in one to five years due to changes in precipitation and/or temperature patterns (including disease). It is considering the possibility of extending cocoa acreage to other regions like Australia.

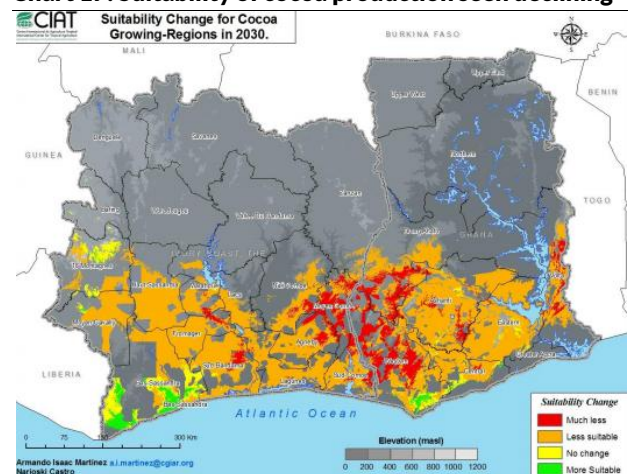
Some climate models predict that climate change effects will significantly reduce the suitability of these areas for cocoa production

Chart 16: Main cocoa producing countries (2011/12)



Source: ICCO

Chart 17: Suitability of cocoa production seen declining



Source: CIAT

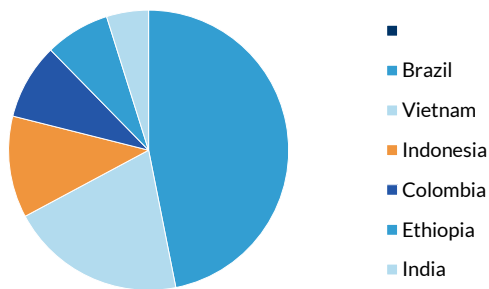
Coffee: no clear net impact from climate change

Climate change is also expected to affect yields in many countries, including Brazil. Some models suggest that most of the area in Uganda (no10 global producer) will be virtually no longer suitable for coffee production by the end of the century. In 2011, coffee production was severely impacted by droughts in Brazil, Indonesia, Colombia and Ethiopia. This pushed Arabica coffee prices to record highs. Arabica coffee is relatively more sensitive to climate variations than Robusta as it has a narrower range of temperatures and precipitations to ensure optimal conditions.

In a conservative approximation, Nestlé now estimates that less than 10% of the coffee it sources comes from countries subject to water-related risks (Mexico, China, India). This is down from an estimated <20% last year. Nestlé launched a study in 2011 to assess risks to key production inputs (incl. water) used in the production of coffee. Growing 1 tonne of coffee requires in average 15,365 m3 of water (predominantly rainwater). The group runs a research programme to improve the drought tolerance of coffee and supports farmers with water-resilience plans that have recorded significant successes, such as in Mexico where water use in coffee production was cut by a factor of 8 to 13.

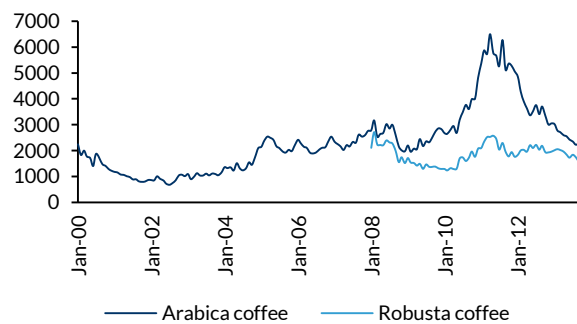
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Chart 18: Main coffee-producing countries



Source: FAO

Chart 19: Coffee price trend



Source: Bloomberg

Other: Bonduelle

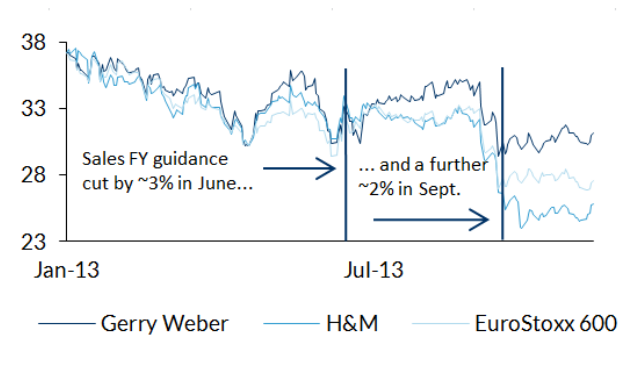
Climate adaptation is certainly a risk for Bonduelle, but the company has made substantial efforts in production diversification. This is now substantially mitigating the climate and weather risks for the company's production profile. Corn represents 15% of production and 50% of production globally is highly sensitive to water and weather. For each major vegetable type (sweetcorn, green vegetables, salad, etc), Bonduelle seeks geographical diversity in its agricultural supply zones and its production tools, and supports farmers in their cultivation practices.

Clothing and apparel

Materiality check. Gerry Weber mostly blamed the weather for the two sales warning in 2013. In June, the company cut its FY 2013 sales guidance by 3.3%, quoting poor weather across Europe as the main reason for not reaching targets. Again in September, Gerry Weber further cut its guidance by some 2% on weather-related poor performance. With its financial year ending in October, there is no catch-up potential.

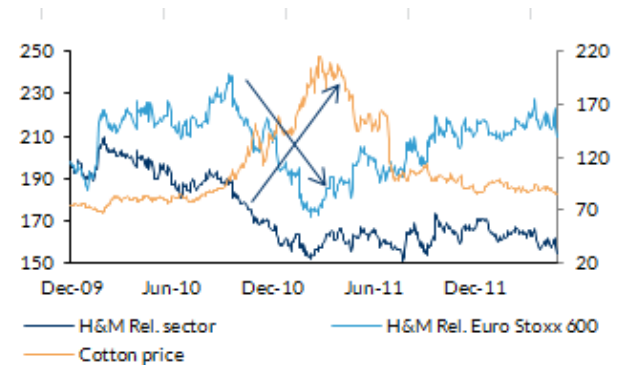
Weather-sensitivity can also materialise through the supply chain, given the dependence of the industry on cotton as a key input. The strong La Niña episode in 2010/11 adversely impacted the production of cotton and contributed to push cotton prices to record highs. This was a challenging environment for H&M, which decided not to raise prices at the expense of its gross margins.

Chart 20: Gerry Weber weather-related sales warnings



Source: Kepler Cheuvreux, company statements, Bloomberg data

Chart 21: Cotton price and H&M relative performance



Source: Kepler Cheuvreux, Bloomberg

Weather a decisive factor during intermediary seasons

The retail business in clothes and apparel is highly seasonal and in some instances the season can be very short: months if not weeks. This is particularly true for fashion products. Marketers and researchers acknowledge that temperature affects consumers' behaviour and purchasing decisions. In the autumn, in the absence of early frost signals, winter coats and down jackets stay on the shelves. In cold weather in the spring means that T-shirts and lights dresses remain unsold.

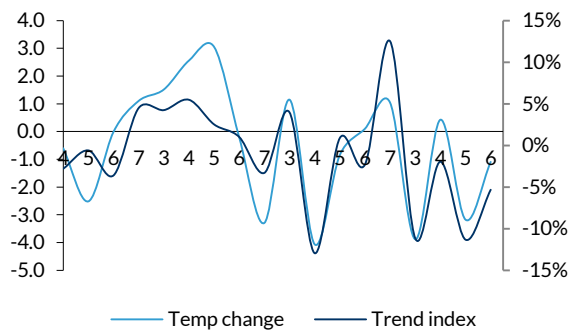
Broadly speaking, apparel and clothing firms are extremely sensitive to weather during the intermediary seasons (spring and autumn). If weather conditions are unfavourable from the very start of intermediary seasons, early markdowns may be necessary to entice customers into the shops, implying lower margins. In addition, most brand retailers is a push business model, which means that garments are ordered months before the actual season and are pushed to be sold profitably to customers within a very short period of time. This means that the textile industry is highly exposed to weather conditions. In spring and autumn, in Western Europe and the US, research shows that temperature anomalies can explain up to 50% of changes in sales.

In spring and autumn, in western Europe and the US, research shows that temperature anomalies can explain up to 50% of changes in sales

The weather sensitivity relationship in Western Europe shows that an anomaly of 1°C translates into 3 to 7% of sales during intermediary seasons depending on the geographical location of the retailer.

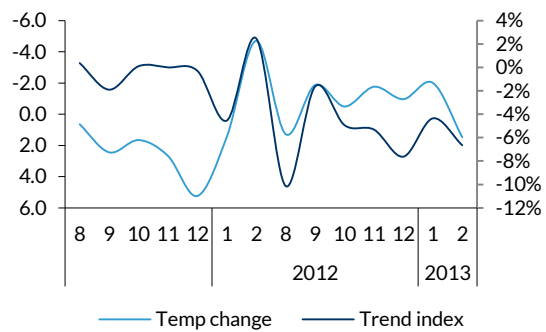
Based on an analysis of the French market, we find a high correlation between clothing sales in March-July (positive correlation) and August-February (negative correlation) over 2011-2013. On average, we find that a change of ±1°C has an impact of up to ±2% on clothing sales.

Chart 22: Temperature impacts SS clothing sales



Source: Kepler Cheuvreux, Bloomberg, INSEE

Chart 23: Temperature impacts AW clothing sales



Source: Kepler Cheuvreux, Bloomberg, INSEE

Companies mastering the value chain are more resilient

The view from our general retail analyst, Jürgen Kolb

In H1, only June saw positive YOY sales growth. According to Textilwirtschaft, H1 German fashion retail sales declined 3% YOY with only June recording a positive YOY performance. Due to the weak sales performance, especially in March but also in April and May, discounts started earlier and were more pronounced, eating into profitability. The Textilwirtschaft survey reveals that c60% of interviewed retailers had declining H1 earnings. The most often-mentioned reasons quoted were: 94% adverse weather, 71% lower customer traffic, 54% easing online competition, 40% disappointing consumer sentiment, 16% missing positive fashion trends.

Business models lack flexibility. Profit warnings from Gerry Weber and Ahlers and lacklustre business for H&M in Germany indicate that retailers are not flexible enough to adjust to external factors. Even though lead times have been reduced in general, the system is still too rigid and does not allow for an adequate merchandise offer. The next risk is on the horizon: early autumn deliveries may weigh heavily, as summer merchandise is still widely available. However, comparisons are getting easier as in H2 2012 only September saw YOY sales growth.

Logistics, inventory management are crucial. We believe that companies with full control of the supply chain can react more quickly to unseasonable weather. Clothes manufacturers having their own retail business have therefore an advantage in terms of inventory management as they can better adjust production to real-time store conditions.

For instance, Next was caught out by the unseasonably warm weather in the UK in August; this left its stores with a shortage of summer clothes and the company lost several million pounds of sales.

With flexible business models, sophisticated logistics, tight inventory management and a growing share of own retail business, we expect the likes of Tom Tailor and Hugo Boss to emerge as relative winners in this environment.

Inditex business model: more flexible than H&M (analyst: Natalia Bobo Björk)

Unlike its peers, Inditex buys more from nearby sources (Spain, Morocco, North Africa), where lead times can be close to 3-5 weeks only (vs 3-5 months in the case of Asia). In fact, Asia accounts for 35% of total sourcing (o/w China is 17%) versus a sector average of some 80%. Despite the obvious cost disadvantage, this allows for greater flexibility. Inditex commits only 50-60% of its collection at the beginning of the season, while the rest depends on customer demand. In fact, when a store identifies certain needs, these can even be met in a period of two weeks. In addition, this protects the company from potential collection “mistakes” and enables it to meet demand needs in full. Moreover, inventories are small and the sales period is limited (as are markdowns, which account for some 15-20% of the full price vs. 30-40% for its main peers). All in all, design is an interactive process across the season, with huge rotations. Buyers know that if they don't buy at a certain moment, the item may no longer be available. Collection failure rates are around 1% versus a 10% sector average.

With flexible business models, sophisticated logistics, tight inventory management and a growing share of own retail business, we expect the likes of Tom Tailor and Hugo Boss to be the relative winners in this environment

Table 13: Weather-sensitivity scoring of companies

General retail	Clothes & apparel	Score	Geo mix	Mitigation factor 1	Retail	Wholesale	Mitigation factor 2	Overall score
Next	Fashion: 65% of sales in large store development	2	93% UK	1x	100% (incl. 33,5% catalogue/online)		0.8x	1.6
Gerry Weber	100%	3	60%+ of revenues in Germany	0.8x	41.20%	58.80%	0.6x	1.4
Hennes & Mauritz	100%	3	~64% in Western Europe	0.6x	100%		0.8x	1.4
Stockmann	~2/3rd of group revs	2	75% Nordic	0.8x	100%		0.8x	1.3
Inditex	95-100%	3	~60% Europe	0.6x	100%		0.6x	1.1
Tom Tailor	100%	3	66%+ Germany	0.8x	57.10%	42.90%	0.4x	1.0
Marks & Spencer	UK: 41%	1	~90% UK	1x	100%		0.8x	0.8
Hugo Boss	~100%	3	60%+ in Europe, 2nd market: North Am.	0.6x	49%	48.60%	0.4x	0.7

Source: Kepler Cheuvreux

Weather-sensitivity in supply chain: cotton

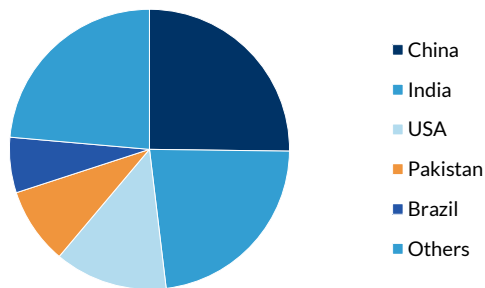
Cotton production is concentrated in China, India, the US and Pakistan (70% of global production).

There is no clear consensus on the overall impact of climate change on global cotton production. Some areas may benefit from limited increases in temperatures and atmospheric CO2. However, water availability may become an issue in producing regions relying on irrigation (US south-west, China Xinjiang, Pakistan) and the expected increase in temperatures and heat waves is likely to create a suboptimal environment for cotton crops (above 32°C) in already hot regions (eg Pakistan).

Floods in Pakistan, Australia and China in 2010/2011 created unprecedented panic buying in the cotton market.

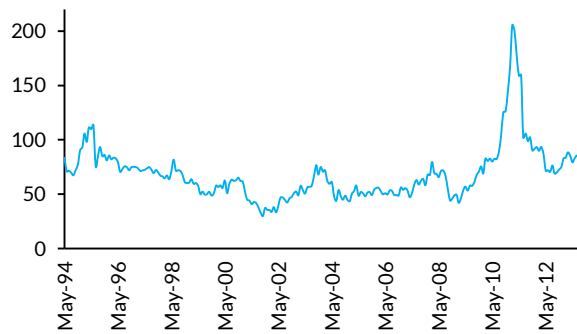
No clear consensus on the overall impact of climate change on global cotton production

Chart 24: Main cotton producing countries.



Source: FAO

Chart 25: Trend in cotton price



Source: Bloomberg

H&M is working on the recycling of textile fibres. A barrier to the development of such a new supply route comes from the relatively low quality of the yarn derived from old clothes. This requires further technical innovation. For instance, a Dutch company (Mudjeans) is to launch a T-shirt made from 30% recycled cotton and believes that the ratio of recycled fibre can be pushed up to 50% for jeans. H&M has already implemented a collection system of unwanted clothes at its stores. In the long-term, the aim is to produce new collections from recycled fibres. When cotton prices peaked in 2010/11, H&M decided not to increase the price of its products, in order to retain its customers.

Inditex is working on an alternative source of textile fibres from lyocell, a natural fibre made from wood pulp.

H&M works on the recycling of textile fibres, Inditex on alternative sources from lyocell

Utilities

High weather impact both at the top and the bottom line

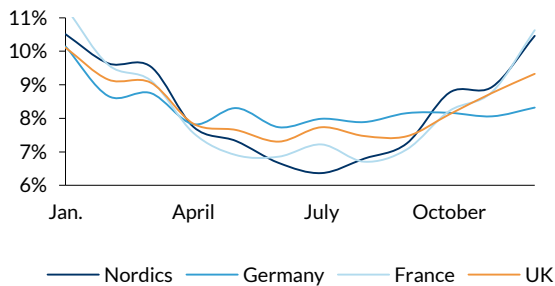
Widely different temperature sensitivity across Europe

Energy is no doubt one of the most weather-sensitive sectors and one of the first to use financial weather cover to protect profits and production costs (first US transaction in 1996, first European cover in 1997). Demand for heat almost entirely depends on how far away temperature is from the comfort level of 18°C (65°F). As a result, temperature anomalies account for up to 85% of changes in energy consumption and slightly less during summer in many countries outside the US, as air-conditioners are less common than heating systems. Weather is by far the largest demand risk for energy distribution. A mild autumn and a warm winter can have a material impact on the sales and EBITDA of many energy distributors. Warm temperatures are not the only issue. Persistent or extreme cold temperatures slash margins as they require distributors to purchase additional energy when spot prices are high.

In terms of seasonality, the summer months have a relatively high contribution to annual electricity demand in Southern Europe (Italy, Spain) due to cooling needs, whereas winter months are the main contributors in Northern Europe (incl. France), especially in Nordic countries where Q3 represents only c20% of the annual electricity demand.

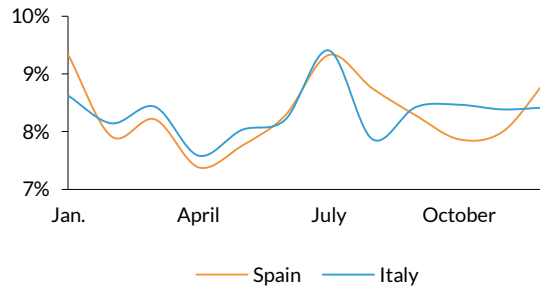
Temperature anomalies explain up to 85% of changes in energy consumption

Chart 26: Seasonality of electricity demand - N. Europe



Source: Kepler Cheuvreux

Chart 27: Seasonality of electricity demand - S. Europe



Source: Kepler Cheuvreux

Electricity consumption in France is particularly sensitive to temperature anomalies. This can be explained by the high penetration rate of electrical heating. Spain and Italy show a symmetrical weather-sensitivity to France, with the summer months being the most sensitive. This can be explained by the high penetration rate of air conditioning.

Electricity consumption in France is particularly sensitive to temperature anomalies

Table 14: Sensitivity of electricity demand to +1°C in given months

	January	August
France	-2%	0.5%
UK	-1%	0.25%
Germany	0%	0%
Spain	-1.25%	2.0%
Italy	-0.5%	2.0%

Source: Climapact

Complex impacts of changes in hydro resources

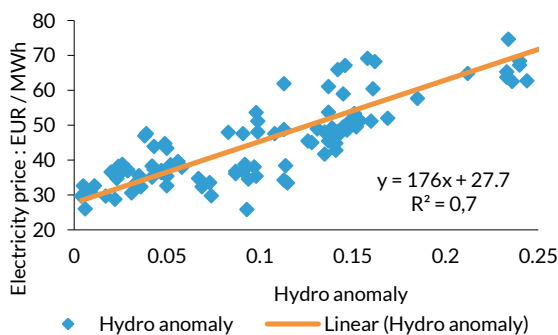
Hydro and wind power generation units have very low variable costs. Changes in production volumes due to water or wind availability therefore have an impact on EBITDA margins of power generators. During droughts and heat waves, cooling needs or thermal capacities may not be ensured and may weigh on load factors. High-fixed costs nuclear assets are therefore also sensitive to droughts.

Hydro: net impacts blurred by interference with electricity price. There is generally a good correlation between precipitation and hydro reservoirs content, hence hydro-based electricity production. The content of hydro reservoirs can be highly volatile. For instance, hydro reservoirs content was 55% below normal in Nordic countries in some days of 2011. The financial impact on operating margins from changes in hydro production can be complex, though, particularly in Nordic countries and Iberia, as a change in hydro and wind production volumes also impacts electricity spot prices (see chart below left). We have showed in our report *Utilities: profits reined in by less rain* (Dec. 2011) that the sensitivity of Fortum and Iberdrola to changes in hydro production volumes is relatively low as price impacts tend to offset volume impacts.

Climatic patterns in Europe tend to show a symmetry between rainfall conditions and hence hydro reservoir levels between Nordic and Iberian countries (see right-hand chart) depending on the NAO index (North Atlantic Oscillation). Unfortunately, there are no predictive skills for the NAO.

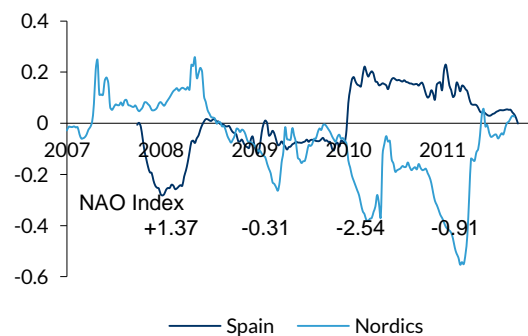
Climate patterns in Europe tend to show a symmetry between rainfall conditions, hence hydro reservoir levels between Nordic and Iberian countries

Chart 28: Hydro anomalies impact Nordpool prices



Source: Kepler Cheuvreux

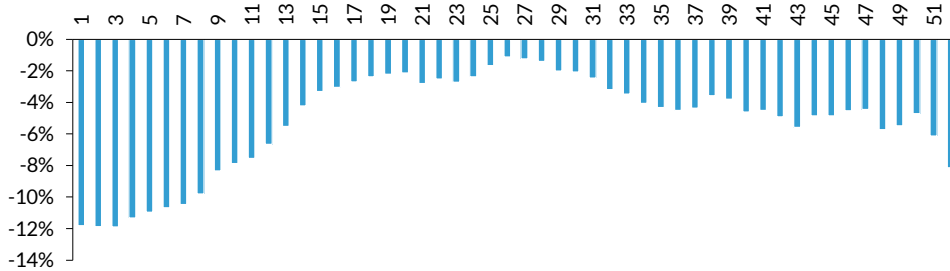
Chart 29: Symmetric pattern in hydro reservoir content



Source: Kepler Cheuvreux

In Spain, where climate models tend to agree on reduced precipitation over the long-term due to climate change, we show that the 10-year median levels of hydroelectric reservoirs fell by up to 12% in the winter weeks between 2004 and 2013.

Chart 30: Change in 10-year median levels of hydroelectric reservoirs over 2004-2013 in Spain

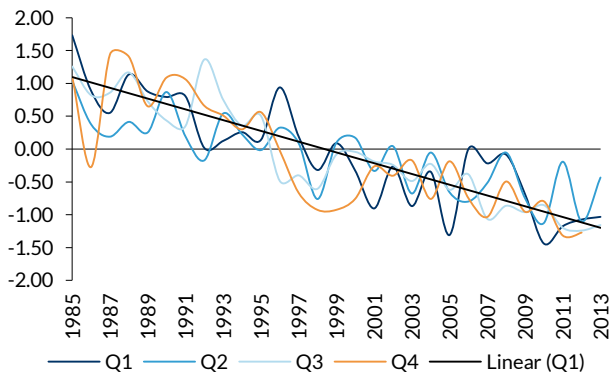


Source: MAGRAMA, Kepler Cheuvreux

Wind: continuous downward trend in average wind speeds in the US. In the US, there has been a general trend towards less wind across all the quarters. In Europe, wind variability is higher in the UK and Italy than in Spain and Germany. There is a long-term trend to more wind in Italy and less in the UK.

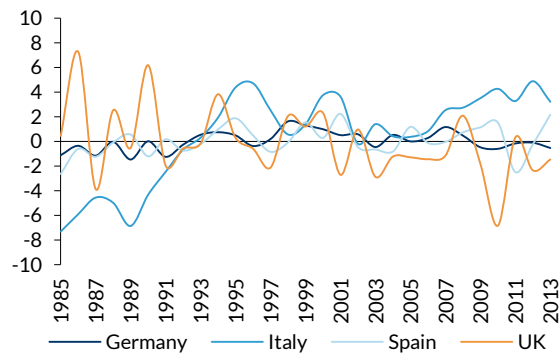
Wind: continuous downward trend in average wind speeds in the US

Chart 31: Trend in wind speed anomalies in the US



Source: Meteo Protect

Chart 32: Trend in wind speed anomalies in Europe



Source: Meteo Protect

H1 2013 a challenging comparison base for utility names

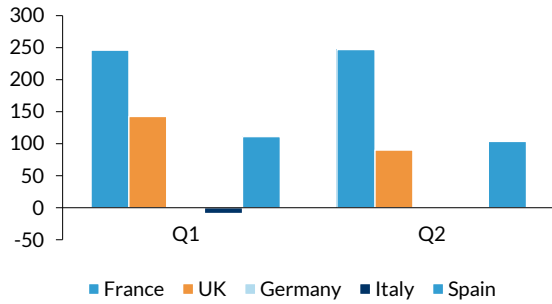
The abnormally cool temperatures and high wind and hydro resources in H1 2013 across Europe create a challenging comparison base for many utilities, with 5-16% downside potential on H1 2013 EBITDA, we estimate (see table below).

Cold weather across Europe has particularly pushed electricity consumption in France due to higher sensitivity. Cold weather in France in H1 2013 was particularly positive for energy sales of EDF and GDF-Suez. Without the weather effect, EDF sales growth would have been flattish, but benefited from a +2.9% positive weather effect, mostly due to

Abnormally cool temperatures and high wind and hydro resources in H1 2013 across Europe create a challenging comparison base for many utilities, with 5-16% downside potential on H1 2013 EBITDA

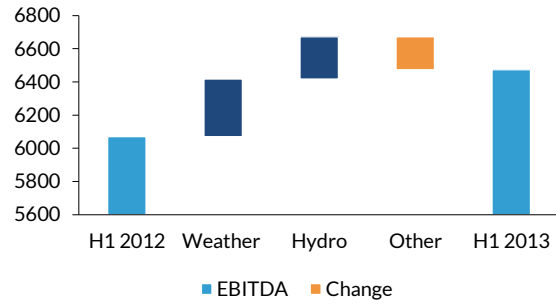
temperature anomalies. Unusually cold temperatures in H1 2013 boosted EDF France's EBITDA by EUR346m, including the normalisation of a -EUR100m negative hit in H1 2012 on margins due to a cold snap in February 2012, which forced EDF to source electricity from the grid. This creates a challenging comparison base for H1 2014. In the same manner, normal temperatures in H1 2014 would deteriorate GDF-Suez net income by EUR236m.

Chart 33: Weather impact index on electricity demand



Source: Kepler Cheuvreux, Bloomberg data

Chart 34: EDF France EBITDA bridge 2012-2013 (H1)

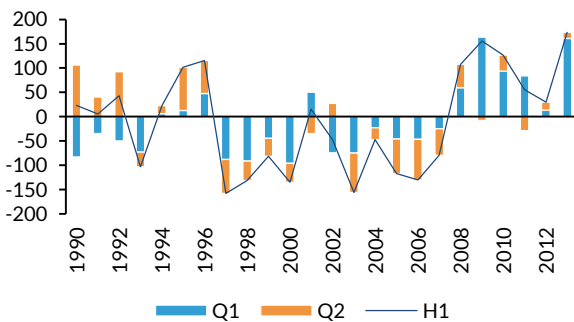


Source: Kepler Cheuvreux, EDF

Availability of wind and hydro resources was abnormally high in H1 2013 across a large part of Europe (except the Nordic countries).

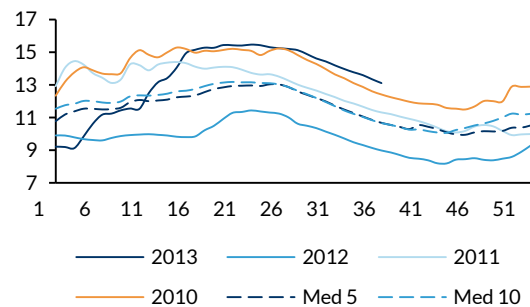
In Austria, the hydro coefficient for Verbund remains highly challenging (11% above the long-term average in H1 2013). Hydro power production in France was also close to record levels in H1 2013. In Italy, 30-year record high precipitation boosted hydroelectricity production (see chart below left). In Spain, hydroelectric reservoirs recovered quickly from their 2012 lows in Q1 2013 to above median levels and even reached record highs in Q2 2013 (see chart below right).

Chart 35: Precipitation anomalies in Italy



Source: xxx

Chart 36: Level of hydroelectric reservoirs in Spain



*Y-axis unit is TWh. X-axis is week #

Source: MAGRAMA, Kepler Cheuvreux

Unusually cold temperatures, high wind and hydro precipitations all create a very challenging comparison base for European utilities.

Table 15: Comparison base and climate normalisation effects

	H1 2013	Comment
Pure renewable players		
Verbund	Hydro coefficient 1.11	Estimated impact from normalisation: -EUR102m, or c13% of H1 2013 EBITDA Production downside in a hydro/wind resource normalisation scenario estimated at c0.9TWh, or c7% of EBITDA H1 2013 Normalisation in H1 2014 could cut EBITDA by EUR40-45m, or 7.7% of H1 2013 EBITDA
EGP	Resource coefficient 1.08	
EDPR	Wind coefficient 1.05	
Diversified utilities		
EDF	Hydro production close to records (+EUR255m YOY) and +EUR346m positive effect on EBITDA from cold vs H1 2012	Climate normalisation in H1 2014 would pull down EBITDA by cEUR400-450m (cEUR150-200m due to hydro and EUR250m due to temperatures). We estimate that normalisation could weigh by cEUR470m on GDF-SUEZ France EBITDA. 6% of H1 2013 EBITDA at stake.
GDF-Suez	Improved hydro resource vs H1 2012 which was close to normal. Positive weather contribution to EBITDA of EUR330m	
Iberdrola	Hydro production up by 83% and wind load factor up by 1.9pp vs H1 2012.	Challenging comp. base. Hydro production in Spain some 2 TWh above normal Normalisation could withdraw 4TWh of hydro production
Enel	Very high hydro production in Italy	

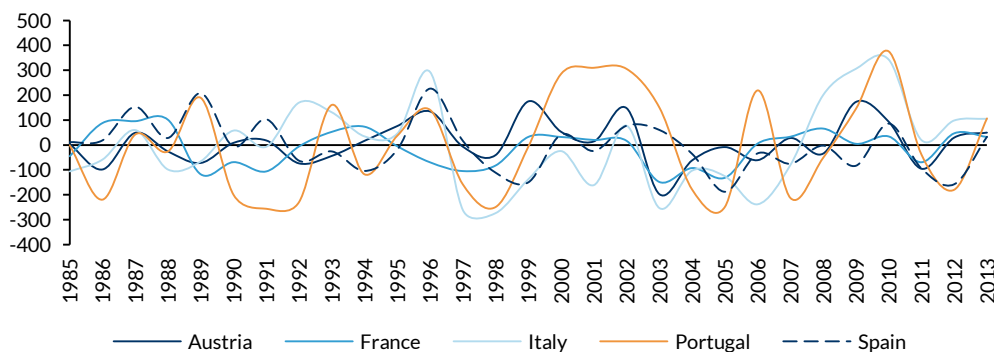
Source: Kepler Cheuvreux, companies

The view from our analyst on Spanish utilities. The impact of high loads in hydro and wind in Spain was quite remarkable in H1 2013. It had a depressing impact on spot prices but was rather good for margins given: a) resilient contracted sale prices and b) cheaper cost of sales as a result of a cheaper generation mix and lower cost of electricity purchases. For renewables, the abolition of the fee in the premium system (leaving the feed-in tariff as the sole system in 2013) spared them the impact of lower spot prices. Effectively, the high hydro and wind loads allowed the companies to offset the impact of the generation taxation that came into force on 1 January 2013.

Annex

The general long-term trend for precipitation in Europe is neutral to slightly higher. According to Meteo Protect data, precipitation variability is about twice as high in Italy and Portugal as in Austria, France and Spain. The remuneration mechanism for EDP hydro assets makes the company little exposed to inter-annual variability.

Chart 37: Trend in precipitations anomalies in different European countries since 1985



Source: Meteo Protect

Other sectors

Tyres: late winter the most adverse scenario

Weather generally has an adverse impact on tyre manufacturers when seasonal weather starts too late (eg no snow till January/February, or a late and short summer): the earlier the snow and the winter, the better the sales of winter tyres. Winter tyres are generally sold at higher average selling prices and generate better margins.

Nokian Tires is by far the most exposed to winter tyres.

Table 16: Weather-sensitivity factors

	Exposure to tyre business (% EBIT)	Geographical exposure	Exposure to winter tyres
Continental	60%	Europe: 55%, NAFTA: 22%, Asia: 18%	c. 15% of EBIT (est.)
Michelin	100%	Europe: 39,4%, North Am: 35.9%, Latam: 6%, Asia: 16.7%	n.a.
Nokian	100%	Europe: 57%, Russia+CIS:35%, North Am. 7%	90%+ of EBIT
Pirelli	100%	Europe: 30,9%, Latam: 34%, North Am. 15.4%, Africa, Asia Pac.:8.7%	14% of total tyres sales (FY 2012)

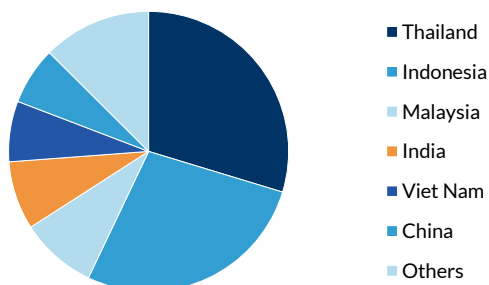
Source: Kepler Cheuvreux

Limited weather-sensitivity of natural rubber production

Natural rubber represents 20%-35% of raw material costs for tyre production, depending on the product mix (the bigger the tyre, the higher the concentration of natural rubber). The production of natural rubber is concentrated in Southeast Asia with Thailand, Indonesia and Malaysia ensuring 2/3 of the global supply. India, Vietnam and China are other large producing countries.

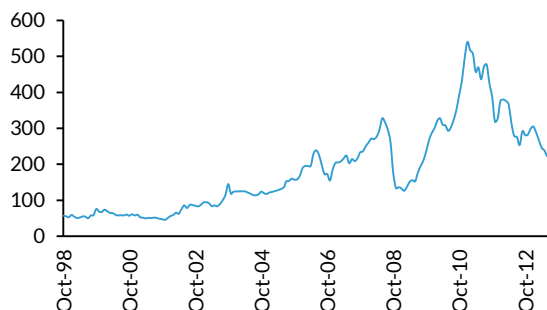
Although natural rubber requires a relatively narrow range of temperatures for optimal crop conditions, trees can sustain extreme climatic conditions (temperatures up to 45°C). Prolonged drought conditions and heavy rain can curtail production, but natural rubber production has relatively low weather-sensitivity.

Chart 38: Main natural rubber producing countries



Source: FAO Kepler Cheuvreux

Chart 39: Trend in natural rubber price (USD/kg)



Source: Bloomberg

Both Pirelli and Nokian consider that climate change risk due to changing weather patterns on natural rubber supply is unlikely, although the impact would be medium or high. Still, Pirelli estimated that in 2012 a USD300/t change in the price of natural rubber would have had an impact of EUR50m on its EBIT (all else being equal).

Supply of natural rubber cannot be hedged. A way of limiting exposure to natural rubber price hikes is to deploy synthetic rubber (derived from hydrocarbons). This requires heavy investments, though.

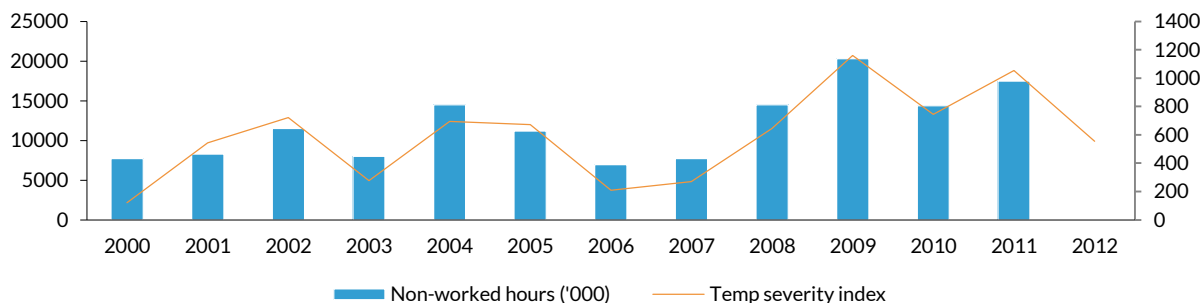
Construction/building materials

Construction, public works and concessions can all be affected by weather conditions. The main disruptive weather patterns are heavy rain and frost, which mostly impact Q1 sales trends (and Q4 to a lesser extent) in Europe.

The sector’s overall weather-sensitivity is relatively low because adverse weather anomalies generally occur during winter months and impact the activity in a quarter which is already a small contributor. The most impacting events are therefore likely to be precipitation events over Q2-Q4, forcing companies to suspend operations.

We have built a winter temperature severity index to reflect how much the activity in the construction and cement sector can have been hampered by weather effects. Our index for France correlates well with the trend in the number of non-worked hours in the construction industry.

Chart 40: Correl'n between temp. severity index and non-worked hours in French construction due to bad weather



Source: Kepler Cheuvreux, CIBTP, Bloomberg

Across Europe, normal weather conditions would create a favourable environment for building materials and construction companies

Others

Husqvarna - Analyst: Johan ELIASON

Husqvarna is a global market leader in chain saws and other hand-held petrol powered forestry & garden products as well as lawn mowers and garden tractors.

It is important to keep an eye on the weather in order to anticipate short-term developments for Husqvarna, at least during the gardening period from March to August. Early warm temperatures imply that the gardening season will start early or vice versa if it is a cold spring. Warm weather is generally preferred for lawnmower sales, but there still needs to be some rain to keep the grass growing during the summer period. A drought will significantly reduce lawnmower sales, though this can be offset by higher irrigation equipment sales, which Husqvarna only sells in Europe, however. On top of this, chainsaw sales are very dependent on winter storms as well as the number of landed hurricanes in North America. **The volume difference between a good weather month and a bad can be up to 10x for Husqvarna, and thus significantly alter the quarterly top-line development.**

K + S - Analyst: Martin ROEDIGER

K + S is a mining company. It is the number five producer in the global potassium market. After the acquisition of Morton Salt from Dow Chemical/Rohm and Haas, K+S is number one in terms of global salt capacity.

K+S salt business is directly weather-sensitive, as the demand for de-icing salt depends on winter weather conditions. In Q1 2013 for instance, K+S's salt segment increased its EBIT by 61% (after a warm winter the year before). Also, the fertiliser business (58% of sales) is indirectly weather-sensitive, as high crop prices (when yields are poor due to adverse weather conditions for instance) are positive for price hike potential at K+S, and vice versa.

Appendix

IPCC: will this strong call be heard?

In September 2013 the IPCC (Intergovernmental Panel on Climate Change) released an update of the scientific consensus on climate change science. We listened to the press conference and read the summary for policymakers. We list below our main takeaways and provide an update on the climate change regulatory agenda.

What's new since the 2007 report?

- New knowledge has been brought on board with 9,200 scientific publications reviewed, including 2/3 published after 2007. 60% of authors are new to the IPCC. Climate models have generally improved, as have IPCC processes.
- It is now extremely likely (>95% probability, vs >90% in 2007) that more than half of the global average surface temperature over 1951-2010 is due to human influence. Projected climate change based on new scenarios is similar to the scenarios presented in 2007 in both patterns and magnitude.
- Confidence on sea level rise has increased. The rate of sea level rise will very likely (>90% probability) exceed the trend of the past four decades. Projections are higher than in 2007, ranging from +0.17m to +0.30m by 2046-2065, depending on scenarios.
- Extreme events: for the first time, the report gives probabilities for further changes in extreme events for the early 21st century. For instance, an increase in hot days, heavy precipitation events and extreme high sea levels is likely in the first part of the century (while most projections were for the end of the century).
- The IPCC states that it is now virtually certain that tropical cyclone activity has increased in the North Atlantic since 1970. However, compared with the 2007 report the likelihood of an increase by the end of the century has been revised from "likely" to "More likely than not for the Western North Pacific and North Atlantic". For the first part of the century, the IPCC has low confidence (ie no clear view).

How robust are these climate models?

During the Q&A session of the press conference, the panel was challenged by questions on the so-called global warming hiatus, ie the fact that global warming has slowed in the past decade (see below). Basically, can we trust models which had not anticipated the recent global warming pause?

The answers from the IPCC members and the Secretary General of the World Meteorological Organization may be summarised as follows:

- It is inappropriate to compare a short-term period with climate model performance. Models have improved in their performance and show a remarkable agreement with long-term climate trends observed. They are calibrated to project long-term climate change. The best time scale is 30 years.
- The observed slowdown is not unusual. The climate models are not designed to predict climate on such short timescale (10-15y), as climate variability is higher. The panel recognises that the attribution of the causes of this 'hiatus' is an emerging scientific issue. Volcanic eruptions, ocean energy uptake, La Niña are all factors that can have played a role.

An extract of the summary for policymakers adopted by 110 governments states: “The long-term climate model simulations show a trend in global-mean surface temperature from 1951 to 2012 that agrees with the observed trend (very high confidence). There are, however, differences between simulated and observed trends over periods as short as 10 to 15 years (eg 1998 to 2012).”

Climate sceptics will always be there, and of course this “pause” helps them to be more vocal, but perhaps more importantly, it was stressed that the linear relationship between warming and cumulative carbon emissions has been acknowledged by 110 governments.

The capacity of policymakers to act on climate change by implementing carbon regulations also greatly depends on the support they receive from the polls. On this point, we highlight that surveys by Gallup in the US show that there is a recovery in the belief that human activities are the primary cause of global warming (still far from the 95% probability) and the level of concern on climate change. Levels remain below pre-“climategate” levels though.

International climate change negotiations and carbon regulation agenda

International talks: upcoming reports in 2014 might better support the need for action.

The findings of the report will be presented and explained at the next UNFCCC negotiation session in Poland in November. However, as the IPCC consensus was already largely embraced by countries under the UNFCCC negotiation process, we do not believe this new report will create a big shock.

Ban Ki Moon has invited leaders at the highest level from all disciplines to a Climate Summit in 2014. By then, the IPCC will have released two other reports, including one on the projected impact of global warming on societies and economies. We believe this report may convey a more tangible (hence worrying) message to policymakers, and help assess the cost of inaction. However, confidence on climate projections at regional level remains relatively low.

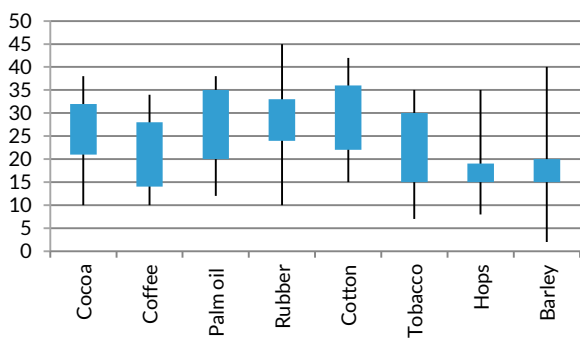
The key meeting will be in Paris in 2015, where world leaders are due to find an agreement on a framework for nations’ 2020 carbon reduction pledges. It is certainly too early to call the outcome of this summit, but we would argue that the general environment might be more favourable this time (eg better economic environment).

Supply chain weather risk assessments

Apart from the auto and computer industries, whose supply chain weaknesses were revealed by the floods in Thailand in 2011, agro-commodities are natural candidates for weather risk. We have assessed the weather-sensitivity of a number of agro-commodities based on three main criteria:

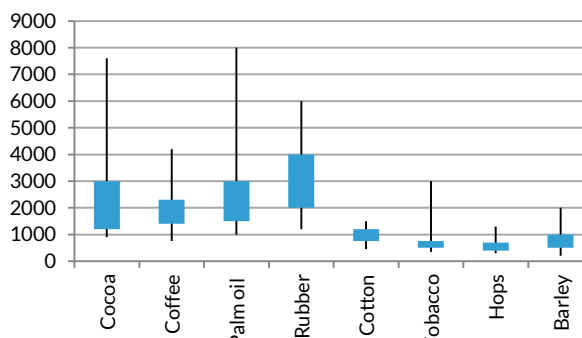
1. **Supply concentration.** The more a crop is concentrated in a limited area, the more it is weather-sensitive. Agro-commodities such as palm oil (88% of global production concentrated in Indonesia/Malaysia/Thailand) or cocoa (70%+ concentrated in West Africa) receive a high exposure score.
2. **Weather-induced crop failure risk.** Based on optimal and absolute temperature and precipitation ranges, we estimate a weather-sensitivity score by crop: the wider the ranges, the lower the risk of crop failure. Cotton, cocoa and coffee have high exposure score on this criterion. Some crops are also sensitive to high winds (eg palm oil, cotton).

Chart 41: Optimal and abs. temperature range by crop



Source: FAO, Kepler Cheuvreux

Chart 42: Optimal and absolute rainfall range by crop



Source: FAO, Kepler Cheuvreux

1. **Supply/demand.** The higher the inventory levels, the lower the sensitivity to adverse weather impact in the supply/demand balance.

Table 17: Weather sensitivity of scores of a set of agro commodities

Agro-commodity	Concentration index*	Sub score	Area harvested	Sub score	Exposure		Total weather-sensitivity score
					Market tension score	Weather risk score	
Cocoa	2065	3	9,9	1	2	5	11
Coffee	1676	2	10,5	1	1	5	9
Palm oil	3616	3		1	1	2	7
Rubber	1880	2	9,4	1	1	2	6
Cotton	1495	2	34	0	1	6	9
Tobacco	2167	3	4	1	1	6	11
Hops	1970	3	0,08	2	1	5	11
Barley	490	0	48,4	0	1	4	5

* HHI formulae

Source: Kepler Cheuvreux

Weather risk management in practice

Achieving high performance standards and creating sustainable value year after year is about understanding and managing all variables that contribute to business performance. In many sectors, weather is one of these key variables. Weather risk management policies help managers and investors to bring answers to the following questions:

- How much of your performance is weather-related?
- What is your performance on a constant-climate basis?
- What are your weather assumptions/scenarios for next month, quarter, financial year?
- What should your weather risk management policy be?
- Should weather risks be hedged? What percentage of exposure should be hedged? What financial objectives?
- What hedging instruments and strategies should be used?

Weather risk management projects carried out by companies traditionally follow a five-step process, which involves:

- Risk identification: determination of significant weather variables and definition of their relationship to business performance.
- Risk quantification: evaluation of overall weather exposure, key periods and profits at risk.
- Risk policy systems and control procedures: budget and scenario-based analysis; determination of financial objectives and pain levels.
- Strategy implementation: design and implementation of hedging strategies in line with risk management objectives.
- Performance management and review: reporting and testing of the effectiveness of risk management policies and strategies; communication to key stakeholders.

Risk identification leads to a mathematical link between weather and sales or EBITDA. It also sets the relevant weather variable or weather index to be used in a derivative or in an insurance contract to provide cover against the financial consequences of adverse weather conditions. Weather indices are generally of three types:

- Aggregate measures of weather variables over a defined period of time, such as average temperature, total rainfall, total sun hours, average wind speed and so on.
- Adverse days, defined in terms of weather variables, such as days when the temperature is above or below a given level, the rainfall exceeds a certain level, etc.
- Adverse events, defined by the occurrence of a given weather event, such as a given recorded wind speed, or temperature, etc.

Research ratings and important disclosures

Disclosure checklist - Potential conflict of interests

Stock	ISIN	Disclosure (See Below)	Currency	Price
AB InBev	BE0003793107	nothing to disclose	EUR	75.99
Ahlers	DE0005009708	nothing to disclose	EUR	11.27
Barry Callebaut	CH0009002962	nothing to disclose	CHF	1,018.00
Bonduelle	FR0000063935	nothing to disclose	EUR	19.00
Campari	IT0003849244	nothing to disclose	EUR	6.02
Carlsberg	DK0010181759	nothing to disclose	DKK	582.00
Continental	DE0005439004	14, 16, 18	EUR	150.35
Danone	FR0000120644	nothing to disclose	EUR	54.86
Diageo	GB0002374006	nothing to disclose	GBP	1,976.00
Dow Chemicals	US2605431038	nothing to disclose	USD	39.66
EDF	FR0010242511	nothing to disclose	EUR	26.72
EDP Renovaveis	ES0127797019	nothing to disclose	EUR	4.03
ENEL	IT0003128367	nothing to disclose	EUR	3.29
ENEL Green Power	IT0004618465	nothing to disclose	EUR	1.80
Fortum	FI0009007132	nothing to disclose	EUR	17.09
GDF Suez	FR0010208488	nothing to disclose	EUR	17.30
Gerry Weber	DE0003304101	nothing to disclose	EUR	30.72
Heineken	NL0000009165	nothing to disclose	EUR	50.60
Hennes & Mauritz	SE0000106270	nothing to disclose	SEK	274.40
Hugo Boss	DE000A1PHFF7	14, 16, 18	EUR	98.14
Husqvarna	SE0001662230	nothing to disclose	SEK	39.21
Iberdrola	ES0144580Y14	nothing to disclose	EUR	4.72
Inditex	ES0148396015	nothing to disclose	EUR	115.65
K + S	DE000KSAG888	nothing to disclose	EUR	19.11
Lindt & Sprüngli	CH0010570759	nothing to disclose	CHF	45,850.00
Marks & Spencer	GB0031274896	nothing to disclose	GBP	496.00
Michelin	FR0000121261	nothing to disclose	EUR	80.55
Nestlé	CH0038863350	nothing to disclose	CHF	66.80
Next	GB0032089863	nothing to disclose	GBP	5,420.00
Nokian Renkaat	FI0009005318	nothing to disclose	EUR	37.50
Orkla	NO0003733800	nothing to disclose	NOK	47.46
Pernod-Ricard	FR0000120693	nothing to disclose	EUR	86.82
Pirelli & C.	IT0004623051	nothing to disclose	EUR	11.31
Rémy Cointreau	FR0000130395	nothing to disclose	EUR	71.12
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Sainsbury	GB00B019KW72	nothing to disclose	GBP	404.6
Stockmann	FI0009000251	nothing to disclose	EUR	11.42
Tesco	GB0008847096	nothing to disclose	GBP	354.55
TOM TAILOR Holding AG	DE000A0STST2	nothing to disclose	EUR	17.49
Unilever	NL0000009355	nothing to disclose	EUR	28.71
Verbund	AT0000746409	nothing to disclose	EUR	16.25

Source: Factset closing prices of 22/11/2013

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Reduce	21.9%	0.0%
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Total	100.0%	0.0%

Source: Kepler Cheuvreux

A: % of all research recommendations

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Amsterdam

Kepler Cheuvreux Benelux
Johannes Vermeerstraat 9
1071 DK Amsterdam
+31 20 573 06 66

Frankfurt

Kepler Cheuvreux Germany
Taunusanlage 18
60325 Frankfurt
+49 69 756960

Geneva

Kepler Cheuvreux SA
Route de Crassier 11
1262 - Eysins
Switzerland
+41 22361 5151

London

Kepler Cheuvreux UK
12th Floor, Moorhouse
120 London Wall
London EC2Y 5ET
+44 20 7621 5100

Madrid

Kepler Cheuvreux Espana
Alcala 95
28009 Madrid
+3491 4365100

Milan

Kepler Cheuvreux Italia
Corso Europa 2
20122 Milano
+39 02 855 07 1

Paris

Kepler Cheuvreux France
112 Avenue Kleber
75016 Paris
+33 1 53653500

Stockholm

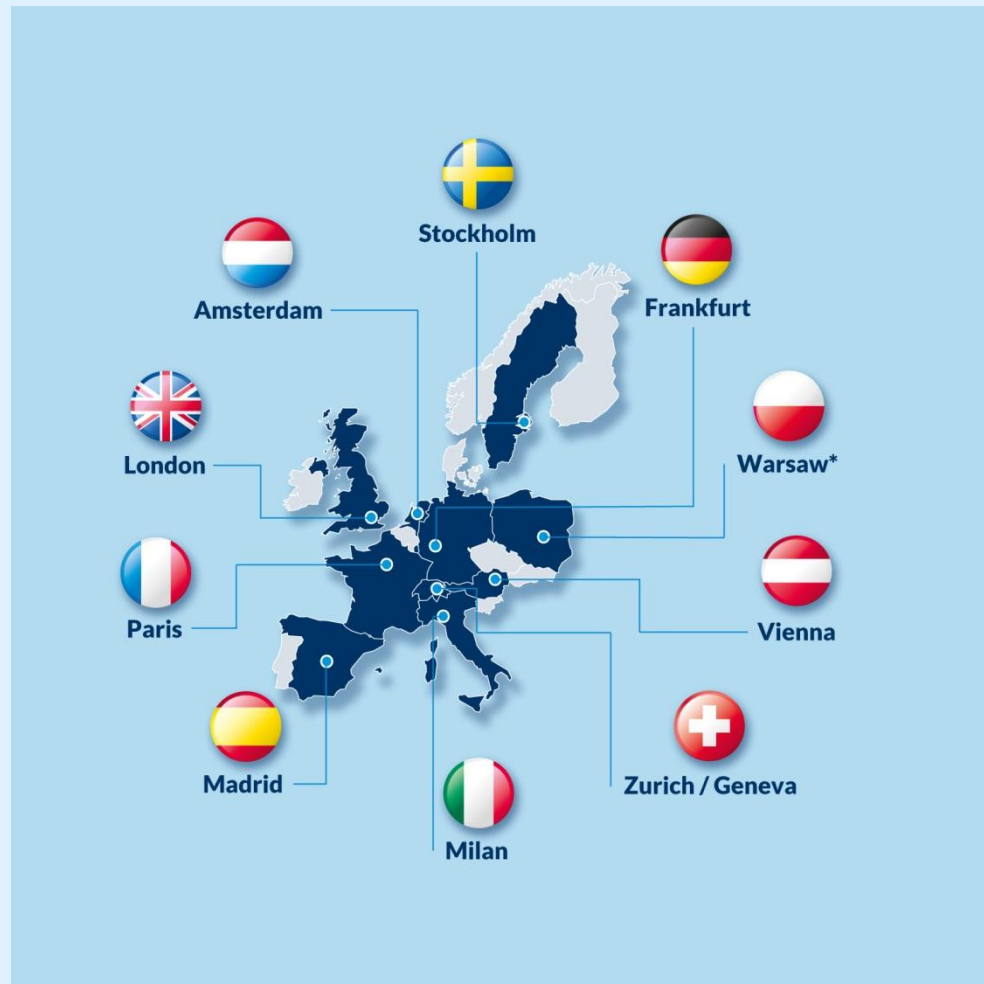
Kepler Cheuvreux Nordic
Regeringsgatan 38
10393 Stockholm
+468 723 5100

Vienna

Kepler Cheuvreux Vienna
Schottenring 16/2
Vienna 1010
+43 1 537 124 147

Zurich

Kepler Cheuvreux Switzerland
Stadelhoferstrasse 22
Postfach
8024 Zurich
+41 433336666



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North America

Boston

Kepler Capital Markets, Inc
225 Franklin Street, Floor 26
Boston, MA 02110
+1 617-217-2615

New York

Kepler Capital Markets, Inc.
600 Lexington Avenue, Floor 28
10022 New York, NY USA
+1 212-710-7600

San Francisco

Kepler Capital Markets, Inc
50 California Street, Suite 1500
San Francisco, CA 94111
+1 415-439-5253