SustainaWeekly

The impact of low Rhine water levels on the Dutch economy

- **Economist: The Rhine is Europe's busiest river. Everyday some 600 ships carrying 200 million tonnes of cargo across the Dutch-German border. Climate change is likely to change the river water dynamics, resulting in more frequent episodes of floods and extremely low water levels. Our analysis shows that international freight is severely disrupted by low water levels, but Dutch industrial production and construction is relatively unaffected.**

- **Strategist: We compared the Implied Temperature Rise score of Sustainalytics across different sectors. The banking sector scores better than energy-intensive sectors, such as utilities, but still lags behind the 1.5 degrees Celsius target required to meet the goals under the Paris Agreement. However, not all utility companies score as bad as the average – for instance, Ørsted A/S scores very well in comparison to its peers.**

- **Sector: Insurance can reduce – though not eliminate – the economic effects of extreme weather events, as it helps to reduce uncertainty by pooling risk. However, the increase in the frequency and intensity of catastrophes will likely reduce the availability of insurance coverage in many locations and/or lead to sharply higher premiums. Indeed, evidence of such a scenario is already building and the situation will likely get worse.**

- **ESG in figures: In a regular section of our weekly, we present a chart book on some of the key indicators for ESG financing and the energy transition.**

The Rhine, the busiest river in Europe, is of great economic importance. However, climate change has increased the risk of extremely low water levels, which can and has impacted economic activity. In this edition of the SustainaWeekly we examine the impact of low water levels on freight volumes transported along the Rhine in the Netherlands and on Dutch industrial and construction output. We go on to assess the "implied temperature rise" scores of Sustainalytics across different sectors. Finally, we ask the question of whether extreme weather events are becoming 'uninsurable'.

Enjoy the read and, as always, let us know if you have any feedback!

Nick Kounis, Head Financial Markets and Sustainability Research | nick.kounis@nl.abnamro.com

Ripple effects: exploring the impact of low Rhine water levels on the Dutch economy

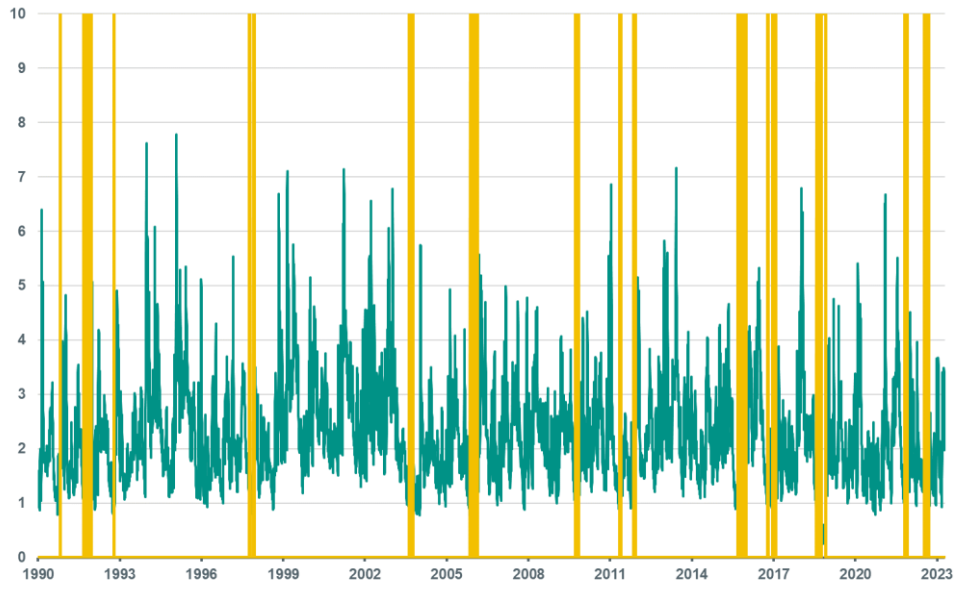
Amit Kara – Senior Climate Economist | amit.kara@nl.abnamro.com
Albert Jan Swart – Sector Economist Manufacturing, Transport and Logistics | albert.jan.swart@nl.abnamro.com
Jeannine van Reeken –Economist/Data scientist | jeannine.van.reeken@nl.abnamro.com
Dirk Jansen

- **The Rhine is Europe's busiest river. Everyday some 600 ships carrying 200 million tonnes of cargo across the Dutch-German border. The river is the most important transport route for German industry, connecting the Port of Rotterdam to the Rhine-Ruhr region, Germany's industrial heartland.**
- **Climate change is likely to change the river water dynamics, resulting in more frequent episodes of floods and extremely low water levels**
- **Transport along the river was severely disrupted in 2018 and 2022 when water levels fell below the critical threshold. German industrial production fell as a result**
- **In this note, we discuss the impact of low water levels on inland freight transport volumes on Dutch economic output. Our analysis shows that international freight is severely disrupted by low water levels, but Dutch industrial production and construction is relatively unaffected**

Introduction

The Rhine, the busiest river in Europe, is of great economic importance. Due to drought, both in 2018 and 2022, there have been episodes where the water level in the Rhine has dropped to critical levels, severely limiting inland shipping. According to the Kiel Institute for the World Economy, in November 2018, low water levels led to a drop in German industrial production of 1.5 percent, causing a decline of German GDP by 0.4 percent.[1] This note is a summary of a longer note where we examine the impact of low water levels on freight volumes transported along the Rhine in the Netherlands and on Dutch industrial and construction output.

Daily water level of the Rhine at Kaub (in cms)



Source: Bloomberg. Note: The yellow vertical areas represent periods when the water level dropped below 78 cms

[1] Ademmer, M., Jannsen, N., & Meuchelböck, S. (2023). Extreme Weather Events and Economic Activity: The Case of Low Water Levels on the Rhine River. *German Economic Review*, *24*(2), 121-144.

Climate change and the Rhine

The Rhine has a pluvio-nival regime, meaning that it is a snowmelt and rainfed river. As the weather gets warmer in spring, snow in the Alps starts to melt, gradually releasing water into the Rhine. Water is temporarily stored in the Alpine border lakes, which has a smoothening effect on the Rhine discharge. Downstream of Basel, the pluvial regime of the Rhine gradually increases in domination.

However, due to climate change, the Rhine regime will change. As the climate becomes warmer, the amount of precipitation increases. There will also be more precipitation in winter, but because of higher temperatures, there will be less snow. Since the snow cover will decrease, the snow will melt faster in spring. Moreover, a warmer climate leads to an increase of the frequency of extreme, high-intensity rainfall events. Thus, the Rhine will turn into a rainfed river, and water levels in the river will become more volatile. This leads to an increased risk of extremely high water levels and floods, mostly in spring. In the summer, there will be less precipitation. On top of that, due to higher temperatures, more water will evaporate. This combination leads to an increased risk of extremely low water levels. This is why it is important to understand the economic effects of water levels.

Empirical specification and results

Our empirical analysis is split into two stages. In stage one, we explore the impact that the low water level, as measured at Kaub, has on freight that is transported along the Rhine in the Netherlands. In the second stage, we estimate the impact of low water levels on industrial production and construction in the Netherlands.

Stage 1: Impact of low water level at Kaub on freight transport

Our regression for stage 1 is specified as follows:

$$\Delta FR_t = \alpha + \sum_{i=0}^{1} \beta_i \Delta KAUB_{t-i} + \gamma \Delta FR_{t-1} + \sum_{i=0}^{1} \beta_i \Delta WT_{t-i} + seasonal\ dummies + \epsilon_t \quad (1)$$

Our outcome measure, ΔFR_t denotes the month over month percentage change in freight transported along the rivers in the Netherlands. We explore the relationship between the water level and tonne-kilometers (tkm) for different types of cargo (wet bulk, dry bulk and containers) and origins/destinations (inbound, outbound, domestic and throughput). Our key variables of interest are $\Delta KAUB_{t=0}$ and $\Delta KAUB_{t=-1}$. These variables denote the absolute change in the number of days below the 0.78 meter threshold for the current month and the previous month. WT, or world trade, is an additional control variable that is included to capture broader macroeconomic developments. Also included is the one month lag of ΔFR_t. The monthly freight data provided by CBS is not seasonally adjusted. We add monthly seasonal dummies to capture any seasonal effects.

The full set of results is available in the longer note. Briefly, our analysis shows that low river levels at Kaub have a significant impact on freight transport in the Netherlands. An additional day of low water level reduces the total weight that is transported along the river by 0.4%. This implies that a string of thirty consecutive days below the threshold will reduce freight transport by around 12%. Our analysis also shows that the effects linger on - the coefficient on the first lag of the water level is similar in magnitude, implying that thirty consecutive days below the threshold leads to a cumulative 24% reduction of freight transport over two months. Both coefficients are significant at the 1% level and the results are robust across the different categories of cargo (wet, bulk and container).

To place this in context, the most severe recent period of drought occurred in the second half of 2018 when the water level fell below the threshold for around 80 days. More recently, in 2022, the water level dropped for 37 consecutive days.

Next, our analysis shows that inbound, outbound and throughput freight is severely impacted by low water levels and this is most pronounced for container freight, but also relevant for dry and bulk cargo. A noteworthy exception is domestic freight which is largely unaffected by the low water levels in Kaub.

The significance of the water level at Kaub for river freight in Netherlands is largely driven by international freight (inbound, outbound and throughput) and as such it reflects the importance of global trade for inland river transport in the Netherlands with Rotterdam as a major European port and Germany a major manufacturing exporter and importer. Our results also show

that the low water levels at Kaub do not result in a significant amount of disruption in freight that exclusively travels on inland waterways within the Netherlands.

Stage 2: Impact of low water level at Kaub on economic activity in Netherlands

The second set of regressions explores the relationship between water level at Kaub and industrial production and construction sector output in the Netherlands. More specifically, we ask if the disruption caused by low water levels at Kaub has an impact on economic activity in Netherlands. We estimate the following regression:

$$\Delta IP_t = \alpha + \sum_{i=0}^{1} \beta_i \Delta KAUB_{t-i} + \gamma \Delta IP_{t-1} + \sum_{i=0}^{1} \beta_i \Delta WT_{t-i} + seasonal\ dummies + \epsilon_t \qquad (2)$$

where the dependent variable, ΔIP is monthly change in output. We test this relationship for mining and quarrying, manufacturing and construction output. We additionally focus on four subsectors within manufacturing namely, chemicals, building materials, basic metals and the manufacture of metal products. These subsectors, are heavy users of inland river transport.

Again, the full set of results is available in the longer version of this note. In short, episodes of low water levels at Kaub do not have a significant impact on economic output. In other words, the industrial output in Netherlands is largely unaffected by developments on the Rhine at Kaub. This is the case for the major industrial groups as well as the four manufacturing sub-sectors. The second stage results are also consistent with our finding that the volume of domestic freight transport within Netherlands is immune to developments on the Rhine in Kaub.

Conclusion

We assess the impact of low water levels on the Rhine on Dutch inland water freight transport volumes and Dutch industrial production. We show that disruptions to the river level caused by drought have a significant impact on the volume of freight that is transported along the river in Netherlands. The impact is most pronounced on international freight rather than on domestic freight. More specifically, we find that thirty consecutive days below the threshold leads to a cumulative 24% reduction of freight transport over two months.

The drought episodes that have caused damage to the German economy in 2018 and 2022 and to Dutch inland water freight volumes did not have a significant direct impact on Dutch industry and construction sector output. One important reason for the dichotomous results is that many Dutch industrial firms are located at the shore or at sea ports, which leaves them largely unaffected by lower water levels in the Rhine. Another explanation is that most of the German economic activity that is hurt by low water levels is located upstream of the major bottleneck Kaub. As the Netherlands is a lower country and is located downstream of Kaub, water levels are significantly higher in the Dutch part of the Rhine. Our analysis finds that inland shipping within the Netherlands was not affected by the drought episodes in 2018 and 2022.

While Dutch economic output is less affected by low water levels in the Rhine than the German economy, caution is advised. The Rhine is currently a snowmelt and rainfed river. As the climate becomes warmer, the water levels will depend more on rain, and the frequency of extreme rainfall events will increase. Thus, the Rhine will turn into a rainfed river, and water levels in the river will become more volatile, which leads to an increased risk of floods in spring and an increased risk of extremely low water levels during the summer. Our study focussed on the short run volume effects of low river levels, but there is also the adverse price effects from the 'low water surcharge' and the longer term effects of adaptation, which might trigger a switch to more expensive road transportation, additional infrastructure spending, such as on warehousing facilities and higher levels of inventory. The longer term price and volume effects requires further investigation.

Finally, more frequent drought episodes and floods, which hamper industrial output and lead to higher transportation costs for businesses, could hurt business investment in German industry, a capital-intensive sector. Since this problem is expected to become more serious in the future due to climate change, and Germany is The Netherlands' most important trade partner, the Netherlands should also be worried about Rhine water levels.

An analysis of five large sectors reveals that none is aligned to the 1.5 degrees Celsius target

Marta Ferro Teixeira – Financials Strategist | marta.ferro.teixeira@nl.abnamro.com

- **ESG data providers have developed tools that can track how much issuers contribute to global warming. The new *Low Carbon Transition Rating* by Sustainalytics is one of these tools**
- **These are computed in the form of an "implied temperature rise" score, which aims to answer the question "What would be the expected increase in global temperatures, if all companies manage their emissions in the same way as this company?"**
- **We compared the implied temperature rise across different sectors**
- **The banking sector scores better than energy-intensive sectors, such as utilities, but still lags behind the 1.5 degrees Celsius target required to meet the goals under the Paris Agreement**
- **However, not all utility companies score as bad as the average – for instance, Ørsted A/S scores very well in comparison to its peers**

The ESG data company Morningstar Sustainalytics developed a tool named **Low Carbon Transition Rating, which measures the degree to which companies are aligned with the goals of the Paris Agreement of maintaining global temperature rises below 1.5 degrees Celsius**. But what is this "rating"? The rating represents how much would the world temperature rise if all the companies in the world were to manage GHG emissions in the same way as that company. Although this measure (implied temperature rise) is not entirely new to the market, given that other providers have also developed similar tools, for instance MSCI and Bloomberg, we focus for now on the Sustainalytics scores.

In this piece we first provide a brief explanation of Sustainalytics' methodology. Afterwards, we analyse the data, and show a comparison of the average scores across different sectors of interest – banks, utility companies, real estate, materials and energy companies. The overall results show that more needs to be done, suggesting that companies' targets are not yet ambitious enough.

The methodology

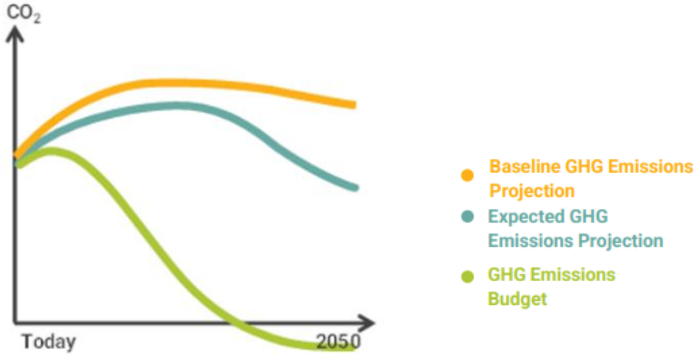
Sustainalytics bases its implied temperature rise calculations on three different GHG emissions pathways:

1. The **GHG Emissions budget** which represents the amount of emissions a company can have while being aligned with the 1.5 degrees Celsius Pathway. This alignment – often referred to as 'net zero alignment' – is based on companies cutting GHG emissions to (close) to zero over the next three decades.

2. The **Baseline GHG Emissions Projection** which represents the emissions the company is expected to have if it continues its business "as is" and takes no actions to manage its emissions

3. The **Expected GHG Emissions Projection** which represents the emissions the company is expected to have based on its existing plans to manage GHG emissions. Ideally, the Expected GHG Emissions Projection should be lower than the Baseline GHG Emissions Projection.

Low Carbon Transition Rating Emissions Projections



Source: Sustainalytics.

The difference between what the company would emit under a “business as usual” approach, and what it aims to emit given its current decarbonization plans is the so called “management adjustment”. Hence, taking into account management’s action, this leaves us with the gap between what the company should emit in order to be net zero, and what it aims to emit. This is called the emissions gap. The emission figures are then converted into implicit temperature rises based on certain CO2 conversion factors. If a company has a gap of zero, then this implies that it is planning to emit exactly what is expected from it in order to be aligned with the goals of the Paris Agreement.
You can find more details about this tool here .

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Expected GHG Emissions vs GHG Emissions Budget

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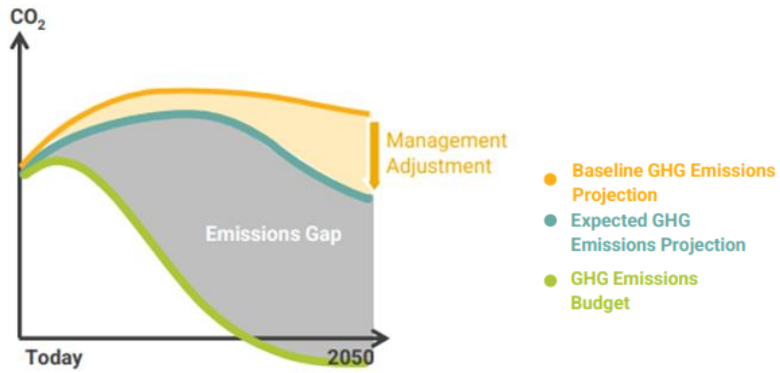


Source: Sustainalytics

Banks are lagging on temperature reduction, but not as bad as utility and energy companies

Now that we have explained the methodology, we will compare the relevant ratings across five different carbon-intensive sectors. Our aim is to better understand the difference in performance between the banking sector, due to its significant scope 3 emissions emanating from loan books, and energy-intensive corporate sectors, such as utilities, real estate, materials and energy companies. Our regional focus is on European countries. Below, we present the results.

Low Carbon Transition Ratings across different sectors

Sector	Severely Misaligned	Highly Misaligned	Significantly Misaligned	Moderately Misaligned	Avg temperature rise (degrees Celsius)	Avg management score
Banks	0	0	37	10	2.3	48.2
Utilities	10	13	9	1	3.7	50.1
Real Estate	0	6	49	8	2.4	44.5
Materials	7	10	54	6	2.8	52.0
Energy	10	11	5	3	3.7	48.6

Source: Sustainalytics

In the first four columns, we count the number of corporates, across each sector, which are “severely misaligned”, :highly misaligned”, “significantly misaligned”, or “moderately misaligned”. The alignment refers to the path to net zero. While no bank or real estate company is considered severely misaligned, that is not the case for utilities or energy companies. The latter two sectors include exploration operations, producers, distributers and users of fossil-fuel based energy which, inevitably are some of the largest CO2 emitters. As such, the numbers are not surprising.

On the other hand, it is interesting to see that all banks included in our sample are still perceived as significantly or only moderately misaligned. Nevertheless, these ratings might be underestimating the amount of scope 3 emissions of banks. Given that banks’ methodologies to calculate scope 3 emissions are still in their infancy, the amount of emissions reported is most likely below the actual number of scope 3 emissions. Which, ultimately, gives banks better ratings.

In terms of the average temperature rise, the overall scores are a bit worrisome, especially since many banks claim that they aim to reach net-zero by 2050. Even though banks are set to achieve on average 2.3 degrees temperature rise, which is the lowest score across the five sectors, this number is still well above the 1.5 degrees Celsius target, suggesting that banks still have a considerable amount of work to do to reduce emissions. The table below shows the implied temperature rise for a sample of the largest banks and what these banks plan to achieve by 2050.

Some of the largest European banks' own ESG targets vs Sustainalytics Low Carbon Transition Ratings

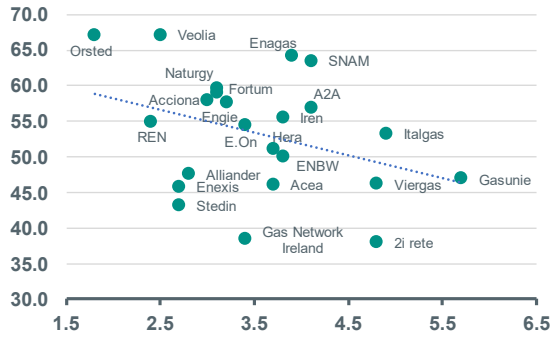
Bank	Implied temperature rise	Alignment	Management score	Targets
BNP Paribas SA	2.1	Significantly Misaligned	53.1	Aims to achieve "net zero 2050" scenario for the sectors with the highest emissions (oil & gas, power generation, automotive, steel, aluminium, cement)
Banco Santander	2.1	Significantly Misaligned	49.3	Achieve net zero carbon emissions across the Group by 2050, and all client emissions that results from lending, advisory and investing
Deutsche Bank	1.9	Moderately Misaligned	59.8	Net zero aligned targets for 2030 and 2050 in four carbon intensive sectors (oil & gas, power generation, automotive, steel)
Intesa Sanpaolo	2	Moderately Misaligned	62.1	Net-zero emission target, in terms of own emissions by 2030 and in terms of loan and investment portfolios, asset management and insurance by 2050
Société Générale SA	2.2	Significantly Misaligned	50.5	Aiming for carbon neutrality by 2050 in both its clients activities (e.g. coal, oil & gas extraction, maritime transport, steel) and own operations

Even though these banks are committed to a net-zero alignment by 2050, Sustainalytics' ratings indicate that the measures / actions that these banks are taking are not ambitious enough to limit the temperature rise to 1.5. As such, banks should step up their game, at least according to Sustainalytics methodology or otherwise they will not be able to meet their own targets.

Despite the bad results of utility companies, there are a few that stand out due to their better-than-average performance

At the other end of the spectrum, utilities and energy companies are on track to contribute to a 3.7 degrees Celsius rise in world temperatures. This comes despite efforts taken in a switch to renewable energy sources. Below we show the implied temperature rise scores (x-axis) for a range of European utility issuers, as well as their management scores (y-axis). Theoretically, we would expect a downward sloping trend, illustrating that management action/plans are indeed feeding into lower rise in temperature. Indeed, such a trend is visible in the chart (see trendline).

Differences across Utilities' companies



Source: Sustainalytics, ABN AMRO

Despite the average standing quite above the target of 1.5 degrees Celsius, there are still companies that stand out due to their better-than-average performance. That is the case of Ørsted A/S which is on track for an average temperature rise of 1.8. This is the result of a company that relies heavily on renewable energy, i.e. 91% of Ørsted A/S heat and power generation was green in 2022. Furthermore, the sustainability targets of the company (see **here**) are quite ambitious (e.g.

net zero emissions in scope 1-3 and 90% reduction in absolute emissions, by 2040), which explains why the company scores a high management grade of 67.1, clearly above the average of 50.1 that utilities companies score.

There is still a long way to go

To conclude, the tool that Sustainalytics developed provides several insights about the ambitiousness of companies' ESG plans and targets. Unfortunately, the results are discouraging. Between the five sectors that we studied – banks, utility companies, real estate, energy and material companies – the results are very different but none is currently aligned with the 1.5 degrees Celsius target. Even though some European banks register the lowest temperature rise (1.8 degrees) across the five chosen sectors, that number still lags behind the target.

Are extreme weather events becoming 'uninsurable'?

Nick Kounis – Head Financial Markets & Sustainability Research | nick.kounis@nl.abnamro.com

- **Extreme weather events are becoming more frequent and more severe. This trend will like continue as global temperatures rise**
- **Insurance can reduce – though not eliminate – the economic effects of these events, as it helps to reduce uncertainty by pooling risk, though insurance coverage is far from complete as it stands**
- **In addition, the increase in the frequency of extreme weather events will likely reduce the availability of insurance coverage in many locations and/or lead to sharply higher premiums**
- **Indeed, evidence of such a scenario is already building, especially with regards to home insurance, and the situation will likely get worse rather than better**

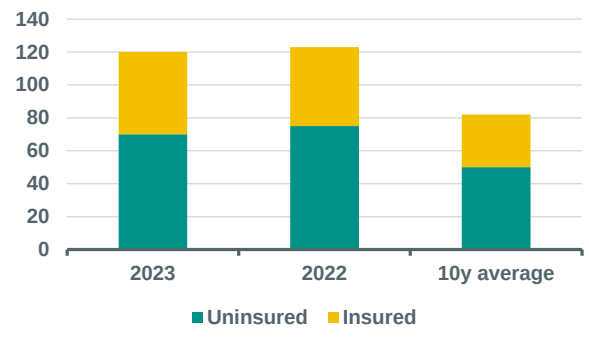
Extreme weather events, such as powerful heat waves and devastating floods, are growing in frequency and severity, and this trend is likely to continue as global temperatures rise. Indeed warming of 2°C is estimated to lead to a fivefold increase in exposure to all types of natural hazards globally. Insurance can play an important role in reducing the economic fall-out, but there are signs that increasing (potential) losses are putting the sector under pressure. In this short note, we look into the question of whether climate catastrophes are becoming 'uninsurable'.

Rising losses from natural catastrophes

Total economic losses from natural catastrophes have been rising sharply over recent years. Data from Swiss Re, one of the world's leading providers of reinsurance and insurance, show that economic losses amounted to USD 120bn in the first half of this year. While this is slightly lower than in the first half of last year, it is up by 46% compared to the average losses over the last ten years. Of that amount, USD 50bn were insured losses, which is 42% of the total, showing that insurance coverage is far from complete even as it stands.

Total economic losses from natural catastrophes

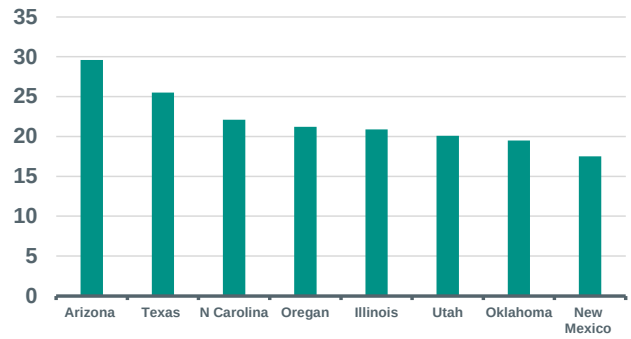
First half of each year, USD bn, 2023 prices



Source: Swiss Re Institute

Rising insurance premiums

% change in home insurance premium Jan 2022-July 2023, selected US states



Source: S&P Global Market Intelligence, Council of Foreign Relations

The economic losses from catastrophes is driven not only by the frequency and severity of these events, but also by the level of exposure. As Swiss Re notes 'besides the impact of climate change, land use planning in more exposed coastal and riverine areas, and urban sprawl into the wilderness, generate a hard-to-revert combination of high value exposure in higher risk environments'.

The economics of 'uninsurable' risk

An insurance premium needs to cover expected losses, as well as expenses and profits. If that is widely not the case, the companies offering the insurance will go out of business eventually. In some cases, regulation can prevent premiums rising high enough. For instance, in California, regulators have prevented insurers from raising rates above a certain threshold. More generally, the expected loss could become so large that the insurance premium needed is unaffordable (and hence become 'effectively uninsurable'). Perhaps most importantly, for a risk to be insurable it needs to be quantifiable. Climate

change is not only making extreme weather events more frequent, but also the fall-out much more uncertain. When the likelihood and impact cannot be adequately quantified, it is impossible to calculate reasonable premiums. Finally, highly correlated risks are also uninsurable and losses related to extreme weather often have this characteristic. As an article by Milliman, the risk management consulting firm (see **here**), notes 'the probability of me totalling my car is almost entirely unrelated to the probability of you totalling your car. In a wildfire-prone area where wildfires are becoming more common due to drought conditions, your probability of a total loss is closely related to your neighbour's probability of a total loss'.

Impact on insurance markets

There are signs in certain geographies of higher premiums and reduced insurance coverage, especially for homes. For instance, home insurance premiums in the US have risen sharply over recent months. Since January of last year, thirty-one states have seen double-digit rate increases, while six saw increases of 20-30%, according to analysis by S&P and the Council of Foreign Relations (see chart above on the right). Meanwhile, some insurers have stepped away from offering insurance in certain regions. The Washington Post reported earlier this month that at least five large U.S. property insurers have told regulators that extreme weather patterns caused by climate change have led them to stop writing coverages in some regions and exclude protections from various weather events. In the Netherlands, consumers over recent years can no longer take out insurance against damage to their home due to subsidence (caused by drought?). The AFM (the country's market conduct authority) notes that in 2016, four insurers still provided insurance for this risk. Similar trends are seen in many other countries. As well as growing catastrophe exposure, other reasons given for higher premiums/withdrawing coverage include soaring construction costs (which increase the replacement cost of a house) and a challenging reinsurance market. Indeed reinsurance (insurance for insurers) has also become much more expensive.

1% is the magic number

Looking forward, the severity and frequency of extreme weather events is likely to increase and therefore so are expected losses. However, obviously the risks and expected losses will differ significantly by location and hazard and hence general statements on the extent of the shift towards assets becoming uninsurable are not possible – though that is obviously the direction of travel. However, a specific example can help provide some colour of the mechanics at play. A recent study on the housing market in Australia by the Climate Council titled 'Uninsurable Nation: Australia's most climate-vulnerable places (see **here**) is interesting in this respect.

The report produced a ranking of the top 10 most at-risk electorates from climate change and extreme weather events by 2030. Riverine flooding was found to be by far the biggest risk, though bushfires and surface water flooding were other important hazards. The analysis uses a benchmark of 1% - properties that have projected annual damage costs equivalent to 1% or more of the property replacement cost – as being high risk. This category is defined as being 'uninsurable' as premiums would become unaffordable. This is consistent with the definition used by the US Federal Emergency Management Agency (FEMA), which is seen as a benchmark. Meanwhile, the report also defines a medium risk category of 0.2-1%, which contains properties at risk of becoming underinsured (note that FEMA's Moderate category – Becoming Uninsurable – is broader at 0.07-1%).

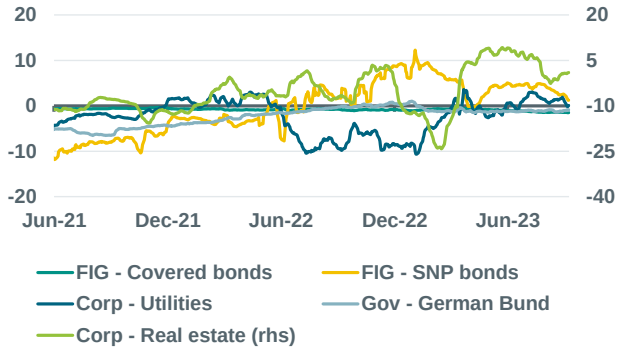
Overall, the research finds that by 2030, across Australia, 4% of properties would be in the high risk category, while a further 9% would reach the medium risk classification. It is also worth noting that there is considerable variation between districts. Taking the top 20 most at risk, the percent of properties in the high risk category varies between 7% and 27.4%, while the proportion in the high and medium categories varies from 11 to 54%. This points to very large variations in assets becoming uninsurable by location. However, recent developments have shown insurance companies have been less granular in their approach to withdrawing insurance. For instance, in the US, insurers have stopped offering insurance policies in whole states rather than particular districts, on some occasions, though this could be incidental.

Overall, the increase in the frequency of extreme weather events will likely reduce the availability of insurance coverage in many locations and/or lead to sharply higher premiums. Indeed, evidence of such a scenario is already building, especially with regards to home insurance, and the situation will likely get worse rather than better as global temperature rise, which will lead to an escalation of acute physical risks.

ESG in figures

ABN AMRO Secondary Greenium Indicator

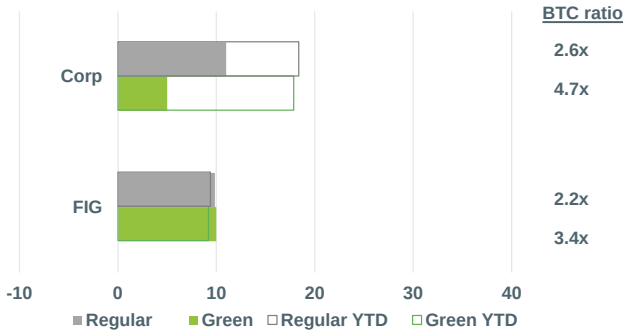
Delta (green I-spread – regular I-spread)



Note: Secondary Greenium indicator for Corp and FIG considers at least five pairs of bonds from the same issuer and same maturity year (except for Corp real estate, where only 3 pairs were identified). German Bund takes into account the 2030s and 2031s green and regular bonds. Delta refers to the 5-day moving average between green and regular I-spread. Source: Bloomberg, ABN AMRO Group Economics

ABN AMRO Weekly Primary Greenium Indicator

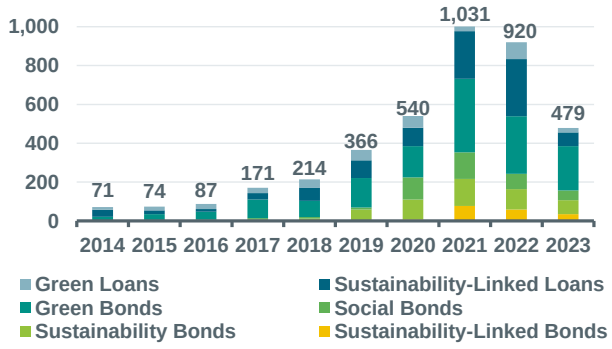
NIP in bps



Note: Data until 08-09-23. BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics

Sustainable debt market overview

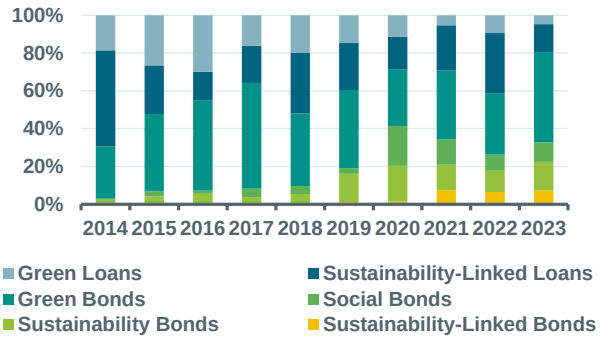
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

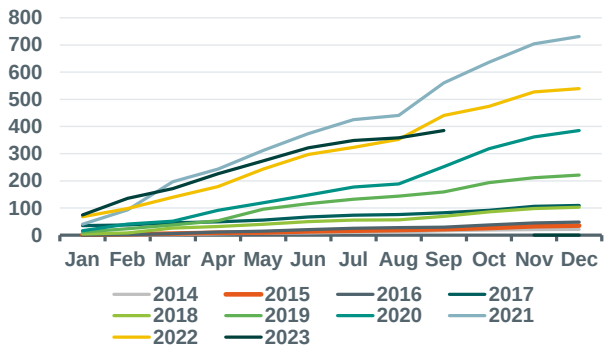
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

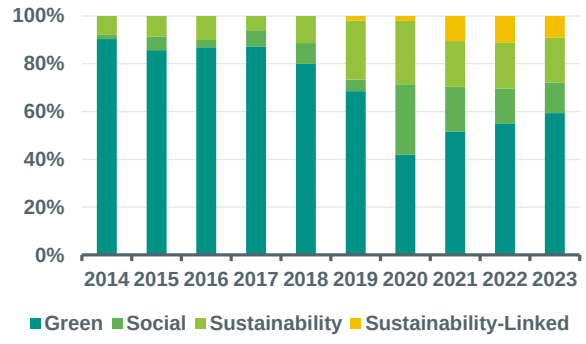
EUR bn (cumulative)



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

% of total

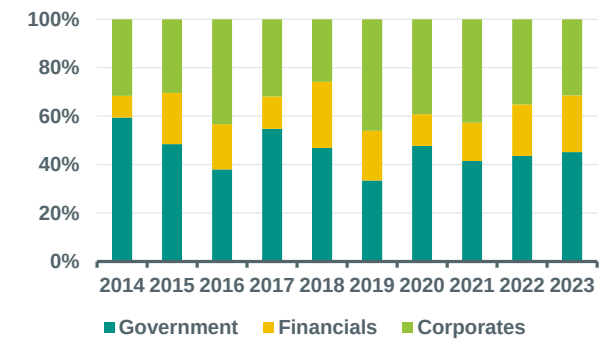


Source: Bloomberg, ABN AMRO Group Economics

Figures hereby presented take into account only issuances larger than EUR 250m and in the following currencies: EUR, USD and GBP.

Breakdown of ESG bond issuance by sector

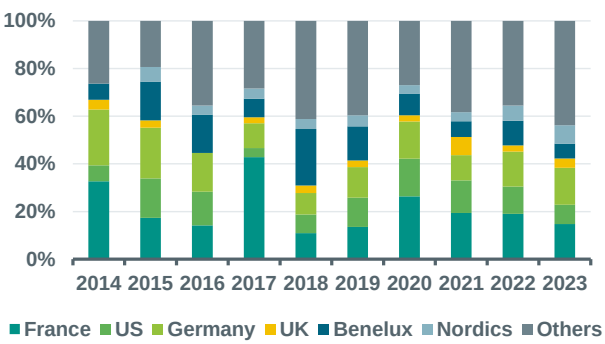
% of total



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country

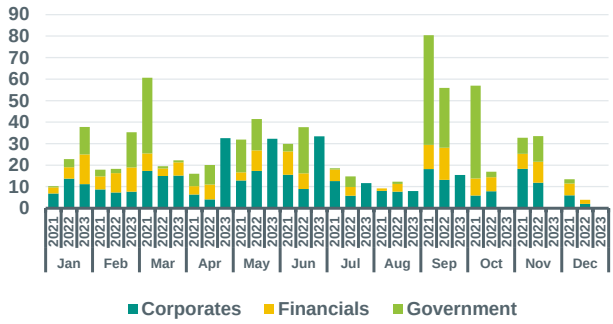
% of total



Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector

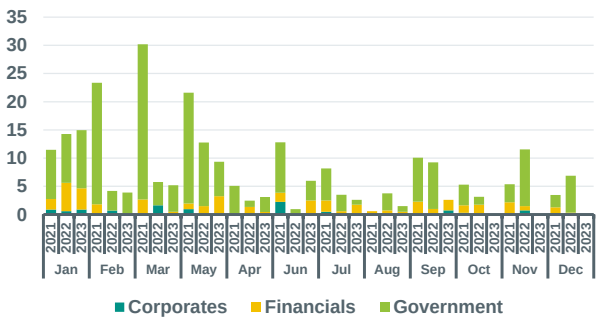
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector

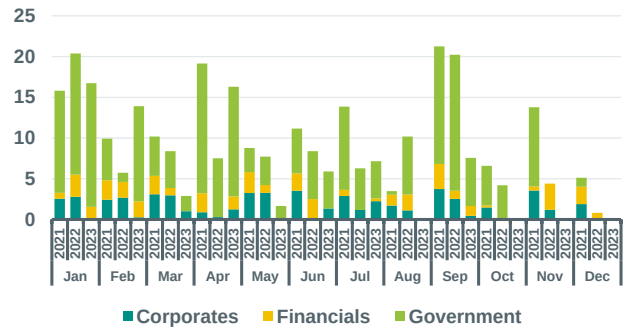
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector

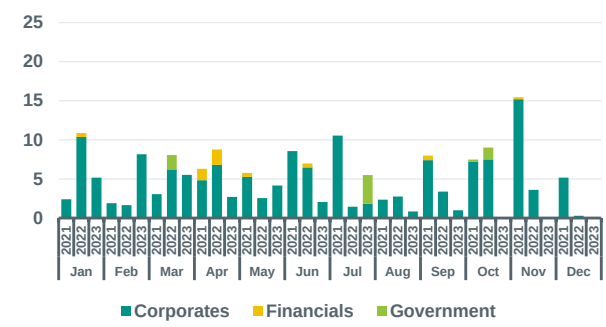
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sust.-Linked Bonds issuance by sector

EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Figures hereby presented take into account only issuances larger than EUR 250m and in the following currencies: EUR, USD and GBP.

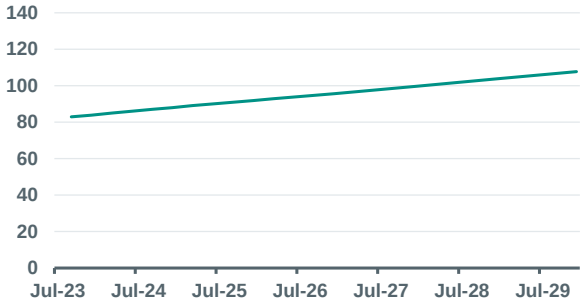
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract futures curve (EU Allowance)

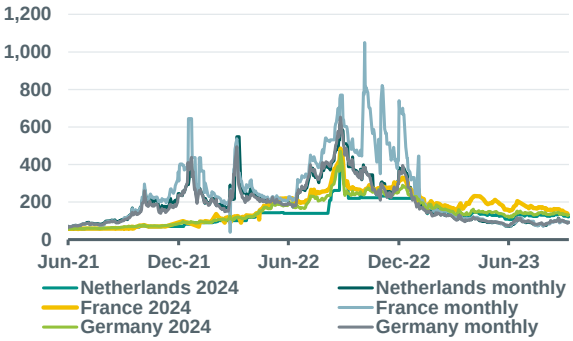
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

EUR/MWh

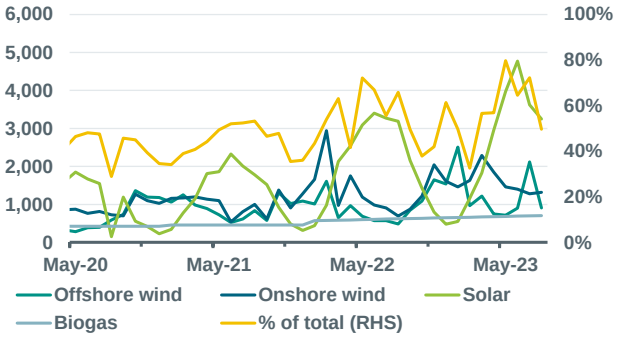


Source: Bloomberg, ABN AMRO Group Economics. Note: 2024 contracts refer to cal+1

Electricity generation from renewable sources (NL)

GW

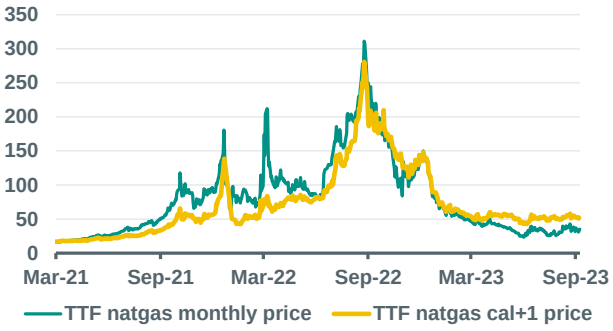
% of total



Source: Energieopwek (Klimaat-akkoord), ABN AMRO Group Economics

TTF Natgas prices

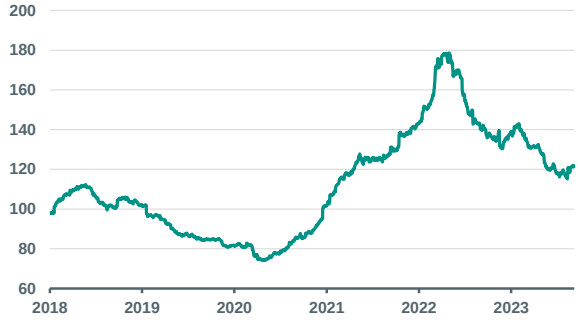
EUR/MWh



Source: Bloomberg, ABN AMRO Group Economics

Transition Commodities Price Index

Index (Jan. 2018=100)



Note: Average price trend of 'transition' commodities, such as: corn, sugar, aluminium, copper, nickel, zinc, cobalt, lead, lithium, manganese, gallium, indium, tellurium, steel, steel scrap, chromium, vanadium, molybdenum, silver and titanium. Source: Refinitiv, ABN AMRO Group Economics

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ABN AMRO Bank
Gustav Mahlerlaan 10 (visiting address)
P.O. Box 283
1000 EA Amsterdam
The Netherlands

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