SustainaWeekly

How useful is the 'most important number you've never heard of' ?

- **Economist: The Social Cost of Carbon (SCC) is an estimate of the cost to society of one additional ton of carbon dioxide emission. Estimates of the SCC are highly contentious but it is actively used in the US for policy cost-benefit analysis. The US revised higher its estimate of the SCC from USD 51 to USD 191 last November. This most recent SCC estimate suggests that the President Biden is 3 times more worried about climate change that President Obama and 40 times more worried than President Trump.**

- **Policy & Regulation: We assess the expected final version of the EU Green Bond Standard (EU GBS) Regulation and the impact for the market. In the short-term, we should expect bonds that comply with the EU GBS to attract a good demand, resulting in a higher greenium. However, in the near- to long-term, the appeal of EU GBS aligned bonds will likely reduce, as green bonds start covering similar transparency requirements, while having lower costs for issuers.**

- **Sector: Relatively high gas prices are a strong incentive for many companies in industry to rapidly reduce their gas consumption. Indeed, many companies in industry have rationalised their gas consumption in the past year or were forced to discontinue or stop production lines altogether. Lower gas consumption in industrial sectors has only partially contributed to industry's greenhouse gas reduction during 2022.**

- **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.**

In this edition of the SustainaWeekly, we first take a closer look at the concept of the social cost of carbon (SCC), which is the net dollar cost to society of one additional ton of CO2 emissions. It is important because the SCC summarises in a single number the costs and the benefits of emissions and as a result it can be thought of as a metric of the size of intervention that is required to maximum welfare. Estimates of the SCC are highly dispersed and contentious. In spite of that, the SCC is actively used in the US for policy cost-benefit analysis. We then go on to assess the expected final version of the EU Green Bond Standard (EU GBS) Regulation and the impact for the market. Finally, we go on to update previous analysis on how the industrial sector has been dealing with relatively high gas prices against the background of the need to make the transition to net zero emissions. Enjoy the read and, as always, let us know if you have any feedback!

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How useful is the 'most important number you've never heard of' ?

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- **The Social Cost of Carbon (SCC) is an estimate of the cost to society of one additional ton of carbon dioxide emission**
- **Estimates of the SCC are highly dispersed and contentious. In spite of that, the SCC is actively used in the US for policy cost-benefit analysis. Countries such as the UK have long rejected SCC as a useful input for setting climate policy.**
- **The US Environment Protection Agency revised higher its estimate of the SCC dramatically from USD 51 to USD 191 last November**
- **This most recent SCC estimate suggests that the President Biden is 3 times more worried about climate change that President Obama and 40 times more worried than President Trump**

Introduction

A passenger flying from Amsterdam to Mexico City and back accounts for around 1 ton of CO2 emissions. The trip will deliver some benefit (leisure or business) to the passenger in the short term, but the CO2 that is emitted from this trip will linger on and the cost to society of that emission will mount over time through rising temperatures, higher sea levels and more severe and frequent weather events. The social cost of carbon (SCC) is the net dollar cost to society of one additional ton of CO2 emissions. More specifically, it is the present value of the stream of costs and benefits of emitting one ton of carbon dioxide or its equivalent today.

Economic theory establishes a strong link between the SCC and the carbon price. The SCC is also a key ingredient in cost-benefit analysis. In the United States, the SCC is actively used by the federal government to, for example, set emission standards for power plants, set vehicle fuel economy standards and for setting tax credits for carbon capture and storage. The Inflation Reduction Act, for example, offers a subsidy of USD 180 for capturing one ton of CO2 emissions.

The SCC has been called the 'most important number you've never heard of' (The Economist 2017) or 'the most important single economic concept in the economics of climate change'[1]. Important because the SCC summarises in a single number the costs and the benefits of emissions and as a result it can be thought of as a metric of the size of intervention that is required to maximum welfare.

We know what it is, but how big is it?

There have been more than 5,000 estimates of the SCC since Bill Nordhaus' pioneering work with Integrated Assessment Models (IAM) in the early-1990s. The SCC is generated from IAM and as such the estimate depends heavily on the myriad of assumptions that are embedded in these models. The estimates very unhelpfully range from $0 to hundreds of dollars, and around a-third of these estimates are less than USD 200 per ton of CO2 emissions and two-thirds are in excess of that value. Arguably, the most contentious judgement in these exercises is the discount factor that is applied to future costs. A higher discount rate signals that we care less about the future. The sensitivity of the SCC to the discount rate can be seen in the table below.

Table 1: Sensitivity of the SCC to the discount rate

	3%	1%	0%
Average	**43**	**163**	**407**
Standard deviation	**54**	**301**	**539**

Source: Richard Tol, Climate Economics, 3rd Edition

The table shows that the average estimate of the SCC stands at USD 43 at a 3% discount rate and nearly 9 times bigger at USD 407 at a 0% discount rate. The dispersion or the uncertainty around this estimate, as measured by the standard

[1] Barrage, L., & Nordhaus, W. D. (2023). *Policies, Projections, and the Social Cost of Carbon: Results from the DICE-2023 Model* (No. w31112). National Bureau of Economic Research.

deviation, widens as the discount rate falls. Intuitively that reflects the fact that we know the future less well than the present and that a lower discount rate places a greater weight on future values.

Beyond academia, the SCC has been something of a political football in the United States over the past few years. The SCC is, after all, a measure of the ambition of policy makers to combat greenhouse gas emissions. It should, therefore, come as no surprise that the estimate of the SCC reflects that preference. For example, the Obama administration estimated a global SCC at USD 42. The Trump administration discarded that estimate and instead used a much lower estimate of USD 3-5 which was based on an estimate that restricted damages to the United States only. That changed quickly with President Biden. In fact, on his very first day in office, President Biden signed an order to reinstate the Interagency Working Group (IWG) and ordered a revised estimate of the SCC. The IWG was responsible for the SCC estimate until President Trump had it disbanded.

The US is currently using USD 51 which is essentially an inflation adjusted estimate of the SCC from the Obama administration. This estimate is based on a discount rate of 3%. The US Environment Protection Agency (EPA) published a revised estimate of the SCC **last November** which is dramatically higher. The new estimate, which is still in proposal stage, is centred at USD 190 at a discount rate of 2%. As before, the estimate is highly sensitive to the discount rate that is assumed in the calculations (see table below).

Table 2: Latest SCC estimates from the US EPA

	2,5%	2,0%	1,5%
2020	**120**	**190**	**340**

Source: EPA External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates incorporating recent scientific advances.

If the SCC serves as a metric of climate change worry of different US presidents, the Biden administration is more than 3 times more ambitious that the Obama administration and close to 40 times more ambitious than President Trump.

Are you asking the wrong question?

The discussion so far is largely focussed on the US and there is a good reason for that. The US is the only major economy that uses estimates of the SCC for policy analysis in spite of very large uncertainties and disagreements. Canada and Israel also use SCC but they rely on the IWG estimates and Mexico benchmarks against the IWG and the Canadian estimates.

Germany publishes its own estimate of the SCC, but the country does not use the SCC for policy analysis. It's most recent estimate stood at EUR 180 at 2016 prices and a 1% discount rate and EUR 640 at a 0% discount rate – again demonstrating the sensitivity of the SCC to the discount rate.

These deep disagreements have led many countries to conclude that the SCC has 'little to no value'[2] for climate policies. To be clear, that is not to say that the effort or ambition to combat climate change needs to be diminished as a result. If anything, more needs to be done. For example, the *High Level Commission on Carbon Prices* in the UK concluded that:

'*many of the impact functions used in modelling exercises to calculate the social costs of carbon are biased downward because they fail to consider many vitally important risks and costs associated with climate change—particularly the widespread biodiversity losses, long-term impacts on labor productivity and economic growth, impacts on the poorest and most vulnerable, rising political instability and the spread of violent conflicts, ocean acidification, large migration movements, as well as the possibility of extreme and irreversible changes… for these reasons, many past modeling exercises to calculate the global social costs of carbon have produced numbers that probably underestimate these costs by very large margins.*'

As a result, the UK, most explicitly, and other countries, implicitly, have rejected the SCC approach because of the

[2] Pindyck, R. S. (2013). Climate change policy: What do the models tell us? Journal of Economic Literature, 51(3), 860-72

uncertainty and divergence of views and deeper flaws that Stiglitz and Stern have identified in IAMs[3] . For them, the effort required to combat climate change should not be based on a cost-benefit welfare analysis from an IAM, but instead, it should be based on achieving the temperature targets set in Paris in 2015.

The target-based approach and the related ambition to achieve the stretched 1.5 degree target is also highly contentious. Bill Nordhaus, the pioneer of integrated assessment models and a Nobel prize recipient, for example, concludes from an updated exercise on his DICE model[4]…

'that the 1.5 °C scenario is "infeasible" within the constraints of realism and the model. …. In an unconstrained situation, the 1.5 °C limit was met, but it required an increase in the harmonized global carbon price from USD 6/tCO2 in 2020 to USD 400 in 2040. The present value economic cost was almost USD 1 quadrillion. While the likelihood of this target can be debated for a few more years, the debate will soon end as the target is likely to be passed before the end of this decade.'

More specifically, they estimate the SCC at USD 3,538 for 2020 to achieve 1.5 degrees centigrade. This compares to the current level of global carbon price which stands at USD 6/tCO2.

[3] Stern, N., Stiglitz, J., & Taylor, C. (2022). The economics of immense risk, urgent action and radical change: towards new approaches to the economics of climate change. *Journal of Economic Methodology*, *29*(3), 181-216.
[4] Barrage, L., & Nordhaus, W. D. (2023). *Policies, Projections, and the Social Cost of Carbon: Results from the DICE-2023 Model* (No. w31112). National Bureau of Economic Research.

Another step closer to the end of the EU Green Bond Standard journey

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- **In this piece, we highlight the key requirements set under the expected final version of the EU Green Bond Standard (EU GBS) Regulation**
- **We discuss also outstanding points, which require a bit more clarity**
- **Furthermore, we assess the implications for the existing green bond market**
- **In the short-term, we should expect bonds that comply with the EU GBS to attract a good demand, resulting in a higher greenium**
- **However, in the medium- to long-term, the appeal of EU GBS aligned bonds will likely ease, as green bonds start covering similar transparency requirements, while having lower costs for issuers**

We previously set out in this publication (see **here**) the key takeaways from the provisional agreement reached by EU authorities on the final text regarding the regulation of the EU Green Bond Standard (EU GBS). Last week, a consolidated text following these agreements was leaked. It is set to be made public in a final format following final votes from the European Parliament (the Council has adopted the consolidated text last Wednesday). This should take place around September. Once adopted, the EU GBS is expected to set the golden standard for what constitutes a green bond in the EU (called European green bonds or EuGBs). Meanwhile, while it remains a voluntary standard, it should support transparency and comparability of green bonds, also preventing greenwashing.

Below, we have highlighted some of the key highlights included in the consolidated document.

Use of proceeds

One of the key features of the EU GBS is the eligible use of proceeds of the bond. The final text shows that the following type of assets/expenditures are eligible for EuGBs: fixed assets (excluding financial assets); capital and operating expenditures (capex and opex, respectively) that were incurred no more than three years before issuance date of the EuGB; financial assets that were created no later than 5 years after issuance date; and assets/expenditures of households (also classified as a sub-category of financial assets). Financial assets are defined under the EU GBS as “debt or equity, or a combination thereof”. However, as per IFRS, financial assets include as well an entity’s contractual rights to receive cash/financial assets from another entity (see **here**), which would include therefore granted loans in a financial institution’s balance sheet. We therefore argue that those would also classify as financial assets under the EU GBS, although more clarity needs to be given on that. On that note, one could also assume that a mortgage loan is deemed to be classified as an “asset of a household” from a bank’s point of view, implying that under the final EU GBS, financial institutions would have to potentially comply with separate requirements whether the financial asset entails a mortgage or not.

For financial assets, in case the issuer uses the portfolio approach (see more on this below), then the condition of financial assets having to be created no later than five years after the issuance date of the EuGB does not apply (our understanding is that this means that all eligible financial assets need to be created on or before issuance date of the EuGB, but that is also not clearly specified). While not properly clarified, we assume that these requirements apply to also assets/expenditures of households, as these are a sub-category of financial assets. Financial assets should also be allocated to a maximum of three subsequent financial assets in a row. It is a bit unclear what exactly is meant with this clause and also whether assets/expenditures of households are excluded from this requirement.

Flexibility pocket of 15%

While proceeds of EuGBs need to (eventually) finance only EU Taxonomy aligned activities, the proposed Regulation includes also a flexibility pocket. That means that issuers may have 15% of the EuGB proceeds not aligned with the EU Taxonomy. This is the case if the financed activity is either (i) not yet covered by the EU Taxonomy; or (ii) in the context of financial international support (which usually refers to financing by or to governments/SSAs), such as climate finance reported to the EU and the UNFCCC, and official development assistance (ODA) reported to the OECD. These refer mainly to activities outside the scope of the EU Taxonomy.

Point (i) related to the fact that when the provisional agreement with regards to the EU GBS was reached, the EU Taxonomy for four out of the six environmental objectives was still under development. Moreover, there were no updates on when a delegated act covering these activities (the so-called Taxonomy Environmental Delegated Act) would be published. However, a few weeks ago, the EU Commission has released a draft Taxonomy Environmental Delegated Act, which was open for feedback until the 5th of May (see our note on this **here**). Also more recently, the Platform on Sustainable Finance published a review (see **here**) on the proposed document. Therefore, it seems that the Taxonomy Environmental Delegated Act will be finalized shortly after, or even before, the application of the EU GBS Regulation. This brings into question exactly which activities would be covered by point (i) mentioned above. The draft Taxonomy Environmental Delegated Act does mention a few activities that are not yet covered by the work done by the Commission, such as agriculture, forestry and fishing. As the Commission highlights, for now, the analysis "prioritises those economic activities and sectors that were identified as having the biggest potential to make a substantial contribution to one or more of the four environmental objectives and for which it was possible to develop or refine the recommended criteria without further delay". Hence, this makes it hard for issuers to properly distinguish which activities will or will not be included in the EU Taxonomy in the future, as there are activities that could be financed by EuGBs, but are not yet covered by the EU Taxonomy.

The use of a portfolio approach

It is not uncommon that green bond issuers make use of the so-called "portfolio approach" when allocating proceeds. This means that instead of directly linking proceeds to expenditures/assets, all these are added to one big portfolio, which should at least match the size of the green bond issuance. The final version of the EU GBS seems to only permits that for financial assets. These, combined, need also to exceed the total value of the EuGBs outstanding.

Financing of gas and nuclear energy

As per the final EU GBS, issuers need to disclose pre-issuance, whether bond proceeds are intended to be allocated to transitional or enabling activities (as per Complementary Delegated Act for the EU taxonomy). More than that, issuers need to make clear whether the proceeds will fund taxonomy-aligned nuclear energy and/or fossil gas activities.

Disclosure on transition plans

If an issuer is subject to publishing transition plans as per the CSRD (this mainly refers to large undertakings and public small and medium-sized undertakings), it is now also required to disclose how the EuGB proceeds intend to contribute to the funding and implementation of those transition plans. It is a bit unclear though how that exactly will work in practice. Transition plans are defined as "the plans (…) to ensure that its business model and strategy are compatible with the transition to a sustainable economy and with the limiting of global warming to 1.5 degrees in line with the Paris Agreement (…) and the objective of achieving climate neutrality by 2050". Hence, this brings into question (i) whether issuers without clear transition plans can issue EuGBs and (ii) how exactly do they need to assess the contribution of the EuGB towards its transition plans (e.g. is there a need for a methodological approach?).

Grandfathering

The final text of the EU GBS includes a seven year grandfathering period. That means that an issuer has seven years to adjust alignment of proceeds, if there is an amendment in the EU Taxonomy. This relates exclusively to proceeds that (i) have not been allocated yet, or (ii) are included in the capex plan *and* do not meet *yet* the Taxonomy requirements (we assume the latter relates to for example, assets that are still under construction). The Regulation also allows for issuers that foresee that the activity financed by the EuGB is at risk of not complying with the amended EU Taxonomy within seven years, to publish a plan (which shall be reviewed by an external reviewer) where it states how it intends to align the activity and how it aims to mitigate negative consequences from the non-alignment.

For financial assets that are allocated using a portfolio approach, the grandfathering criteria is slightly different. In this case, issuers need to make sure that all activities included in such portfolio are aligned with the EU Taxonomy criteria *that was applicable during the seven years prior to the publication of the allocation report* (and the allocation report is done annually until full allocation, under the portfolio approach). This means that if the EU Taxonomy criteria is amended, then an asset

that was already included in the portfolio, can continue to be part of the "eligible assets pool" for at most seven years after the Taxonomy revision, even though those proceeds were already allocated.

Capex plans

The issuer needs to publish a so-called capex plan in the case that the proceeds of the EuGB refer to capex or opex, which do not fully meet EU Taxonomy requirements at issuance date. This plan needs to specify until when all expenditures funded by the EuGB will be EU Taxonomy-aligned (and this needs to be a date before the bond maturity). Furthermore, full EU Taxonomy alignment needs to be reached within a maximum of five years from issuance date, unless a period of up to ten years is justified by specific features of the activity itself (we would assume this refers to, for example, technologies which are still under development). Obviously, the ten years exception also needs to comply with the requirement that the pre-established deadline by the issuer needs to be a date before the bond maturity.

60 days after all the Capex plan has been reached, and all proceeds now comply with the EU Taxonomy, an external reviewer will need to confirm this EU Taxonomy alignment. A summary of the Capex plans needs to also be included in the bond prospectus, making it also therefore a legally binding document.

Post-issuance transparency documents

Issuers of EuGBs need to disclose an allocation report on an annual basis and until full allocation of proceeds, which may relate to one or multiple issuances of EuGBs (that means, they are not required to issue one report per bond). The allocation report shall also contain (if applicable) information on the progress made with regards to the achievement of the Capex plans. This allocation report shall be verified by an external reviewer *after the full allocation of proceeds.* If, however, the EuGB proceeds finance a portfolio of financial assets, then the report shall be done on an annual basis, unless there has not been any changes on allocation.

Issuers need to also disclose an impact report stating the environmental impact of the use of proceeds, but only after the full allocation of proceeds. As information on the environmental impact of green bonds is sometimes crucial for investors to do their own impact reports, this clause might be prejudicial for investors.

External reviewers

Another important ingredient of the EuGBs relates to external reviewers. These will have to be registered with the European Securities and Markets Authority - or ESMA (also including reviewers located in third-country jurisdictions). EuGB external reviewers will therefore be under the supervision of ESMA, which will charge fees for external reviewers due to its registration/supervisory role. It also has the right to impose fines if external reviewers commit certain infringements.

For sovereign issuers, the review of the allocation of bond proceeds can be done by a state auditor instead of an external reviewer. However, even in this case, external reviewers are still required to confirm alignment of the bond's use of proceeds with the EU Taxonomy.

ESMA will publish draft regulatory technical standards on the registration of/regulation for external reviewers within 12 months after the EU GBS regulation entries into force.

Complicating factor regarding external reviewers is that there cannot be EuGBs issued without properly registered external reviewers at ESMA. But this process will take a while until it has been fully set-up (as stated above), and might not be completed at the time that the EU GBS becomes effective. In order to solve this issue, the final version of the EU GBS includes a transitional period: External reviewers will have up to 18 months after the entry into application of the EU GBS Regulation to provide EuGB alignment confirmation to issuers, even if the process of their ESMA accreditation is still pending. In this case, reviewers need to notify ESMA and comply with the Regulation requirements on a best-effort basis. Furthermore, for non-EU reviewers, there needs to be a legal representative located in the EU during this transitional period. This might result in a few of the existing external reviewers in the market (e.g. Moody's, MSCI) not being able to provide confirmation of alignment during these 18 months.

Green securitisation

A new feature of the final text is that it also includes requirements with regards to green securitisation. Interestingly, the Regulation makes it clear that bond proceeds refer to "proceeds obtained by the originator from selling the securitised assets to the SSPE (Securitisation Special Purpose Entity)". This makes it clear that the securitised pool is not necessarily composed by green assets, but can also consist of regular assets from the balance sheet of the originator. However, the Regulation does require that none of the securitised exposures comprise fossil fuel. Issuers should also disclose the share of securitised exposure that finance EU Taxonomy-aligned activities.

Furthermore, originators shall fulfil the EU GBS requirements on a pro-rata basis (based on their share in the pool of securitised exposure). One exception is that synthetic securitisation (where a party buys credit protection on a portfolio of assets) cannot use the EuGB designation.

Legally binding transparency of EuGBs

The bond prospectus from an EuGB shall make reference to the EU GBS Regulation. This means that National Competent Authorities (NCA) will supervise and ensure that issuers comply with their obligations. NCAs have then the ability to impose admin sanctions and other administrative measures to issuers if they don't comply with the Regulation. NCA however do not verify the truthfulness or accuracy of the information provided by issuers, nor that the obligations regarding allocation of proceeds have been complied with (as this is taken care of by external reviewers, which in turn, are regulated by ESMA). Nevertheless, the failure to disclose information would allow NCAs to step in, making EuGBs' transparency (that is, reporting) a legally binding obligation for issuers.

Disclosure for non-EU GBS aligned ESG bond issuers

The final text of the EU GBS Regulation also states that "the Commission will publish guidelines [within 12 months after the EU GBS Regulation comes into force] with a view on *voluntary templates* for pre-issuance disclosures for issuers of bonds marketed as environmentally sustainable and sustainability-linked bonds". This shall include, for example, the previously mentioned disclosure on how the bond contributes to the issuer's transition plans, and how bond proceeds contribute to the issuer's taxonomy-aligned turnover/capex/opex (if applicable). Hence, it is also unclear whether this template for non-EU GBS aligned ESG bonds will also refer to something similar to the European Green Bond Factsheet, or whether it will refer to a different document. Specifically for Sustainability-Linked Bonds (SLBs), the template will include (among others) disclosure on the rationale, level of ambition, materiality and calculation methodology of KPIs.

Other remarks

The final version of the EU GBS also contains the following:

- Three years after the Regulation enters into force, the Commission will publish a report about the need to regulate the SLB market, accompanied by a legislative proposal
- Five years after the Regulation enters into force, and every three years thereafter, the Commission will submit a report evaluating (among others) the update of the EU GBS and its use/impact in the bond market as well as the transition to a sustainable economy.

Implications for the green bond market

While the EuGB is definitely a big step forward to the green bond market, it may also lead to some disturbances in the near- and medium-term. First of all, we think that the first EuGBs that will come to the market will benefit from stronger investor demand than regular (or non-EU GBS aligned) green bonds. That is not only because these bonds will have a "first mover" factor that will certainly attract investors' attention, but also because a few of the existing dark green bond funds (that is – the ones that are classified as Article 9 under the SFDR) have already set EU Taxonomy alignment targets. EuGBs will therefore be a quick and efficient way for those investors to meet these targets. The direct consequence of a stronger demand towards EuGBs will be a higher greenium, compared to regular green bonds. This will therefore lead to a differentiation in the ESG bond market, at least initially.

We also note that the clarification by the Commission on the SFDR a few weeks ago (see **here**) will likely result in more Article 9 funds having less strict targets linked to the EU Taxonomy. This could reduce the demand of investors towards

EuGBs, as some investors slowly loosen (or fully discard) their EU Taxonomy alignment targets. This will however, likely only occur only in the more medium-term.

Furthermore, the market for EuGBs is likely to remain small in the coming few years. That is because only a small amount of undertakings have so far been able to scan their assets and expenditures against EU Taxonomy alignment. In particular financial institutions, for example, should struggle to find eligible assets until companies start formally disclosing this information. The latter, on the other hand, will only occur once CSRD reporting requirements start to be fully in place. In that respect, we expect utility companies to become the first EuGB issuers, as they are well able to provide evidence about full EU Taxonomy alignment (including Do No Significant Harm), while this can still be quite challenging in some other sectors. More generally, more publicly available data, application of Taxonomy requirements in subsidy schemes, permits and market requirements are therefore necessary to expand the availability of eligible assets and therefore, the issuance of EuGBs.

Information on EU Taxonomy alignment will certainly pick after CSRD-aligned reporting start to emerge, and, as we previously noted, we should see more EuGBs after that. However, in the more medium- to long-term, we also expect that EuGBs will likely lose their appeal. That is because the EU GBS will bring some challenges for both issuers and investors, as we highlight below.

For issuers: the costs related to the ESMA's supervision and registration of external reviewers will certainly be passed through to issuers. That is, the costs of issuing green bonds that comply with the EU GBS will be higher than of issuing regular (non-EU GBS aligned) green bonds. Hence, issuers will only have a financial incentive to issue EuGBs if those are translated into material funding advantages (such as higher greeniums) in the primary market. Issuers will therefore need to weight the costs and benefits of EuGBs and will not issue them if the costs exceed the benefits. While we think this will unfortunately be the case in the more medium- to long-term (as we will explain below), it remains to be seen if the cost-benefits analysis will weight in favour of EuGB issuances.

For investors: over time, it might not be justifiable to keep bearing the higher prices (higher greenium) of EuGBs. As we previously noted, investors might be willing to accept the higher greenium to quickly comply with internal EU Taxonomy targets. However, as issuers also start to report on EU Taxonomy alignment (as per the CSRD), investors will more easily be able to also ensure alignment through normal bonds. On top of that, when it comes to assessing EU Taxonomy alignment of investments, the SFDR does not yet specify any distinction between EuGBs and regular green bonds that have also provided an EU Taxonomy alignment assessment, but do not carry the EuGB label. This means that investors might also decide to just invest in regular green bonds to meet their own Taxonomy targets (perhaps complemented with the to-be-announced voluntary templates), as these fulfil fairly similar purposes (also in terms of transparency), but are less costly. On top of that, as we previously noted, it might even be that with time, "green" investors no longer need to set EU Taxonomy requirements.

We note as well that as per CSRD, statutory auditors are also allowed to check the alignment of assets/expenditures with the EU Taxonomy (see **here**). This means that EU Taxonomy alignment, which is properly verified by a credible third party, will already be part of regular reporting of undertakings. Hence, this brings into question what would be the benefit in the long-term of having EuGBs, as it will also no longer provide additional (EU Taxonomy) information. We emphasis the EU Taxonomy information part, as in terms of additional transparency, the EU GBS does not differ significantly from the existing market practices and recommendations of the ICMA Green Bond Principles. Regular green bonds can also improve in quality over time, supported by, for example, the voluntary templates to be developed by the Commission. Certainly, the legally binding attribute of the EU GBS and the regulation of external reviewers give investors an additional assurance on the degree of confidence towards the information provided by EuGB issuers. But it seems debatable whether this reduced greenwashing risk justifies the higher costs.

In the long-term, we also expect there to be other standards. For example, China has already its own Taxonomy, the UK is in the process of developing it, and we should also expect similar moves from other large green bond issuing countries such as the US. Issuers should then have more incentive to issue green bonds that align with their own national standards. The

EU Taxonomy also relies heavily on EU regulation. All these factors should also make it challenging for non-EU issuers to issue EuGBs. All in all, the EU GBS could also therefore lead to some regional fragmentation of the green bond market in the long-term.

High gas price still grips industry

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- **Relatively high gas prices are a strong incentive for many companies in industry to rapidly reduce their gas consumption**
- **Many companies in industry have rationalised their gas consumption in the past year or were forced to discontinue or stop production lines altogether**
- **Lower gas consumption in industrial sectors has only partially contributed to industry's greenhouse gas reduction during 2022**

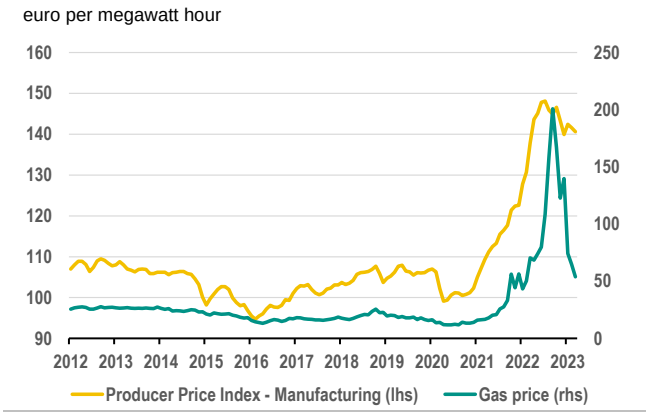
Rationalisation of energy consumption is not new in industry. Since the oil crisis in the 1970s, designing the production process as efficiently as possible has been in the DNA of industrial companies. From then on, all kinds of measures were taken to improve processes. Today, this is not much different. The current high gas price increases pressure on the business continuity of many industrial companies and forces companies to take even more efficiency measures. Much more frequent moves are also being made to replace fossil fuels in processes wherever possible. In terms of process innovations, the industrial sector is thus ahead of the curve, both in economic and ecological terms.

Trend in gas price and consumption

More than three quarters of total Dutch natural gas consumption is accounted for by economic activities in sectors. Most of this is consumed by industry (with a 40% share), closely followed by energy supply (with over a 37% share). At some distance follows agriculture with a 12% share of total consumption by sectors. The three sectors together - industry, energy supply and agriculture - account for almost 90% of gas consumption by Dutch sectors.

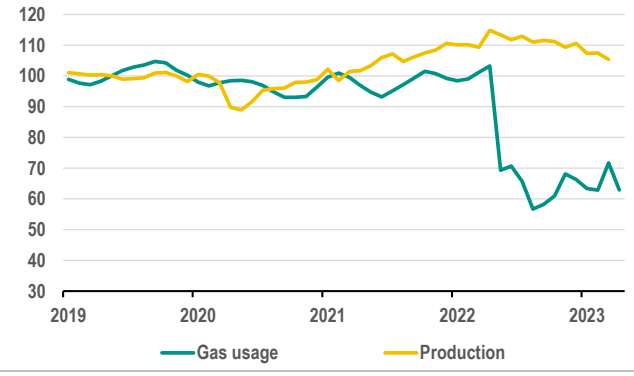
In particular, the energy-intensive subsectors within industry - such as chemicals, base metals, food, paper and building materials - are sensitive to energy price increases. Companies that additionally use natural gas as a feedstock are also vulnerable. In addition, other industrial subsectors also could not escape the sharp gas price increase since February 2022. The TTF gas price rose sharply in 2022, taking producer price index up with it. On 26 August 2022, the gas price reached its peak of EUR 305/Mwh. The gas price then weakened to a level of EUR 55/Mwh in May 2023. Although this is a significant drop in price level, the gas price is still some 240% above the average level of the gas price from 2019 to 2021.

Gas price vs. producer price index since 2012



Source: Refinitiv, CBS, ABN AMRO group Economics

Production versus gas usage industry



Source: CBS, ABN AMRO Group Economics

Industrial output increased by 6.2% year-on-year throughout 2022, while industry-wide gas consumption declined by around 25% over the same period. In the first quarter of 2023, we saw a 3% year-on-year decline in output. Gas consumption in this quarter fell by about 34% year-on-year on average.

The relatively level of high gas prices have been a strong incentive for many companies to rapidly reduce gas consumption. Especially for large consumers of natural gas - such as many companies in industry - this was vital. With efficiency measures, electrification (such as heat pumps and electric boilers) and fuel substitution, gas consumption could be reduced in the short term. Such measures helped. Indeed, it directly translated into lower production costs and thus better earnings. Many companies in industry rationalised their gas consumption or were forced to discontinue or stop production lines

altogether. The fast pace in reducing gas consumption since February 2022 is evidence to this. And still gas consumption in the industry is at a relative low level. The average gas consumption from May 2022 to the first quarter of 2023 was some 35% lower compared to the average level of gas consumption from 2019 to April 2022.

Industrial sectors and gas

In Dutch industry, six subsectors are dominant when it comes to gas consumption volumes. These are the food industry, paper industry, chemical industry, petroleum or oil industry, building materials industry and base metals industry. Together, these six sectors account for 85-90% of total industrial gas consumption. The chemical industry accounts for more than half of gas consumption, followed by the food industry with 15% and then the oil industry (13%).

Natural gas is used in different ways in these six industrial subsectors. In the chemical sector, it is mainly used for energy purposes (industrial processing), but partly also as a raw material for finished products (petrochemicals and fertilisers). The food industry mainly needs low-temperature steam, which requires a lot of gas. The refining of crude oil (cracking process) requires a lot of energy and this uses a lot of natural gas, which then causes greenhouse gas emissions from the oil refineries. In the building materials industry, gas is indispensable to achieve the necessary high temperatures in furnaces. This is especially the case in the glass and ceramics industries. The base metals industry also needs gas to reach high temperatures for the melting process, while the paper industry uses a lot of energy (especially gas) in the drying process.

Relationship between gas consumption and production by industrial subsectors

index (2019=100), 6-month moving average

Source: CBS, ABN AMRO Group Economics

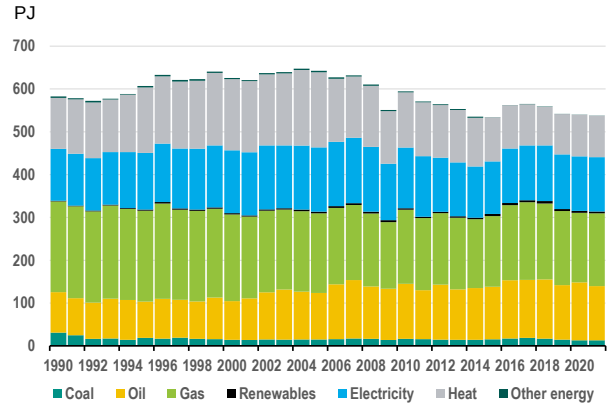
In the food industry, gas consumption shows a very erratic pattern over time, with peak gas consumption especially in the winter months. However, peak levels in 2022 and 2023 are still lower than the peak level in 2021. In the building materials industry, gas has by far the largest share in the energy mix. Coal, electricity and oil are also part of this mix. But here, too, there has been a tilt in the mix to mitigate the higher gas price.

In 2022, industrial production in the above six sectors - apart from the building materials industry - is much lower compared to 2021. This also applies to total gas consumption in 2022. Again, the building materials industry is an exception. Gas consumption rose in this sector in 2022, while the other sectors saw a substantial drop, especially in the chemical and oil industries. There has also been a substantial reduction in gas consumption in the base metals industry. In the first quarter of 2023, production in the food and oil industries increased year-on-year, while output in the other sectors fell sharply. However, gas consumption increased in this quarter only in the food industry. Notably, annualised gas consumption was much lower in the paper, base metal, chemical and petroleum industries.

Fuel and energy requirements in the oil industry for the crude oil refining process often come from a mix of other refined products such as gas, fuel oil, naphtha (hydrocarbon) and diesel. This mix of fuels can be varied. For instance, the use of natural gas was greatly reduced by the price explosion of gas, in favour of using other refined products or renewable variants. This allowed output in the oil industry to be maintained.

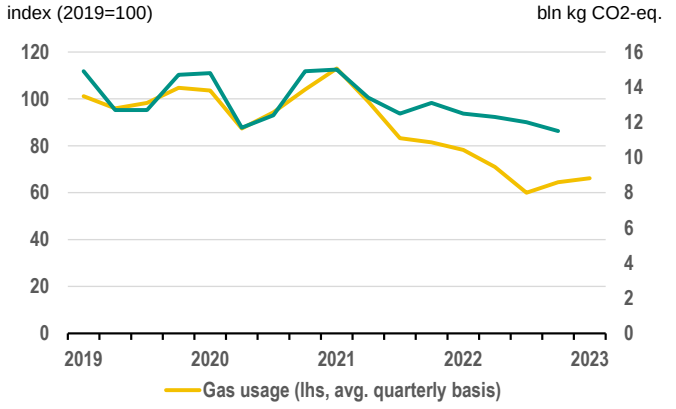
Coal, oil and gas still dominate industry's energy mix. This has been the case since 1990, and over the years there have been only marginal shifts in this mix. In both 1990 and 2021, the combined share of fossil fuels in the energy mix is about 58%. Further reduction of fossil fuels should contribute to a reduction of greenhouse gas emissions in the coming years. Through further electrification of industrial processes, the share of electricity will continue to grow in the coming years, provided that network capacity is significantly expanded.

Energy mix industry



Source: CBS, ABN AMRO Group Economics

Gas usage industry versus GHG emissions industry



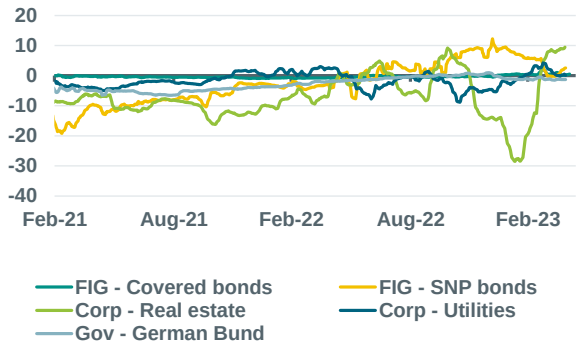
Source: CBS, ABN AMRO Group Economics

Lower gas consumption in industrial sectors has helped reduce greenhouse gases. By 2022, greenhouse gas emissions in total industry decreased by 11%, while industrial gas consumption fell by around 25%. The fact that the non-fossil option could often not be chosen directly in gas fuel substitution contributed to the fact that the pace of emission reduction is slower than the pace of reduction in gas consumption. Other and additional measures are needed to accelerate greenhouse gas reductions. This means working on process improvements, smarter heat use, further electrification, deployment of renewable energy and maximum circular use of raw materials. These are good steps towards greater energy efficiency. But this often does not happen overnight.

ESG in figures

ABN AMRO Secondary Greenium Indicator

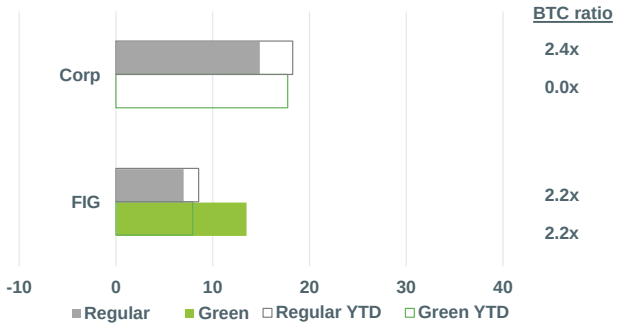
Delta (green I-spread – regular I-spread)



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

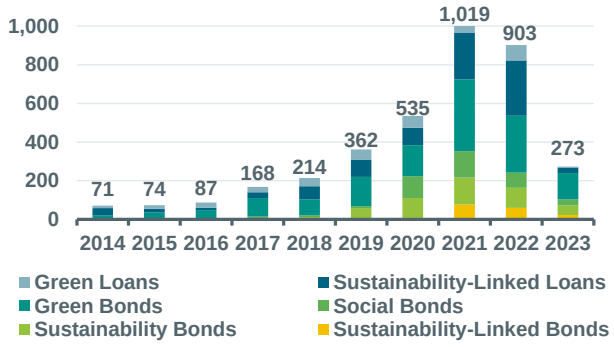
NIP in bps



Note: Data until 11-05-23. BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics

Sustainable debt market overview

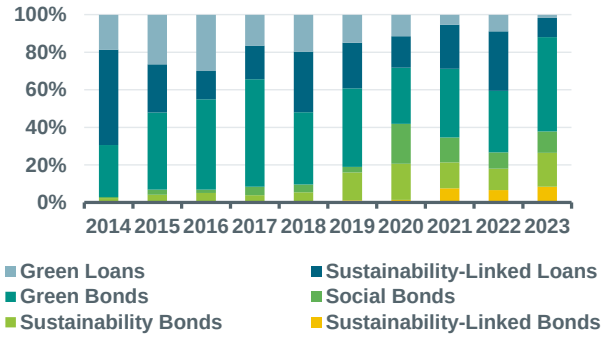
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

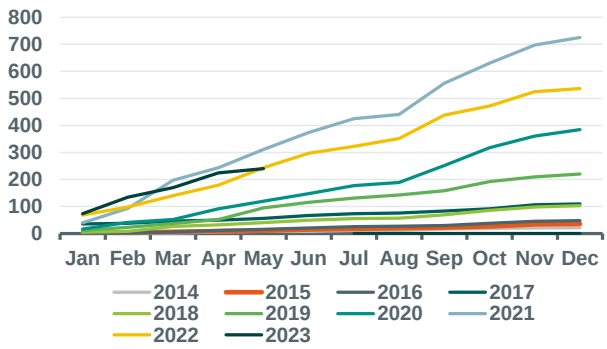
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

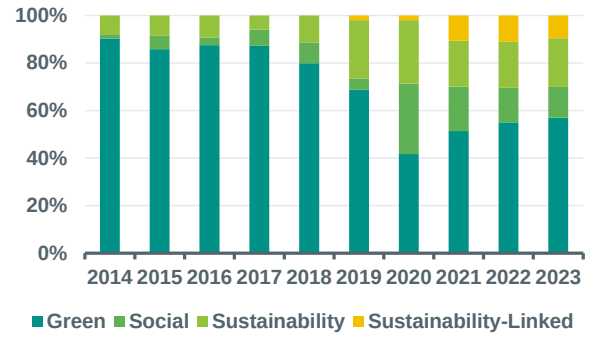
EUR bn (cumulative)



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

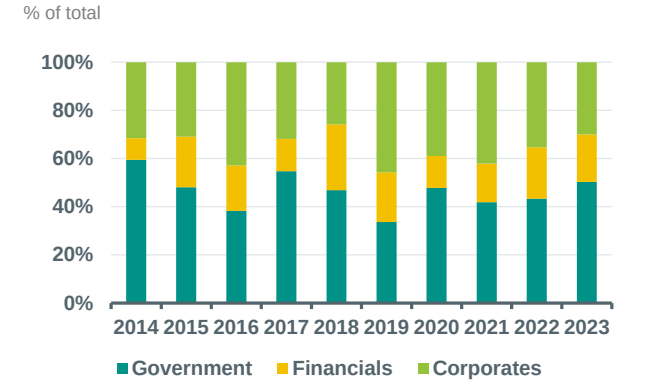
% of total



Source: Bloomberg, ABN AMRO Group Economics

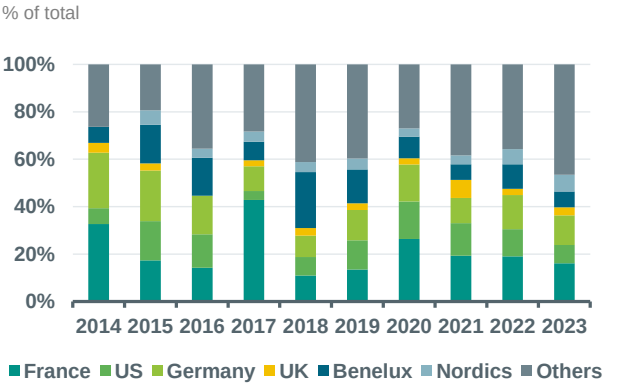
Figures hereby presented take into account only issuances larger than EUR 250m and in the following currencies: EUR, USD and GBP.

Breakdown of ESG bond issuance by sector



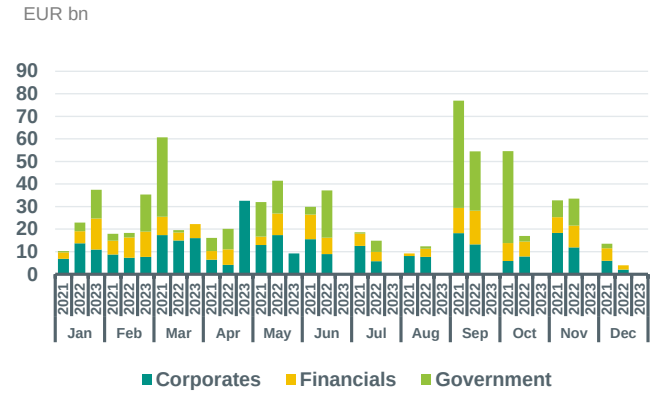
Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country



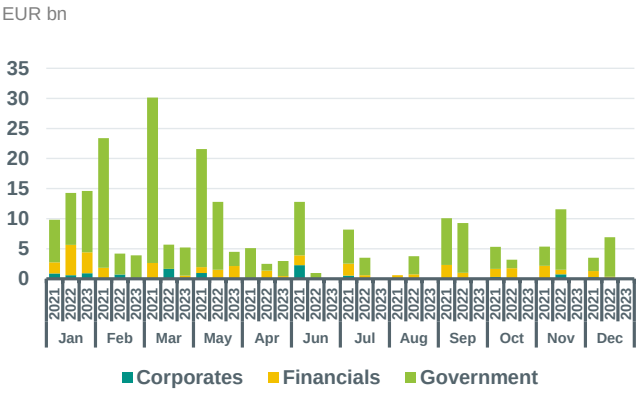
Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector



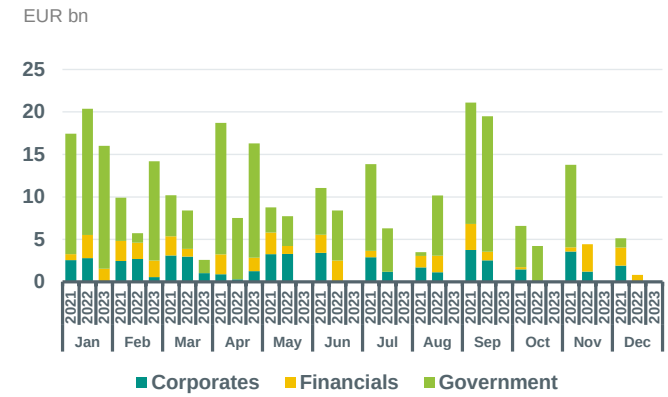
Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector



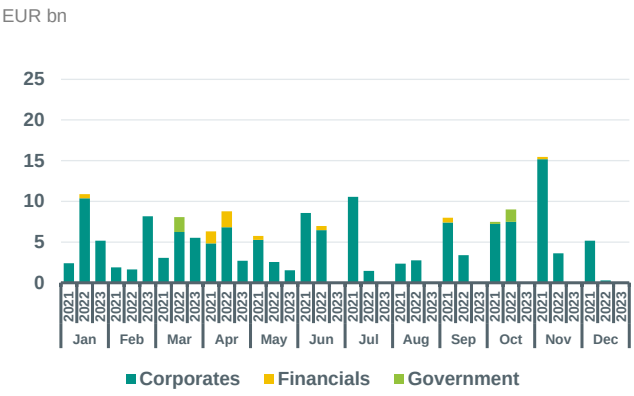
Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sust.-Linked Bonds issuance by sector



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.

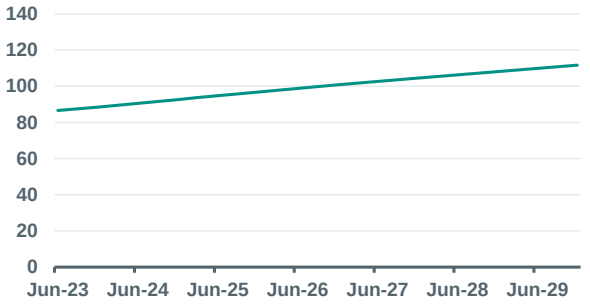
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract futures curve (EU Allowance)

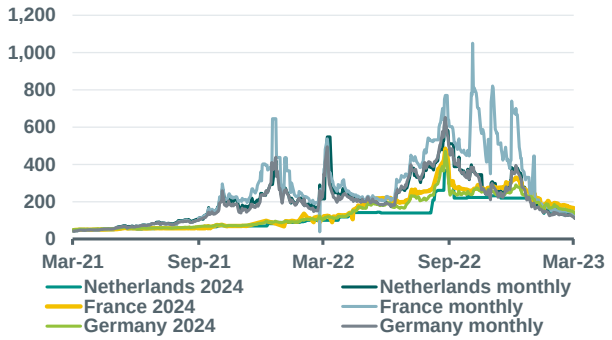
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

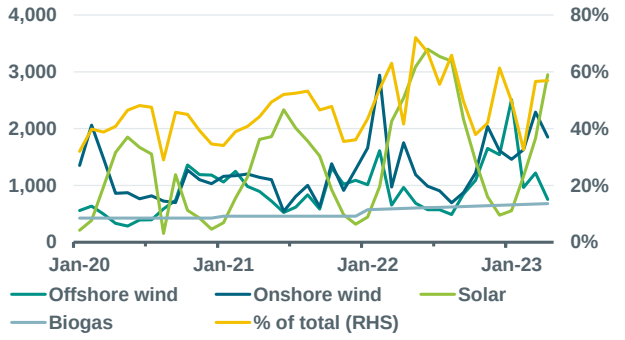
EUR/MWh



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

Electricity generation from renewable sources (NL)

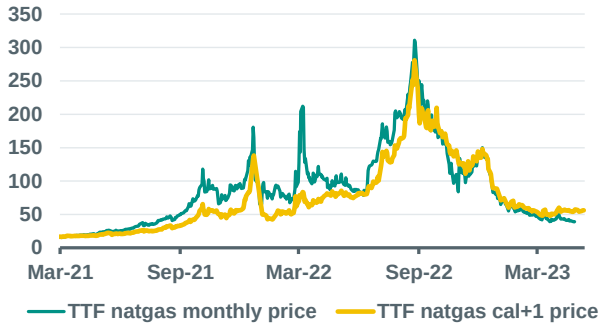
GW % of total



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

TTF Natgas prices

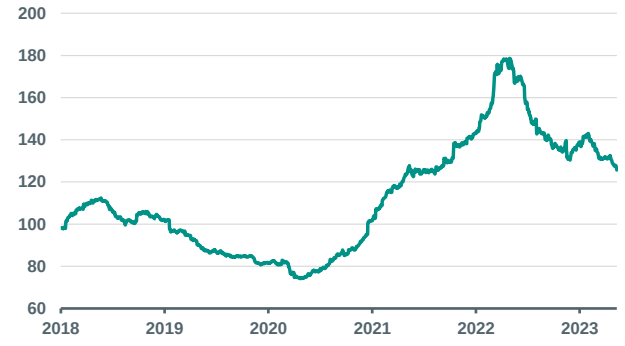
EUR/MWh



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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