SustainaWeekly

Opportunities and challenges for wind power

- **Economist:** **Wind power is a main strategic source for renewable energy. Onshore wind is the cheapest renewable source for electricity. The Levelized Cost Of Electricity (LCOE) has been decreasing for both onshore and onshore power, which among other drivers, participated in boosting deployments globally. Spatial claims and social acceptance are main challenges for onshore wind deployments. Limited grid capacity may limit or slow down the deployments of wind power.**

- **Strategist:** **Issuance of euro denominated ESG bank bonds reached EUR 52bn 2023H1. The share in total issuance rose to 17%, up from 14% last year. More than 25% of senior non-preferred paper was issued in ESG format in H1. The split between green and social bonds dropped this year, especially due to covered bonds. Funding advantage remains strong, reflected by higher bid-to-cover ratios and lower new issue premia for ESG bank bonds.**

- **Sector:** **We have defined three possible future emission scenarios for trucks. We assume the following scenarios: policy/positive, base and negative. The positive scenario assumes that the government policy is according to plan and that the bottlenecks are sufficiently addressed. In the other scenarios we take into account bottlenecks such as affordability, technology, costs, shortage of metals and challenges to adjust the grid.**

- **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 set out the role of wind power in the energy transition, along with the associated trends in costs and investments and the challenges for the sector. We go on to analyse the trends in ESG bank bond issuance in the first half of this year, including demand and pricing relative to non-ESG peers. Finally, we set out three possible future emission scenarios for trucks, which is a snapshot into our broader thematic on emission scenarios for road mobility. The reduction path for trucks starts later and there will possibly be ongoing emissions in all scenarios as it is a hard to abate subsector.

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

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The wind of change is blowing

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- **Wind power is a main strategic source for renewable energy**
- **Onshore wind is the cheapest renewable source for electricity**
- **The Levelized Cost Of Electricity (LCOE) has been decreasing for both onshore and onshore power, which among other drivers, participated in boosting deployments globally**
- **Spatial claims and social acceptance are main challenges for onshore wind deployments**
- **Limited grid capacity may limit or slow down the deployments of wind power**

Introduction

Windmills have long been an important way to extract power for different economic purposes. They played an essential role in agriculture and further became a national symbol for the Netherlands. Facing climate change and the prioritization of energy security by some countries such as the European Union, wind power has moved to the top of the list as a strategic renewable source for energy. Based on the location of the wind turbine, we can distinguish between offshore (wind turbines are located on a body of water, usually oceans) and onshore (the turbines are located on land) wind. Each of these turbines has its advantages and disadvantages. For example, offshore wind has relatively more stable blow of the wind, but it is more expensive to deploy and requires supporting infrastructure investments. In this article we set out the role of wind power in the energy transition, along with the associated trends in costs and investments and the challenges accompanying wind power.

The role of wind power in the transition

Next to solar, wind power is one of the main pillars for the energy transition. However, and in contrast to solar, households do not invest directly in wind deployments. Thus, wind installations are mainly deployed through large investments.
Europe is considered abundant in wind power. Under the REPowerEU plan, the European Union aims to reach a renewables share of 39% of the European electricity mix by 2030. This target was further raised to 42.5% in May 2023. To reach this goal wind power capacity is envisioned to increase by 129 GW for the EU over the 2023-2027 period, added to the current 255 GW already installed. Globally, and according to the Global Wind Energy Council (GWEC), wind capacity reached 906 GW by the end of 2022, with a year to year growth of 9%. GWEC further forecast new capacity additions of 680 GW over the 2023-2027 period. Accordingly, wind power has an essential role to play in the energy transition. The subsequent section dives into the trends in wind power and main drivers for wind investments.

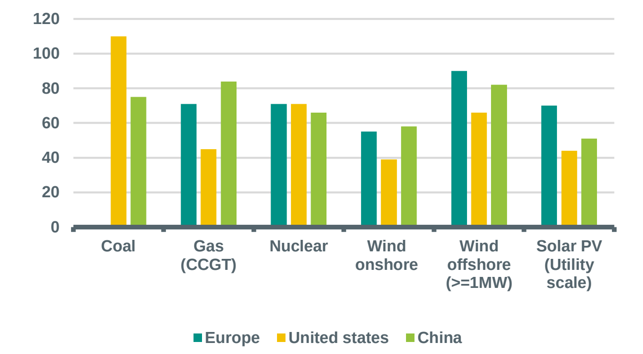
Trends in wind power

Levelized cost of electricity (LCOE) is a useful measure to compare different electricity sources. LCOE is defined as the ratio between the sum of discounted lifetime costs of a technology and the sum of discounted energy production. Costs may include investment costs; operation and maintenance costs; or decommissioning costs. LCOE depends on many factors such as discount rate and current state of the technology. The maturity of the technology and high capacity factor[1] for wind turbines participated in reducing its LCOE. Accordingly, onshore wind is one of the cheapest sources of energy (for Europe the cheapest) followed by solar PV nuclear and offshore wind, as seen in the left hand side of the figure below. This highlights the competitive position of wind power compared to other alternatives. The right hand panel of the figure illustrates how LCOE have been evolving overtime. The chart shows a clear decrease in global LCOE for both onshore and offshore wind. Among all countries, China has the lowest LCOE for both onshore and offshore wind. Offshore wind's LCOE is forecast to decrease for most countries, with an expected steep decline for France, Germany, and the Netherlands by 2025 and for the United states by 2030.

[1] Capacity factor of an intermittent resource measures the power produced by a renewable resource in comparison to its maximum potential. Wind turbines have a capacity factor that ranges between 0.25 and 0.30 for onshore wind turbines, and between 0.40 and 0.45 for offshore wind.

Median levelized cost of electricity by region, at 7% discount rate

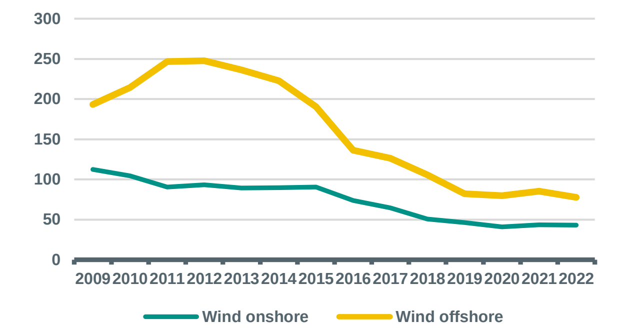
Unit: USD/MWh



Source: IEA, ABN AMRO Group Economics

Global LCOE

Unit: USD/MWh

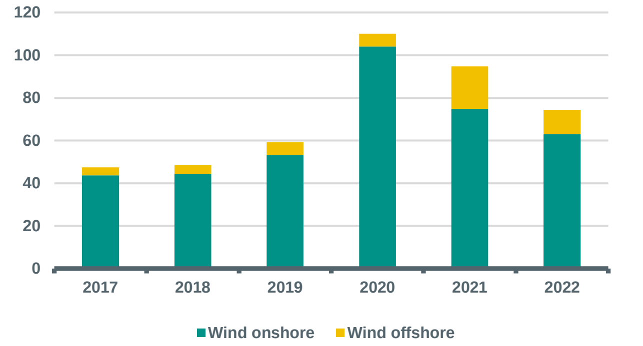


Source: Bloomberg, ABN AMRO Group Economics

The decrease in LCOE, along with the policy support and energy security concerns have boosted investments in wind power as seen in the figure below. Capacity additions (left hand panel) reached their highest level in 2020. These investments were driven primarily by deployments in China as developers were speeding up to finish their projects to benefit from the last year (2020) of the subsidy scheme offered by the Chinese government. Noting that wind capacity additions in the EU were rising as well, driven mainly by deployments in Germany and Spain. According to the IEA, solar and wind deployments has helped the EU to mitigate the effects of the energy crisis with an estimated EUR 100 million as savings in energy bills.

Global net wind capacity additions

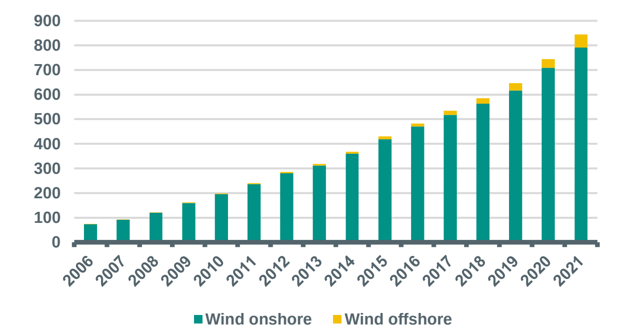
Unit: GW



Source: IEA, ABN AMRO Group Economics

Global accumulated wind capacity

Unit: GW



Source: Bloomberg, ABN AMRO Group Economics

Wind power challenges

Even with the potential and increasing role of wind as a renewable source of energy, there are several challenges that affect the deployment of wind power. Some of these challenges differ between onshore and offshore wind. Below we highlight some of these challenges.

Spatial claim

Renewable energy sources require more space than their fossil counterparts. We can define two types of spatial claims. Legal and technical. For wind power, legal spatial claim can be defined as the legally determined space around the wind turbine usually for safety purposes. The technical spatial claim can be defined as the space needed around the turbine to work efficiently (see here for more). For example, distance from other wind turbines to avoid turbulence and wake losses, or distance to buildings to minimize noise and shadows of blades on buildings. Moreover, additional space is needed for supporting infrastructure, like storage and grid expansions. That is, the space needed for wind turbines exceeds that of the actual installations, which reduces the competitive position and may become a limiting factor for wind investments compared to other alternatives, especially for onshore wind.

Permitting

Like any large scale long term investments, permitting and auction designs are one of the main obstacles that limit the growth of wind power. One solution could be a flexible permitting system that takes into account the fast change in technology. Site studies by the government could also play a role in cutting waiting times and reduce uncertainty for potential investors. Triggered by the energy crisis, the EU countries have been focusing on easing the regulations and policies that govern permitting in order to enable and accelerate the deployment of wind and utility solar PV (**see here**).

Grid/system integration

The development of offshore grid connections is essential for wind power to flourish. Grid capacity is one of the major bottlenecks that could limit or slow down the deployment of wind projects. Grid connection solutions could entail a medium voltage grid for onshore projects and a high voltage for large farms, whether onshore or offshore. Balancing solutions on national and European levels could also play a role in making the grid more flexible. For example, increasing the usage of interconnectors; flexible demand and storage; along with creating capacity markets for long term adequacy.
Finally, challenges related to system integration can be alleviated by spatial smoothing, complemented with solar energy, market integration, storage and flexible generation/demand response.

Social acceptance

Public acceptance is one of the major obstacle for onshore wind, especially in the cities where there are other competitive alternatives, which makes acceptance uncertain, time and shock sensitive. For example, energy security concerns in Europe, along with the rapid climatic changes, rearranged priorities and increased the social acceptance to renewable power installations, including wind turbines. Normalizing the required distance from wind turbines may increase the acceptability by the public for onshore wind. However, if such norms increases the spatial claim of the wind turbine, the feasibility for certain project could be compromised (**see here**).

Costs

Wind power has been witnessing rising costs following the increase in the prices of main inputs such as steel, along with bottlenecks in supply chains. Given the rapid decline in the costs of other alternative power sources such as solar PV, there is a need to lower the costs of wind turbines, particularly for offshore wind. This would increase the competitive position of wind power and give the technology more stability of financing and support regimes.

Economic and biodiversity impacts

Wind power would create a crowding out effect to other economic activities. For example, fishing will be hindered around offshore wind farms. In addition, concerns about biodiversity conservation form another challenge for wind power. For example, the blades of wind turbines along with the created noise would change animal behaviour and may affect biodiversity adversely. Furthermore, circularity of wind turbines is also a major concern that needs to be tackled. However, innovations in system integration concepts and designs that are nature inclusive are promising solutions in these areas.

Issuance of ESG bank bonds picked up in H1

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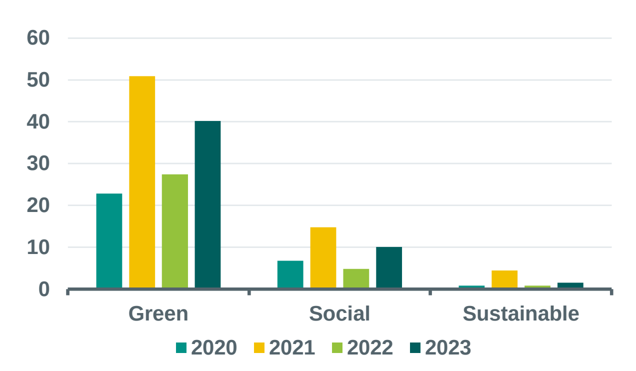
- **Issuance of euro denominated ESG bank bonds reached EUR 52bn in H1 of 2023**
- **The share of ESG bonds in total issuance rose to 17%, up from 14% last year**
- **More than 25% of senior non-preferred paper was issued in ESG format in H1**
- **The split between green and social bonds dropped this year, especially due to covered bonds**
- **Funding advantage remains strong, reflected by higher bid-to-cover ratios and lower new issue premia for ESG bank bond than for non-ESG peers**

Issuance of ESG bank bonds increasing

Issuance of green, social, and sustainability (ESG) bank bonds, denominated in euro, picked up during the first half of this year, not only in volume but also in relative terms. The amount of ESG bonds issued in H1 2023 almost reached EUR 52bn, which already exceeds last year's total issuance (EUR 33bn) by a wide margin. The graph below left also shows that this year's issuance is just slightly below total ESG issuance seen in 2021. A breakdown by ESG type reveals that green bond issuance jumped to EUR 40bn so far in 2023, while issuance of social bank bonds doubled to EUR 10bn compared to last year's issuance (whole year). Sustainability bank bonds, of which the use of proceeds tend to (re)finance a mix of green and social assets, remain a niche, with only EUR 2bn of issuance in 2023.

Issuance of ESG euro bank bonds

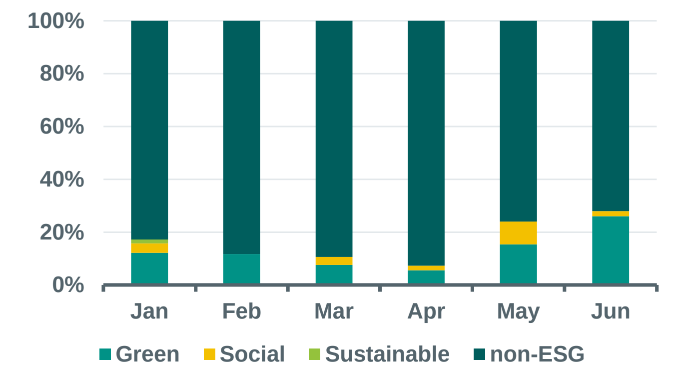
EUR bn



Source: Bloomberg, ABN AMRO

Share of ESG bonds in total issuance

% of total issuance EUR bank bonds



Source: Bloomberg, ABN AMRO

The rise in ESG bank bond issuance partly reflects the general increase in bank bonds witnessed so far this year (covered bonds issuance in H1 was a new record amount, while senior preferred bank bond supply was also around 80% higher compared to H1 2022). Having said that, issuance of ESG bank bonds also strengthened in relative terms. This year, 17% of total euro-denominated bank bond issuance was in green, social, or sustainability format, compared to 14% in 2022, 22% in 2021, and 10% in 2020. A breakdown by month shows that issuers started to prefer issuance of ESG bonds following the banking turmoil in March, which kept the door to the primary market closed for a few weeks. As such, ESG bonds helped to reopen the primary market, while the ESG format also supported access to the market for some smaller, lower-rated, banks.

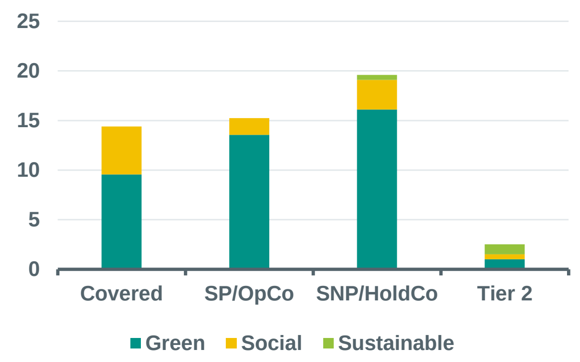
Looking forward, issuance of ESG bank bonds seems to be on track to reach our forecast of roughly EUR 70bn of ESG issuance in 2023 as a whole. We expect issuance of bank bonds to slow down during the remainder of the year on the back of lower funding needs as well as the already high issuance in H1, If we assume that a similar share of the upcoming expected supply of euro-denominated bank bonds will be in ESG format, we end up with around our initial forecast. However, the split between asset classes is likely to be slightly different, with somewhat higher senior ESG bank bonds being issued and less ESG covered bonds than initially thought.

More than 25% of senior non-preferred issuance in ESG format

A breakdown by asset type shows that senior non-preferred bonds (SNP) were mostly issued in green, social, or sustainability format. Around EUR 20bn of euro denominated ESG bonds were issued in H1 2023, which is remarkable given that total supply of SNP bonds (in EUR) was roughly similar to that in H1 last year. Consequently, the share of SNP issuance in ESG format jumped to 28% of total SNP issuance this year, up from 24% in 2022 and almost three times the share in 2020. Meanwhile, issuance of ESG covered bonds and senior preferred (SP) paper were roughly EUR 15bn so far this year. For covered bonds, this implied a slightly higher share in total issuance (10%) compared to last year (9%), whereas the share of ESG bonds in total SP issuance dropped to 21% this year versus 28% last year. The latter is likely due to this year's strong increase in SP issuance (which is already almost at levels seen during the whole of 2022). Finally, banks also continued to issue Tier 2 debt in ESG format, although the volume of new issuance remained limited to EUR 2.5bn in the first half of 2023. Still, this represented 15% of total issuance, which was up from 11% in 2022.

2023 issuance of ESG bank bonds by asset class

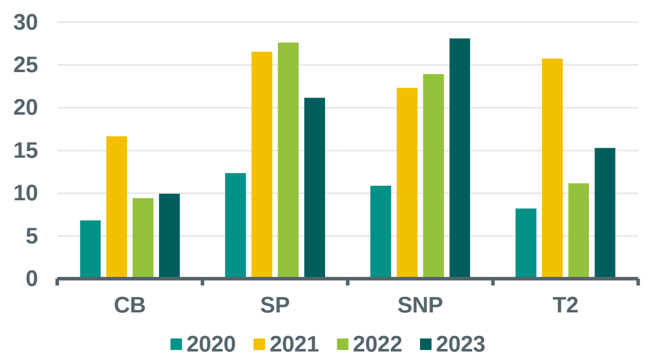
EUR bn



Source: Bloomberg, ABN AMRO

% share of ESG bond issuance in total issuance

%, 2023 (ytd)

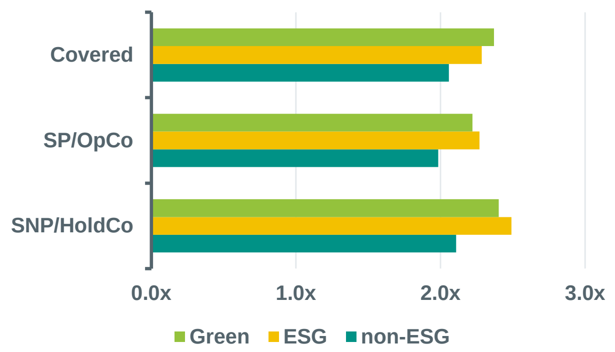


Source: Bloomberg, ABN AMRO

Digging a bit deeper in the data by splitting issuance of green and social bonds, reveals that green bond issuance was around four times higher than supply of social bonds. This makes sense, as guidelines for green bonds are much clearer (for instance due to the EU Taxonomy) than for social bonds. However, it is interesting to note that the ratio of green versus social bonds did decline in H1 this year, suggesting some catching up effect for social bonds. Indeed, in 2023, the ratio of green/social bonds was 4.0x, while it was 6.2x in 2022. This drop was broad based (except for SP paper), but most pronounced in the covered bond space, where the ratio dropped to 2.0x this year versus 5.2x in 2022. This, in turn, reflects that social covered bonds are often used to (re)finance social housing, which tends to be a clear and well-defined objective.

Average bid-to-cover ratio in 2023

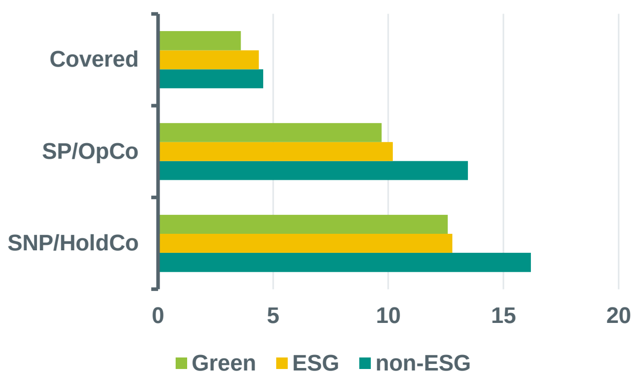
Ratio



Source: Bloomberg, ABN AMRO

Average new issue premium in 2023

In bp



Source: Bloomberg, ABN AMRO

ESG bank bonds still attract strong demand, while new issue premia lower

Banks that come the market with green, social, or sustainability bonds benefit from stronger investor demand, which also allows them to price these bonds with a lower concession than non-green peers (the so-called greenium). The graphs above show the average bid-to-cover ratios (see graph above left) of green, ESG, and non-ESG senior bank bonds and covered bonds. It is clear from the graph that all ranks of debt benefit from stronger investor demand, with the difference largest for SNP paper. This makes sense, as the potential for a funding advantage is also higher for these bonds given that they are issued at wider levels than SP bonds or covered bonds. A similar picture arises when looking at the average new issue premium, which is lower for ESG bonds than on-ESG bonds, and in particular for SNP (and SP). Overall, these data make it clear that the ESG bond market started the year on a strong note, with the ESG footprint having become larger in the primary market and funding advantages remaining clearly present.

Emission scenarios for trucks

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- **Whereas GHG emissions for the Netherlands declined by 29% between 1990 and 2022, GHG emissions from mobility declined by only 8%**
- **Trucks are responsible for around 20% of mobility emissions**
- **We have defined three possible future emission scenarios for trucks**
- **Policy/positive scenario: we assume that policy targets are reached, the needed charging points are installed on time, the grid is adjusted to deal with the extra electricity demand, the battery technology improves and less critical metals are used**
- **Base scenario: we assume that the fleet of zero emission trucks will increase at a slower pace as some of the charging infrastructure and refuelling infrastructure will not be ready on time, the battery improvement is delayed and there is some shortage of critical metals**
- **Negative scenario: we expect a substantially lower amount of zero emission trucks, the charging and fuelling infrastructure is assumed to be delayed significantly, there are shortages of critical metals and the battery range is not increased sufficiently**

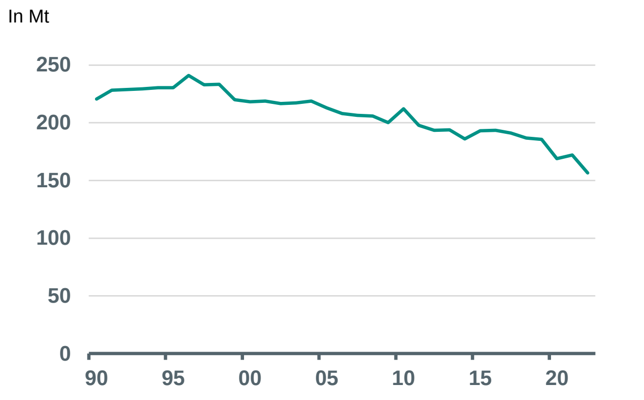
Introduction

Recently we have published an ESG Economist – Emission scenarios for road mobility (see link). In this report we define three emission scenarios for the subcategories of road mobility: cars, buses, vans and trucks. With these scenarios we can clearly see what the possible trajectories are for these subsectors and crucially what the key assumptions are behind the different trajectories. Going forward, by monitoring developments in these assumptions, we can assess what trajectory looks most likely. We set out the following scenarios: policy/positive, base and negative. The policy scenario is also the positive scenario assuming that the government policy is executed according to plan and the bottlenecks are sufficiently addressed. In the other scenarios we take into account bottlenecks such as affordability, technology, costs, shortage of metals, challenges to adjust the grid that result in a deviation from the policy scenario. For this edition of the Sustainaweekly first start with the greenhouse gas emissions from mobility and then we focus on the scenarios for trucks.

Greenhouse gas emissions

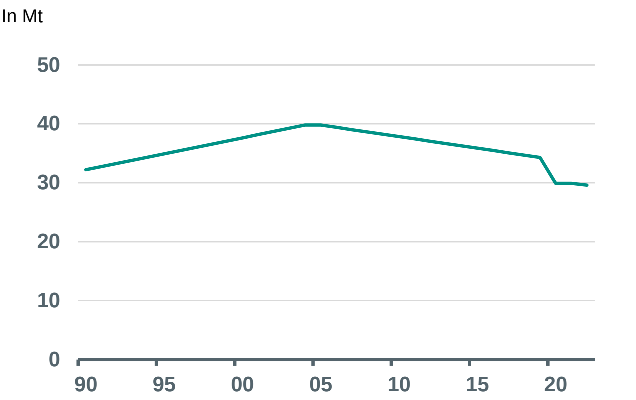
In 2022 the Netherlands emitted 156.6 megaton greenhouse gas emissions. This comes with a reduction of around 29% compared to 1990. The mobility sector emitted 29.6 megaton in 2022; a reduction of only 8% (see the graphs below). The mobility sector clearly lags behind in terms of reducing greenhouse gas emissions compared to the Netherlands overall. The government has set ambitious targets in reducing emissions in this sector, even more ambitious than the EU27.

GHG emissions Netherlands



Source: CBS, ABN AMRO Group Economics

GHG emissions mobility sector



Source: CBS, ABN AMRO Group Economics

The mobility sector includes emissions from personal cars, light-duty vehicles or vans, heavy-duty vehicles or trucks, buses/motors/motorcycles, construction traffic and domestic navigation. Road transport is the biggest emitter in the mobility sector. It is responsible for around 85% of the total emissions of the mobility sector. Passenger cars account for around 51%

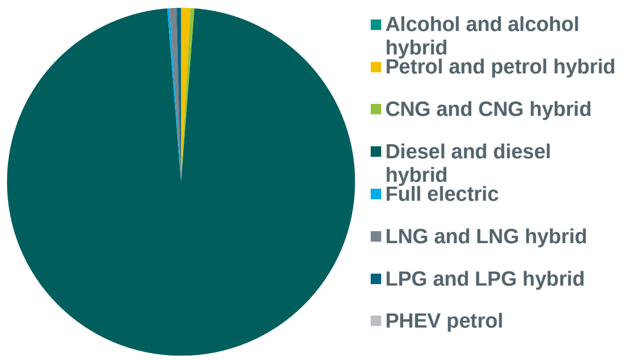
of emissions of the mobility sector. Heavy duty vehicles account for 20% of the emissions, light-duty for around 11% and buses/motors/motorcycles for around 3%.

Climate policy trucks

The Dutch government's policy is that in 2025 there are middle-sized zero-emission zones for trucks and vans in 30 to 40 municipalities. In 2027 road mobility becomes part of ETS2. Moreover the government expects that there are 5,000 zero-emission/plug-in hybrid trucks in in 2025 and 10,000 in 2030. The EU has a target that there are recharging stations every 60 km on main roads for trucks above 3,5 tonnes and hydrogen refuelling stations at least every 200km on main roads by the end of 2030. The EU is preparing tougher CO2 standards for new trucks in the European market, aiming to meet a net zero emissions target across EU27 by 2050. In 2022 in the Netherlands, there were close to 168,000 trucks on the road. The graph below shows the share of the fuel types of the fleet.

Fleet composition trucks 2022

In %



Source: CBS, ABN AMRO Group Economics

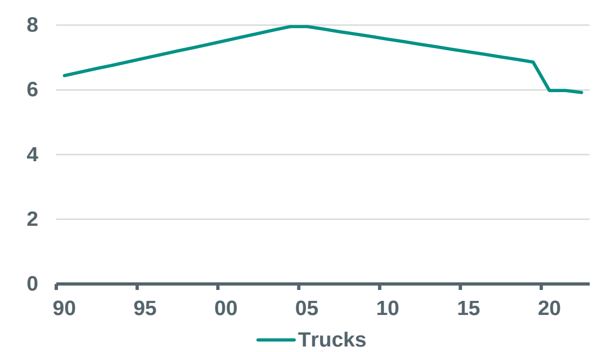
The fuel type diesel and diesel hybrid take the largest share, accounting for 98% of the total; full electric accounts for 0.2% and the fuel cell category is negligible. On average 12,000 buses are sold annually. We assume that the average life of a bus is 12.5 years. For the greenhouse gas emissions of the different scenarios we take into account the total emissions in recent years and the composition of the fleet.

Scenarios for trucks

For the policy/positive scenario we assume that policy targets are reached and that the needed charging points are installed on time including the overnight charging infrastructure and that the grid is adjusted to deal with the extra electricity demand.

GHG emissions trucks

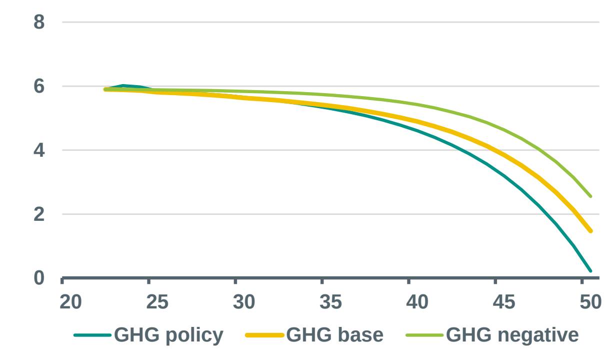
In Mt



Source: CBS, ABN AMRO Group Economics

Emission scenarios trucks

In Mt



Source: ABN AMRO Group Economics

We also assume that the battery technology improves so that the range is increased to minimum 500 km and lower amounts of critical metals are used. For shorter distances, battery electric trucks are used and for long-distance mainly fuel cell trucks. For 2023 the subsidy scheme for zero emission trucks was within one day four times oversubscribed.

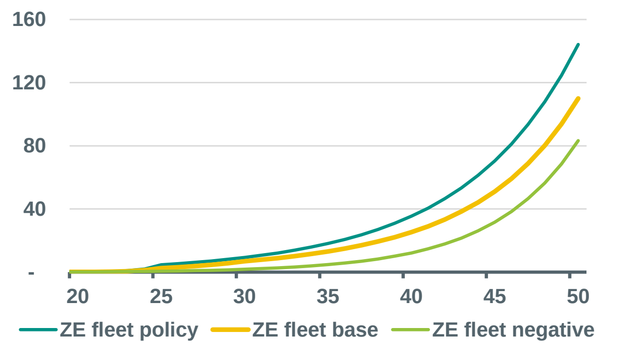
In the policy/positive scenario, the fleet of zero emission trucks start to rise considerably in 2035 due to the availability of technology and charging infrastructure. As a result the fleet of trucks with internal combustion engines and the resulting greenhouse gas emissions drop (see graphs above and below). As this trajectory has a later start, emissions will also decline later. This is a hard to abate subsector, so there will be some remaining emissions.

For the base scenario, we also assume that the fleet of zero emission trucks will increase, but at a slower pace than the policy scenario as we assume that some of the charging infrastructure and refuelling infrastructure will not be ready on time. Moreover the improvement in battery technology to increase the range will take longer. Furthermore there will be a shortage of critical metals and/or batteries which drive up the price of battery electric vehicles.

For the negative scenario we expect a substantially lower amount of zero emission trucks than in the other scenarios. In this scenario the charging and fuelling infrastructure is assumed to be delayed significantly. Furthermore, there will be also a substantial shortage of materials and the range of the battery will not be increased sufficiently. As a result, the path of reducing emissions will be slower and there will be substantial ongoing emissions.

Fleet zero-emission (full battery, fuel cell) trucks

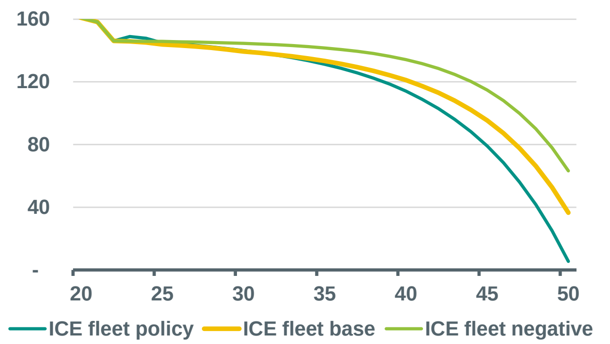
In thousands



Source: ABN AMRO Group Economics

Fleet internal combustion engine trucks

In thousands



Source: ABN AMRO Group Economics

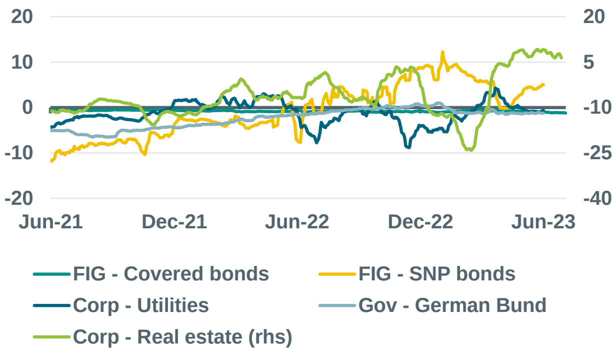
Conclusion

We have defined three emission scenarios for trucks. With these scenarios we can clearly see what the possible trajectories are for this subsector and how the crucial assumptions behind them are developing. We have the following scenarios: policy/positive, base and negative. The policy scenario is also the positive scenario assuming that the government policy is according to plan and that the bottlenecks are sufficiently addressed. In the other scenarios we take into account bottlenecks such as affordability, technology, costs, shortage of metals, challenges to adjust the grid that result in a deviation from the policy scenarios. In the base scenario there is a modest deviation and in the negative scenario there is a substantial deviation. The reduction path for trucks starts later and there will possibly be ongoing emissions in all scenarios as it is a hard to abate subsector.

ESG in figures

ABN AMRO Secondary Greenium Indicator

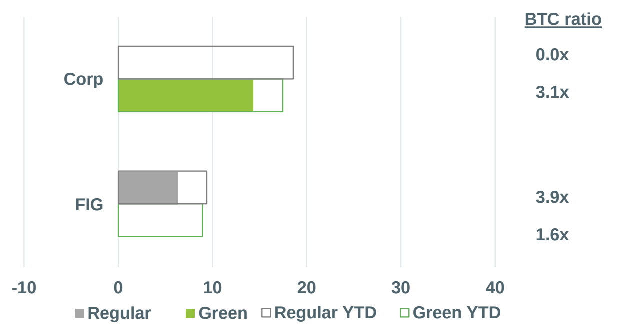
Delta (green I-spread – regular I-spread)



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

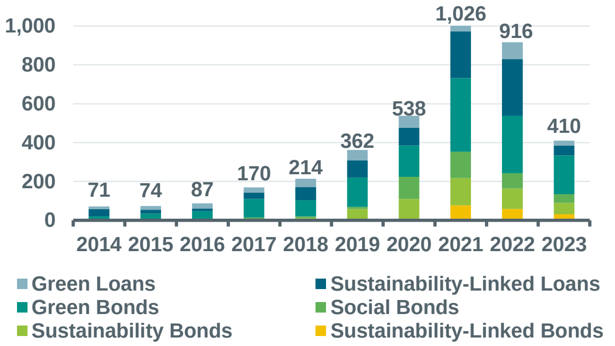
NIP in bps



Note: Data until 05-07-23 (except FIG: data as of 04-07). BTC = Bid-to-cover orderbook ratio. Source: Bloomberg, ABN AMRO Group Economics

Sustainable debt market overview

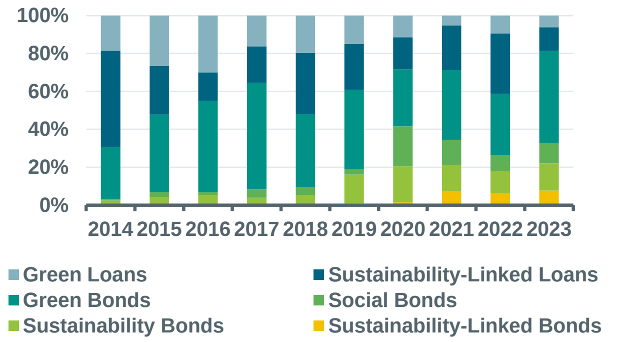
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of sustainable debt by type

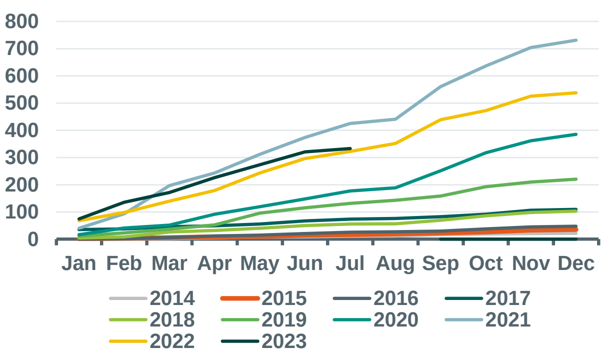
% of total



Source: Bloomberg, ABN AMRO Group Economics

YTD ESG bond issuance

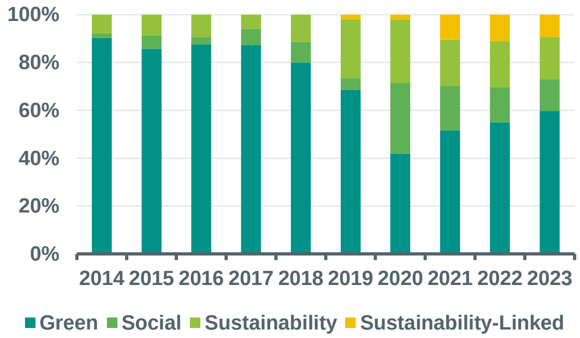
EUR bn (cumulative)



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by type

% of total

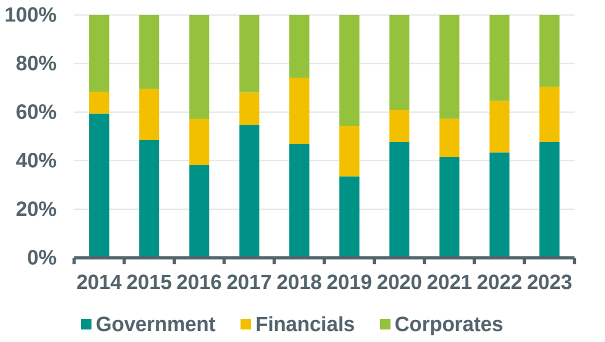


Source: Bloomberg, ABN AMRO Group Economics

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

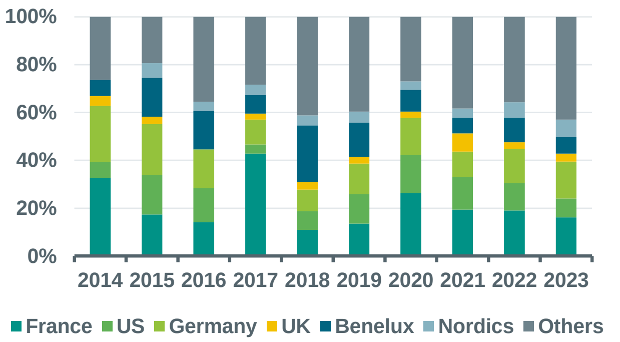
% of total



Source: Bloomberg, ABN AMRO Group Economics

Breakdown of ESG bond issuance by country

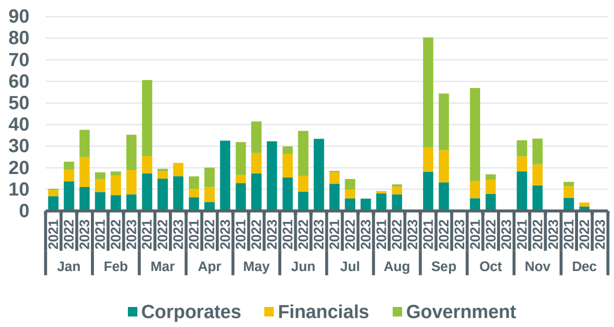
% of total



Source: Bloomberg, ABN AMRO Group Economics

Monthly Green Bonds issuance by sector

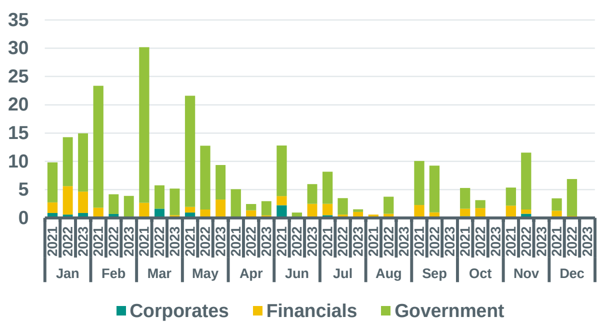
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Social Bonds issuance by sector

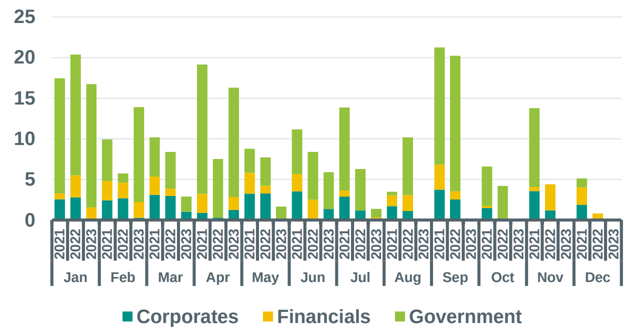
EUR bn



Source: Bloomberg, ABN AMRO Group Economics

Monthly Sustainability Bonds issuance by sector

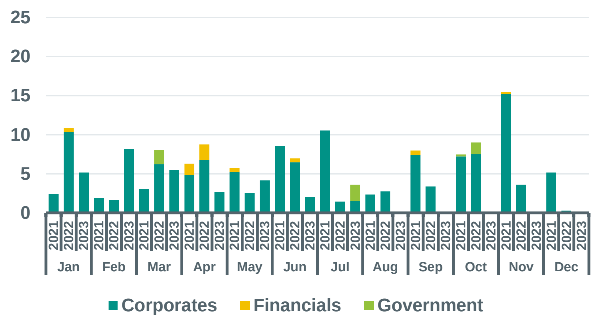
EUR bn



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.

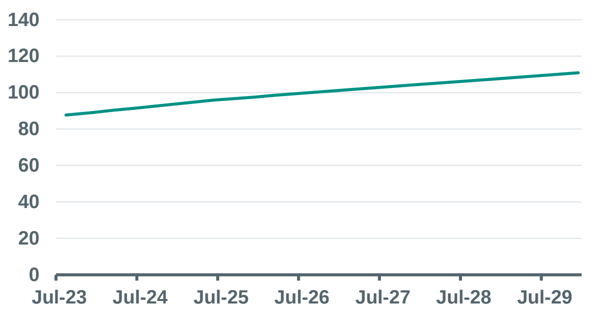
Carbon contract current prices (EU Allowance)

EUR/MT

Source: Bloomberg, ABN AMRO Group Economics

Carbon contract futures curve (EU Allowance)

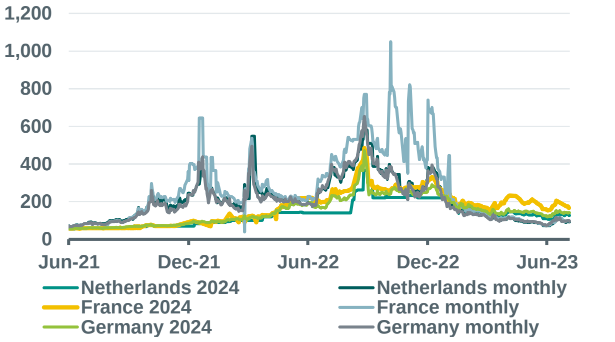
EUR/MT



Source: Bloomberg, ABN AMRO Group Economics

Electricity power prices (monthly & cal+1 contracts)

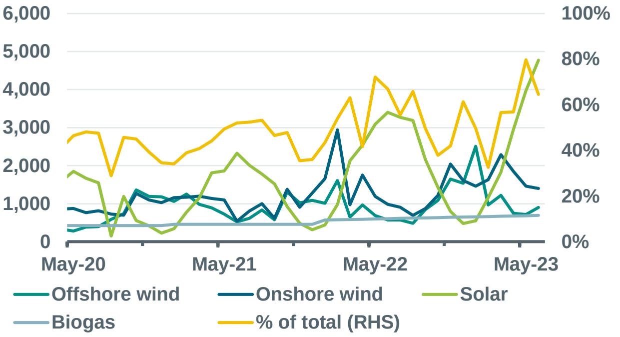
EUR/MWh



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

Electricity generation from renewable sources (NL)

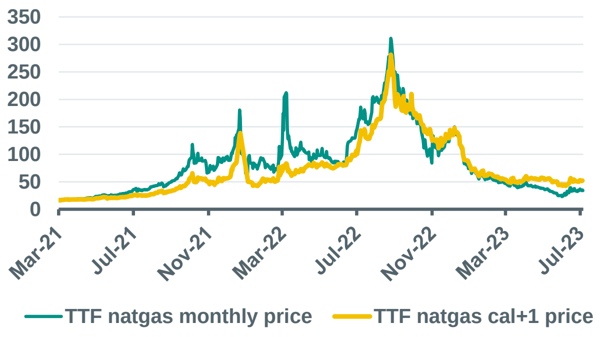
GW % of total



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

TTF Natgas prices

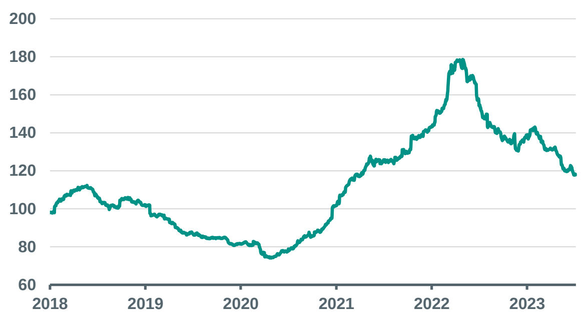
EUR/MWh



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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