

The Green Bond

Your insight into sustainable finance

07 April 2022



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War and Climate Risk

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Letter to the reader

As one of the effects of the sad and meaningless aggression of the Russian leadership in Ukraine, we see the climate discussion turning from an isolated challenge to an integrated part of a broader solution.

The need to ensure energy independence will, without doubt, speed up investments in energy efficiency (EE) solutions, alternative energy sources (nuclear included), as well as carbon storage models to reduce the damage of potential extending operations of coal. A likely boom in various carbon offset prices (all of them, listed as well as unlisted, and regulated as well as unregulated) is likely to be a consequence – basically making EE even more attractive to capture potential excess allowance and use it as a financing tool.

But the war also has other consequences. Our ability to raise awareness around climate change and chase broad solutions will be challenged without democracy. Hence, we need to focus on stability to guarantee our freedom to, jointly, address global issues like climate change, pollution, biodiversity loss, mass migration, water shortages etc. Consequently, it is my expectation that, as it happened with the pandemic, the investors' focus will change to include (or sometime even prioritize) different challenges. In this case, challenges brought by the war, such as migration (and integration) – not only from Ukraine but also due to hunger in the wave of disruptions in food supplies, employment - not only for migrants, but also as a result of lower consumption due to higher prices, interruptions in global trade, and lower production as a result of the need to adjust supply chains. The investment needed and jobs created on the back of

EE investment, alternative power investments and new infrastructure will be the solution for many of these challenges, or, in other words, climate and sustainable investments in themselves will stabilize the overall society.

Additionally, it is likely that a lot of investors will search for opportunities to invest in rebuilding what has been damaged and lost in Ukraine – and to help the Ukrainian people to try to move on.

As always, we have the privilege of having some external contributions: David Viner (a lead author of IPCC's adaptation report) and Rabia Shah from CGG providing reflections on the adaptation report, Lars Nilsson (a lead author of the newly released IPCC mitigation report) and Fredrik Bauer from Lund University, Lasse Pinderup and Helene Breinholt Søndergaard from KommuneKredit, on the financing of adaptation in Danish municipalities, and the EIB on the situation in Ukraine and the bank's swift move to support urgent liquidity needs in Ukraine to support food and fuel, as well as an outlook on how global lenders can support the move forward.

Last but not least, I want to say that our thoughts and hearts are with the Ukrainian people – and our hope is that this meaningless war will stop very soon.

Enjoy your reading,

Christopher Flensburg

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Transition update

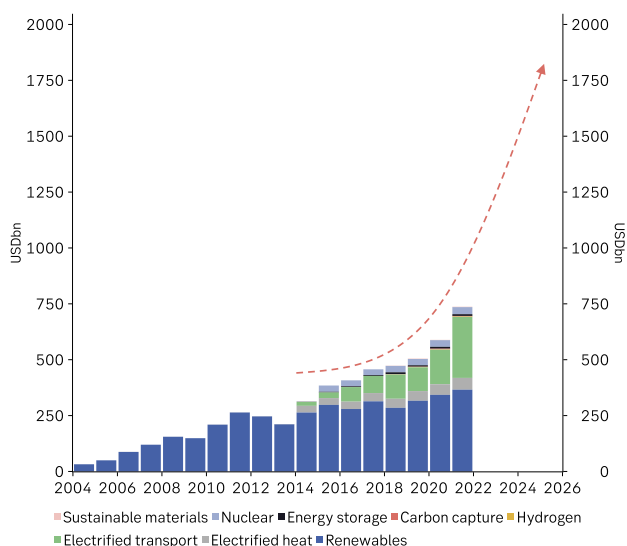
New transition speed limits

Heading into 2022 we were expecting transition investment to ramp up significantly. The war in Ukraine may at first delay the transition and increase emissions. However, looking further ahead, the push for energy independence adds one more catalyst for a faster transition.

How will war affect the transition outlook?

On the back of the energy shortages in second half of 2022 and spike in natural gas prices, we expected 2022 to be the first year where more than USD 1tn is invested across all transition segments, with renewable energy finally breaking a 10-year deadlock. However, since the latest issue of *The Green Bond*, events have once again delivered an upset to investment assumptions for 2022.

Figure 1 Investments set to soar



Source: Bloomberg New Energy Finance

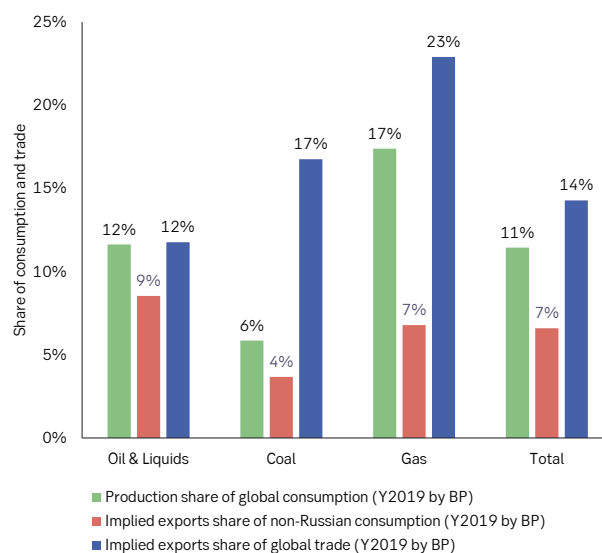
The night between 24th and 25th of February Russia invaded Ukraine. First and foremost a humanitarian tragedy with lives lost and starting a large flow of refugees into Europe. However, from an energy transition perspective this also changes the outlook, with different implications in the short and longer term. The reason is that Russia is the world's largest fossil energy supplier.

Short term effect is negative

As Figure 1 shows, across all fossil energy types, Russia alone covers 11% of global energy consumption.

This is particularly important in Europe, which gets 30% of all its energy from Russia. It remains to be seen how much of this supply will be reduced by war and sanctions. For now, Europe has carefully designed sanctions to allow contracted gas to continue flowing.

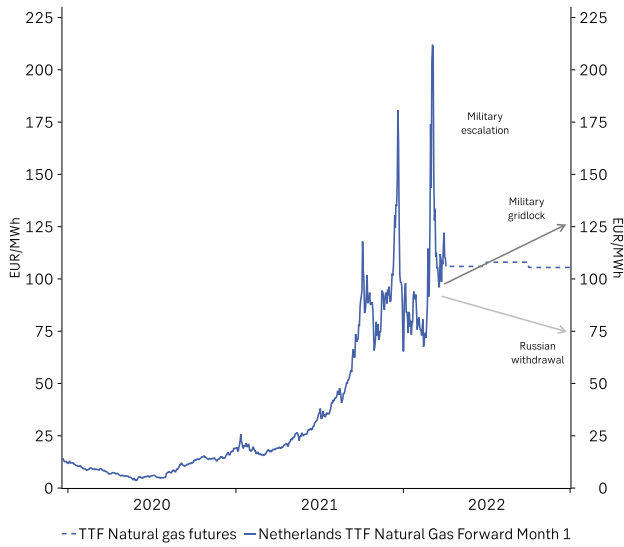
Figure 2 Russia – global energy supply



Source: BP

Markets initially priced what looked like a complete cut-off from Russian natural gas with European natural gas prices spiking above 200 EUR/Mwh but fell back as it became clear that sanctions wouldn't prevent Russian gas from coming to Europe. However, natural gas prices remain more than 5x higher than they were before 2021, and there is still a risk that the outcome ultimately may be a more complete elimination of Russian supplies to the rest of the world. The war will thus make it more expensive and difficult to get enough energy to support economic activity. This has a two-sided effect on the energy transition outlook.

Figure 3 European natural gas prices

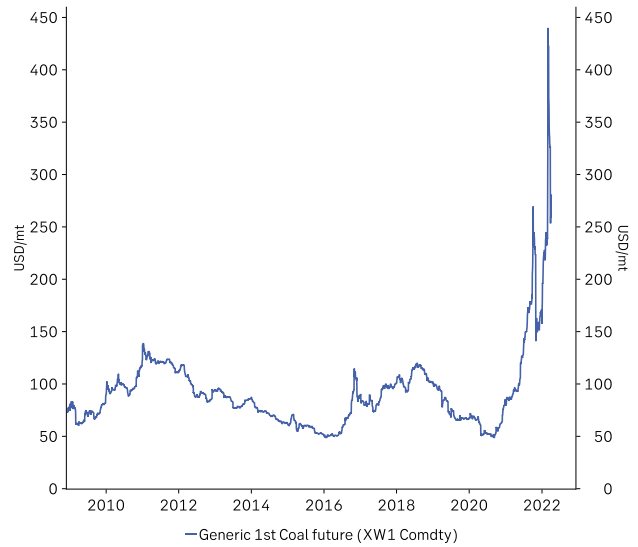


Source: Bloomberg

On the one hand, the loss of some and potentially all Russian natural gas supply means it is inevitable that more coal and oil will be used. Energy is a basic necessity, and if we do not have enough of it, getting enough of it will take precedence over all other policy objectives. Until we either restore Russian supply or expand significantly on the supply from other energy sources, politicians will realistically not be focussing on long term emission levels, but instead will look only at supply security.

This substitution effect is reflected in the surge in coal and oil prices, triggered by Europe's natural gas price shock.

Figure 4 Coal future

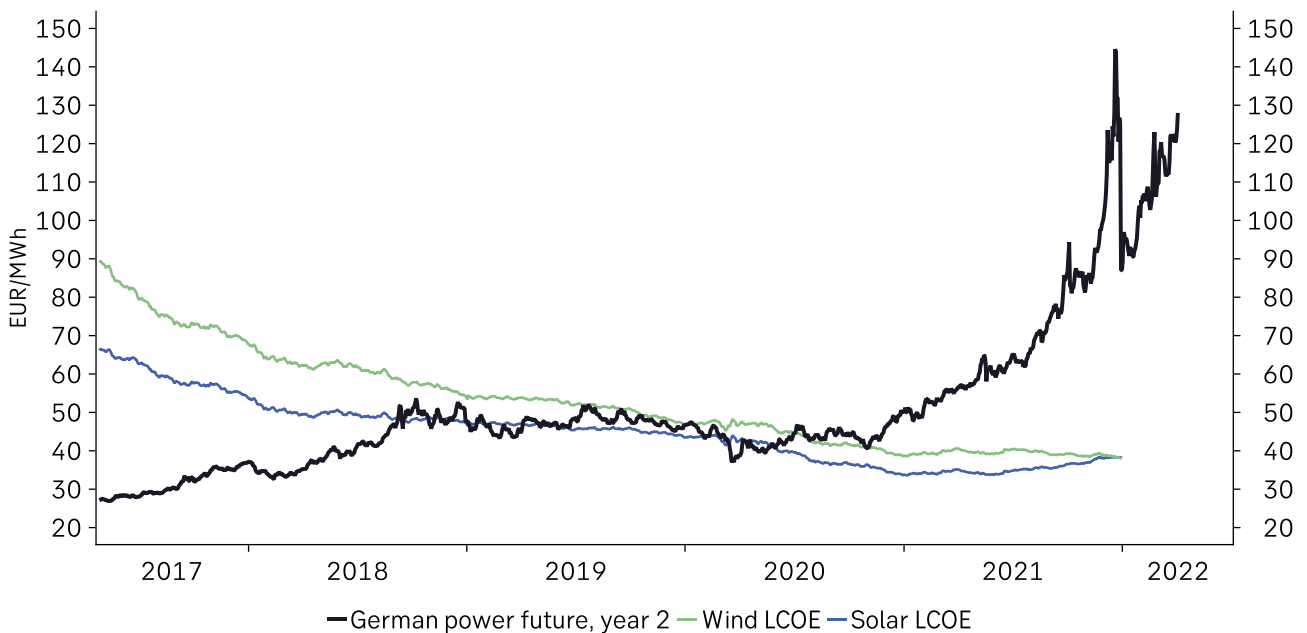


Source: Bloomberg

But at the same time the cost advantage for renewables is even larger now. As Figure 5 shows, European power prices two years into the future remain at almost 3x the level from before 2021. At the same time the levelized costs of energy (LCOE, total cost from cradle to grave), for solar and wind in Europe are below EUR 40 /MWh.

This means that while the short-term fix is fossil driven the only viable long-term solution is a combination of cheap renewable energy with some kind of low-emission backbone like nuclear power or massive storage.

Figure 5 Levelized cost of energy (LCOE)



Source: Bloomberg New Energy Finance, Bloomberg

This is to some extent a parallel to what happened in China during autumn 2021 when shortages of energy led China to vacuum the market for coal to provide a short-term fix. At the same time China ordered 150 new nuclear plants for delivery before 2035 and ramped up its investment plans for renewable energy at the same time.

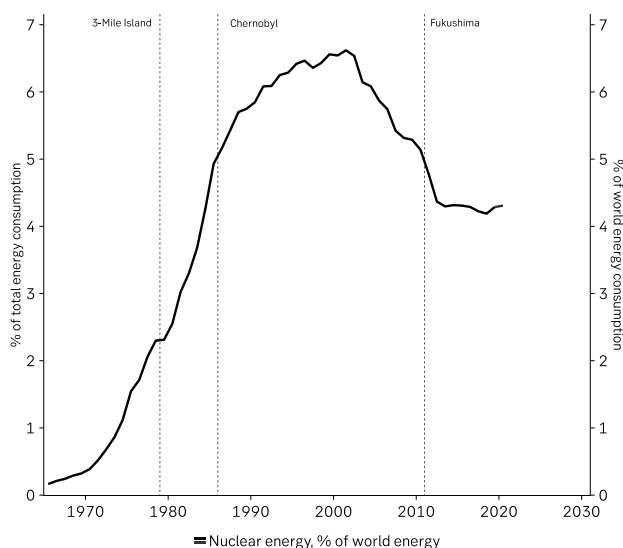
So, while the short-term effect of the war like the short-term effect of the pandemic is unequivocally negative from a transition and climate risk perspective, the long-term implications could well turn out to be exactly the opposite.

Long term impact is positive

Even though we will have to use more coal and oil in the next year or two to compensate for acute shortages as a result of the war, and this is likely to lead to higher CO₂ emissions in the near-term, in the longer-term it means that we now see the convergence of three powerful drivers for transition investment.

First of all, the political motivation for investing in renewables has changed following the invasion of Ukraine, which exposed Europe's vulnerability due to reliance on external suppliers of energy. In a short period of time, governments became willing to spend whatever it takes and removed all budget restrictions to secure energy independence and scaling up defence.

Figure 6 Nuclear s-curve



Source: Bloomberg

Energy policy has thus essentially become a part of security policy focused on securing energy independence. China has similar concerns and is actively working to reduce dependence on foreign suppliers. Renewable energy and nuclear power are the main sources of energy that are not dependent on access to fossil materials.

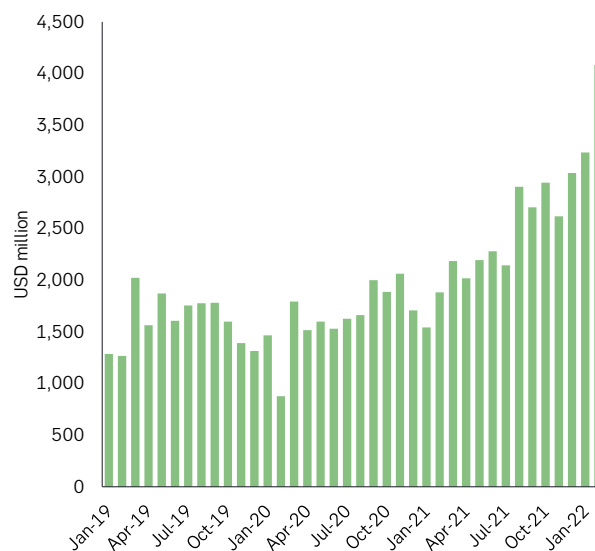
In contrast, the US is oversupplied with domestic energy, so in this region the second argument may carry more weight.

The economic case for renewable energy has also strengthened tremendously, following the supply shocks related to the war in Ukraine. The high cost of fossil-based energy relative to renewable energy means countries can significantly reduce the cost of energy by accelerating the transition. In an increasingly electrified world, access to cheap and reliable electricity supply is likely to be an increasingly important parameter for competitiveness.

As mentioned above, the total cost (LCOE) of renewable energy in Europe according to BNEF is less than one third of the market price for power. Given that high energy prices are imposing significant losses of spending power on consumers, this is likely to be an argument that carries substantial weight, also in the US.

The final argument for transition investment is the one that has been there all along: the need to prevent an irreversible climate disaster by reducing CO₂ emissions. According to the IPCC's latest report on *Mitigation of Climate Change*, 'it is now or never' if we want to stave off such an outcome. The report indicates that total GHG emissions must peak by 2025 to maintain the possibility of limiting temperature increases to 1.5 degrees. One might imagine that this threat would be the most pressing concern, however over the past decade it has become clear that it was not sufficient to overcome political reluctance towards spending money.

Figure 7 PV exports from China



Source: Bloomberg New Energy Finance

With security-related and economic arguments combining with climate risks the political resistance has been blown away. A massive investment increase was already underway, triggered by rising energy costs. Early data for 2022 shows a surge in China's export of solar PV equipment to the highest level ever (Figure 7), in line with our expectation that total transition investment could

surpass USD 1tn in 2022. Adding in the security argument for increasing energy independence, we expect this trend to strengthen further in the coming quarters.

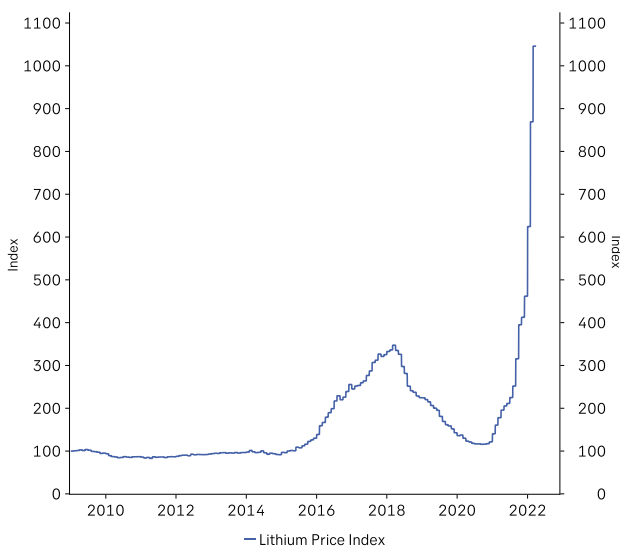
Looking further ahead this increased political commitment is also likely to keep the door open for full decarbonization by 2050. According to the IPCC, for that to be realistic, annual global investment in electricity generation must on average in the coming eight years be 2-5x or around USD 800bn higher than today. For transportation, investment will need to be 7-8x or USD 1000bn higher than today. Investments in energy efficiency will need to be 2-7x or USD 500-1500bn.

Our forecast of investment exceeding USD 1tn in 2022, which implies a doubling in less than five years, will thus have to be followed by another doubling in the first half of this decade and a third doubling in the second half to more than USD 4tn per year. From a pure spending perspective, this no longer looks unrealistic. However, the question is whether it is physically possible.

Physical speed limits for transition

The challenge is a classic economic problem: the faster the transition, the more expensive it will be. Even if governments are willing to pay for wind turbines, solar panels, grids, batteries and other infrastructure, they also need to ensure there is enough physical material to build it with. Energy transition is highly resource intensive requiring a range of inputs from steel through copper to lithium. Most of these are currently relatively scarce resources following a decade of underinvestment.

Figure 8 Lithium price



Source: Bloomberg

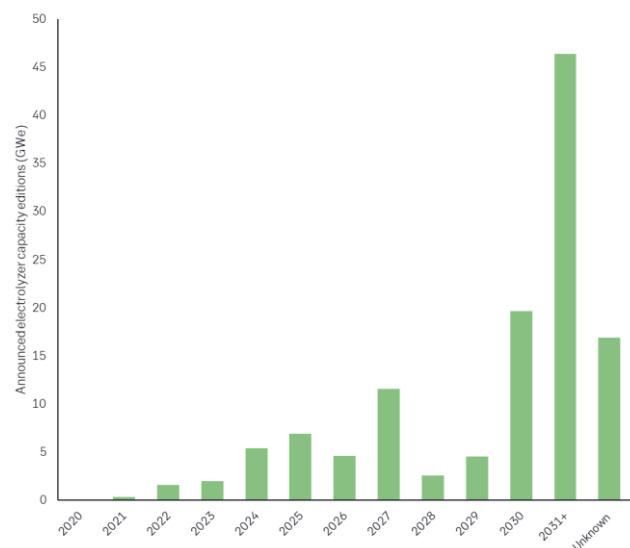
Prices of key inputs were already rising in 2021, but this was amplified by the war in Ukraine, because both Russia and Ukraine are important suppliers of materials. We have

already seen a surge in the price of lithium, steel, nickel, and other key inputs. At the end of the day the speed of the energy transition will thus be decided by the availability of physical resources needed to facilitate the shift towards a zero-carbon society.

If we were to try to install 4x as many wind turbines already next year, we would not have the physical inputs or the factory capacity to meet that demand. As a result, we can only increase investment in a new energy system at the same pace as the supply of natural resources and production capital increases. This means that faster transition will require substantial secondary investment in mining, metal production and factories.

There is also a circular argument, because the same increase in energy costs that is making renewable energy more attractive, also drives the price of production inputs higher as metal production in general is very energy intensive.

Figure 9 Announced hydrogen investment, GWe



Source: Bloomberg

Apart from the direct investment in energy production the new energy system will require substantial investment in storage and/or more stable electricity production like nuclear. Green hydrogen is an obvious candidate when it comes to replacing Europe's natural gas supply because it can work using the same infrastructure. However, even if you have plenty of green electricity, scaling up green hydrogen production and driving down the costs will require additional resource intensive investment. As Figure 9 shows, investment plans are already being drawn up for this purpose, but there is room for upside in the second half of the decade.

Finally, electrification itself is likely to require a rapid replacement of all the capital equipment that currently uses fossil fuel as input.

In coordination with the expanded clean electricity supply, energy users must at the same pace invest in more zero-emission production capital. By the time that the supply of green hydrogen or ammonium reaches the market, the supply of hydrogen or ammonium powered ships should also be ready. If it is ready sooner, it will have no available green fuel. If it is ready later, there will be no takers for the increased supply of green fuel.

The problem is that both investment in renewable energy supplies, mining capacity and new factories is a lengthy process that requires a long lead time. As a result, a long-time horizon in the planning process is required.

A new regime to boost transition

All of this means that while the political regime change opens the way for a faster transition, achieving such an outcome will require large and coordinated investments across many sectors, not just energy producing sectors.

It is also increasingly clear that the new speed limit for the transition progress is physical more than political or financial. The investor community has been ready to fund transition for years and after the energy shortages of 2021 and the shock from the war in Ukraine in 2022, the political commitment is no longer likely to be in doubt.

However, it is also clear that if you ramp up investment faster than supply can keep up the result will be bottlenecks and a much more expensive transition as the cost of renewable energy infrastructure increases.

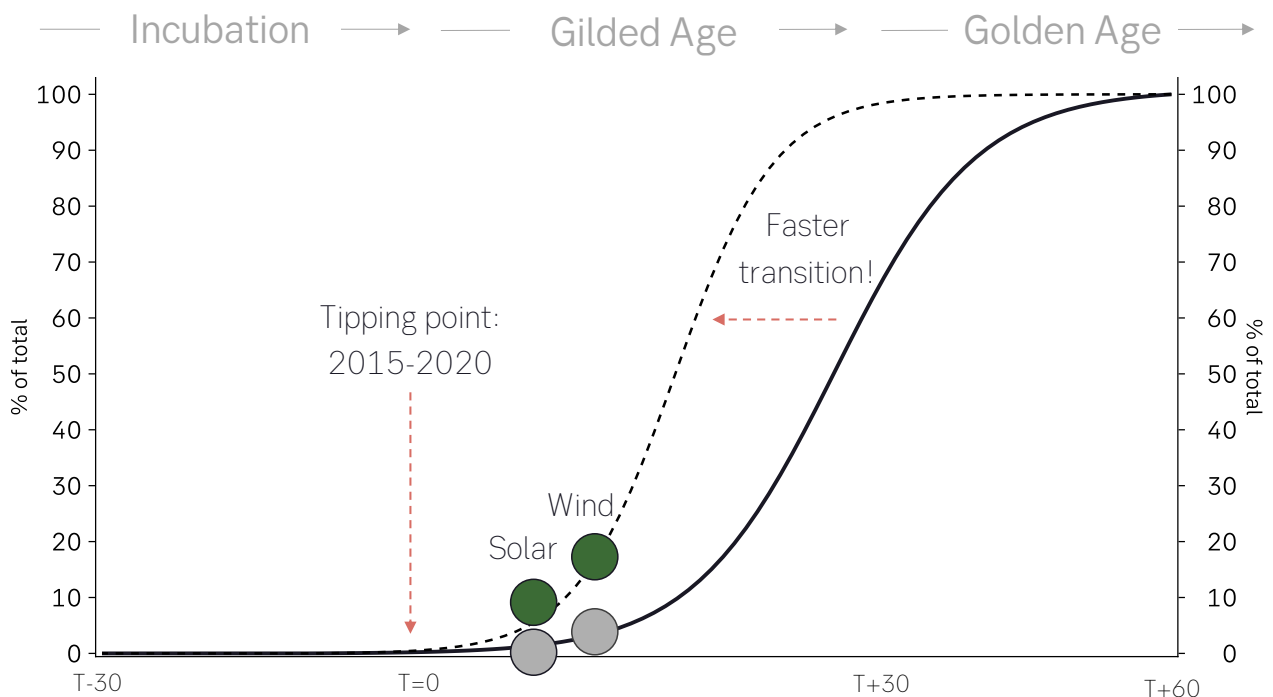
The optimal strategy would be to coordinate the two types of investment. Early political commitment to long term energy investment plans will allow markets to assess and price the needed supply expansion while there is still time to adjust production capacity, both for suppliers of input to the energy infrastructure and for energy users needing to replace fossil-based capital equipment.

From a market perspective, such an increase in the future supply is only likely to materialize if the current supply is extremely profitable. This suggests that we should expect high margins to be persistent in mining and materials, energy production and the supply of machinery and equipment across the electrified value chain over the coming 10-20 years.

This is complicated, but at least the commitment to a long-term strategy of reduced energy dependency means more clarity for all involved about when to expect the shift in energy to materialise. With relative cost of clean energy likely to decline, certainty about future supplies should also serve as a strong incentive investment in electrification in the private sector. As for miners, a high long-term price is probably the only effective driver of increased investment.

Taking all of the unusual shocks of the past few years into account, we are therefore still convinced that the world is about to embark on a secular investment boom that at least will keep the door open for keeping the temperature increase below 1.5°C

Figure 10 Shifting to a faster transition S-curve



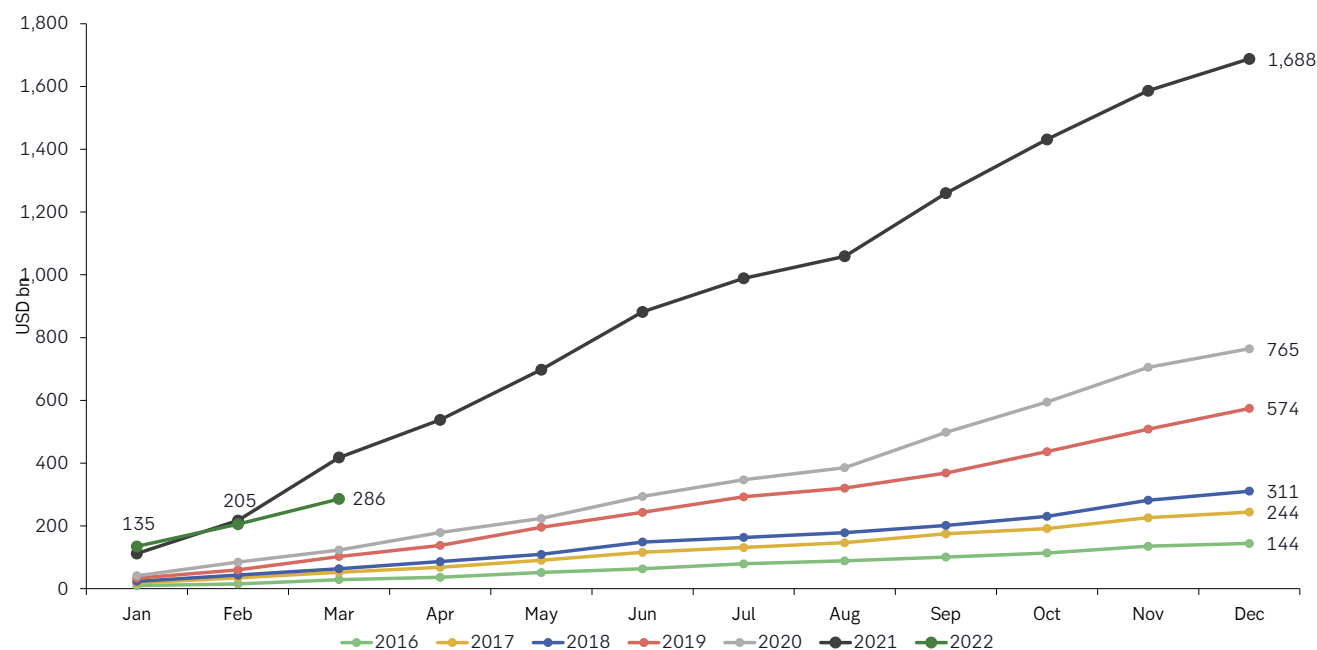
Source: SEB

Sustainable Market Update

A challenging start to 2022

The first quarter of 2022 has seen the first decline in sustainable debt issuance in six years. This is likely to be a temporary reaction to geopolitical turmoil, but there are also signs of a change in the pricing of sustainable assets. For bonds, lower 'greeniums' reflect lower realized returns and higher realized risk. In equities, the clean energy index has de-rated after what looks like a liquidity bubble, but still looks expensive. We think this is a healthy repricing to more realistic assumptions about future returns.

Figure 11 Cumulative sustainable debt transactions



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

The first quarter of 2022 has seen the first year-on-year decline in sustainability debt transactions since at least 2016. According to preliminary figures reported until 1 April, a total of USD 255.9bn in new labelled bonds and loans were transacted in January to March 2022 compared to USD 416.3bn in the same period last year (-32%).

Green bonds slightly outperformed this trend falling only 11% short of Q1 of 2021 whereas social bonds plunged 64%. Sustainability and sustainability-linked bonds, however, improved in Q1 compared to the same period last year by 16% and 119%, respectively.

There is little doubt that this setback is related to a sharp increase in geopolitical risk.

Several new sustainable bonds have been put on hold or delayed since the outbreak of the war in Ukraine due to uncertainty about market pricing. Just like during the first months of the pandemic in 2020, governments have been preoccupied with short-term damage control rather than long-term planning.

We expect sustainable debt to see renewed growth in the coming months as the shock recedes and the need for social funding becomes clear. More importantly, the war also amplifies the ever-increasing economic and political arguments in favor of a rapid transition to renewable energy and thus suggest that the need for sustainable finance funding will pick up rather than slow down.

New sustainable bonds: lower 'greenium'?

Notable new issuances

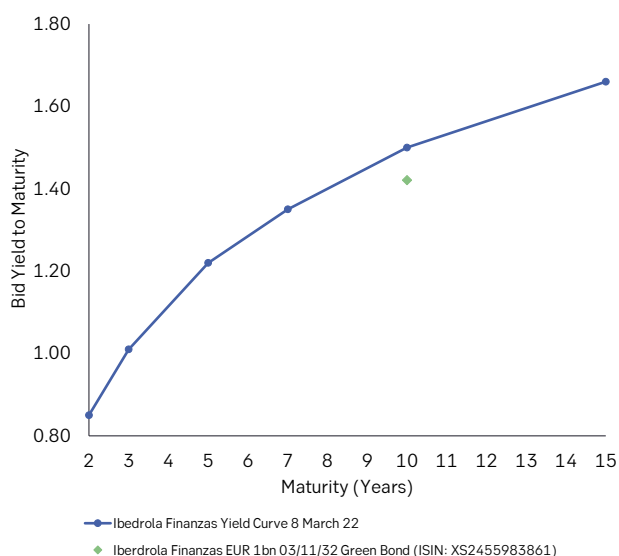
On 22 March the Government of Canada launched its inaugural Green Bond, raising CAD 5bn for a 7.5-year maturity. With a yield at issue of 2.311%, this equated to a "Greenium" of around 2 basis points relative to the CAD curve at time of pricing. Initial price guidance was indicated at 2.5bps vs the Canada government curve and orderbooks surged to a peak of CAD 12.5bn before the final spread was set, meaning some investors dropped out. According to the issuer, ESG investors represented 72% of the buyers, with 45% of the bonds allocated to international investors.

The bond has performed well in the secondary market and as of 29 March is trading close to 4bps inside Canada's conventional curve. This aligns well with the pricing of Denmark's green bond, issued at a 'greenium' of around 6bp and now trading at 3.5bp below its conventional twin.

Outside the sovereign market, recent issues from European utilities suggest that the 'greenium' is starting to disappear.

First, Iberdrola issued a EUR 1bn green bond with a 10-year maturity on 8 March. With demand exceeding EUR 3 bn. bond was traded with a yield of 1.421% at issuance. This compares to an expected yield of 1.50% based on the interpolated yield curve of Iberdrola. This means that Iberdrola's latest green bond was issued at a 'greenium' of 8bps for the issuer.

Figure 12 Iberdrola's new green bond and yield curve as of 8 March 2022

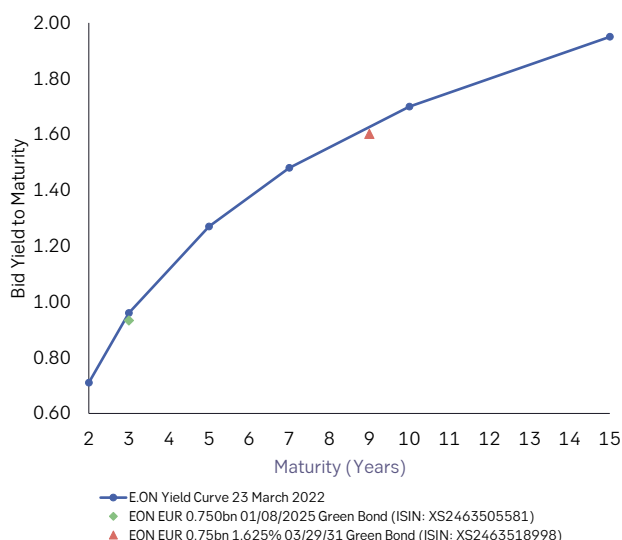


Source: Bloomberg

Second, E.ON issued two green bond tranches with a combined volume of EUR 1.5bn on 23 March. The two tranches were equally split between a EUR 0.75bn green bond maturing in January 2025 with a yield at issuance of

0.933% and another EUR 0.75bn green bond maturing in March 2031 coupon of 1.625% with a yield at issuance of 1.602%. The difference in yield at issuance to the expected yield based on E.ON's yield curve was 3bps for the 3 year-bond and around 4bps for the 9-year bond. Thus, E.ON was able to sell its bonds with a slight discount.

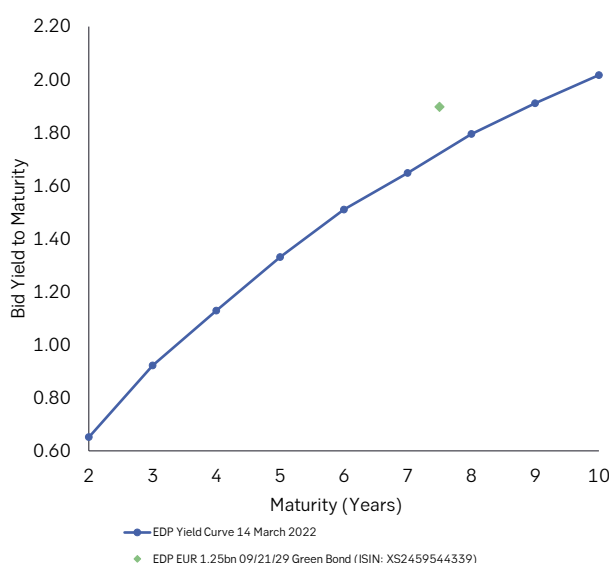
Figure 13 E.ON's new green bond and yield curve as of 23 March 2022



Source: Bloomberg

Third, EDP issued a EUR 1.25bn 7.5-year duration green bond on 14 March. The bond was sold with a yield of 1.897% at issuance. Unlike Iberdrola and E.ON, EDP's most recent green bond was priced above its yield curve which would have predicted a coupon of 1.726%. This means that EDP sold its bonds at a considerable premium of 17bps.

Figure 14 EDP new green bond and yield curve as of 14 March 2022



Source: Bloomberg

Thus, it appears that there is less willingness from investors to pay higher price for a green bond with the same default risk as a regular bond from the same issuer.

Green Bonds shouldn't have a 'greenium'

The lower 'greenium' on some recent issues suggests investors are starting to rethink the pricing of green bonds relative to their conventional siblings.

A recent whitepaper from ICMA, *Searching for Greenium*, notes that 'the similarities in the mechanics and profile of green bonds suggest that they should be pari passu with non-green bonds of an identical issuer, seniority, and optionality' or in other words, there should not be any 'greenium' at all in theory. However, they also note that 'this principle of equivalence and assumed flat pricing does not always hold in practice'.

This may be because a rising share of the investor community, notably the sustainable investor community, cannot access the conventional bonds due the restrictions they impose on their investment set. If the share of investors with this preference rises faster than the 'green' share of issuance, then an imbalance between supply and demand could lead to a higher price for the green asset.

However, if this is the case, then those investors are also bound to receive a lower return if they hold the bond to maturity. And at some point, the supply of green bonds will catch up with demand.

Figure 15 Total return, global bond indices



Source: Bloomberg

As the market matures, we are thus likely to see prices converge between green and conventional bonds with similar risk. This would also lead to the result you can see in Figure 15: excess returns for green bonds at the index level will disappear over time as pricing becomes tighter.

Over the past year, the Bloomberg Green Bond Index has given back five years of excess return to trade even with the Bloomberg Global Aggregate Index.

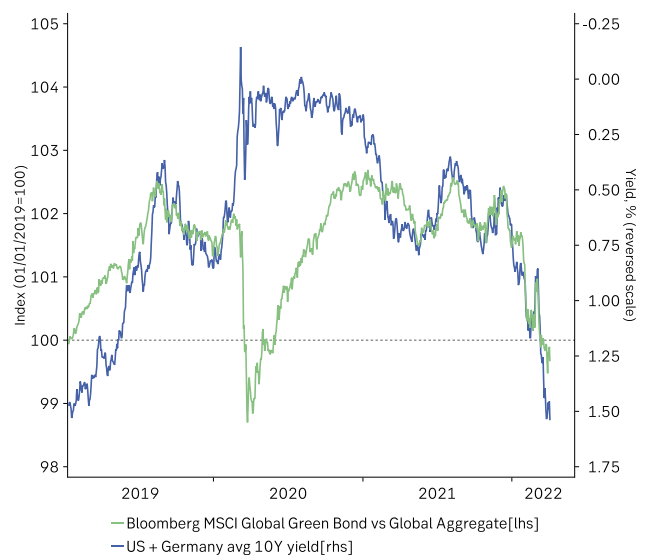
Figure 16 Modified duration, global bond indices



Source: Bloomberg

When you are comparing indices, it is important to adjust for basis effects. In the individual issuer analysis, you can use an interpolated yield curve for the same issuer. In the Green Bond Index, you cannot be sure that it has same duration or credit rating as the regular index. In this case, a longer duration for the Green Bond Index may help explain some of the relative return patterns. As you can see in Figure 16, a duration gap opened up from 2019-2021, and this means Green Bond Index relative return was supported as long as long yields were falling.

Figure 17 Relative return and bond yield

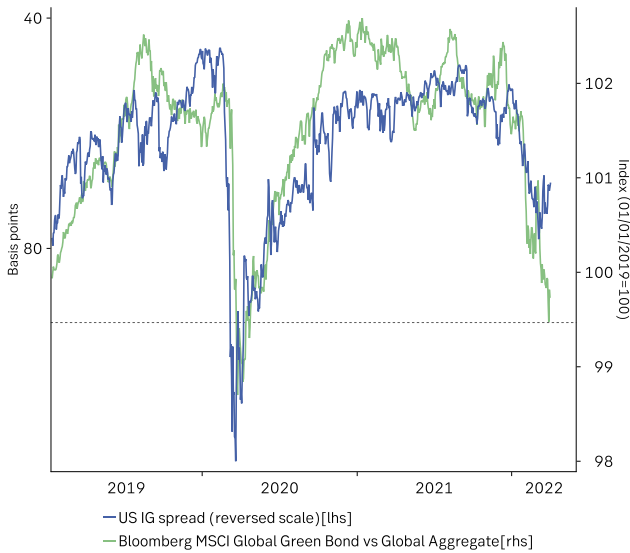


Source: Bloomberg

The close link is evident in the last part of Figure 17, which shows a close correlation between changes in long government bond yield levels in Europe and the US and relative return for the Green Bond Index.

This is not the whole story, however. If you look at the shock in 2020, the correlation was the other way around the Green Bond Index underperforming even though long yields were falling.

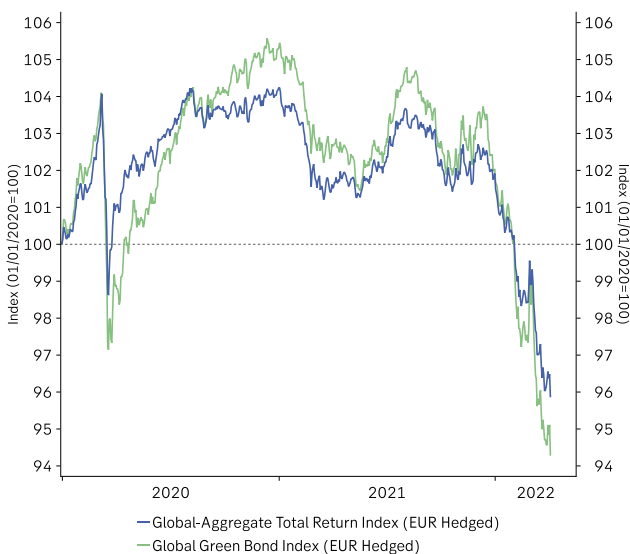
Figure 18 Relative return and credit spread



Source: Bloomberg

Figure 18 suggests there is something else going on, as the relative return for the Green Bond Index appears to be negatively correlated with credit spreads across the whole period. This suggests the Green Bond Index is not a 'quality' index, but rather contains an element of elevated risk, maybe due to the lower liquidity they tend to offer, which can be a problem particularly during credit risk sell-offs.

Figure 19 Total return, global bond indices



Source: Bloomberg

In any event, the result is that the Green Bond index now has underperformed during the last two major selloffs for the broader bond market index. This weakens the only fundamental argument for a 'greenium' for bonds with same default risk. If Green bonds were less volatile during selloffs, then that could in principle justify a higher price and a lower long-term return. However, for now it looks more like the opposite is the case.

Pricing in equities: the 'greenium' is too high!

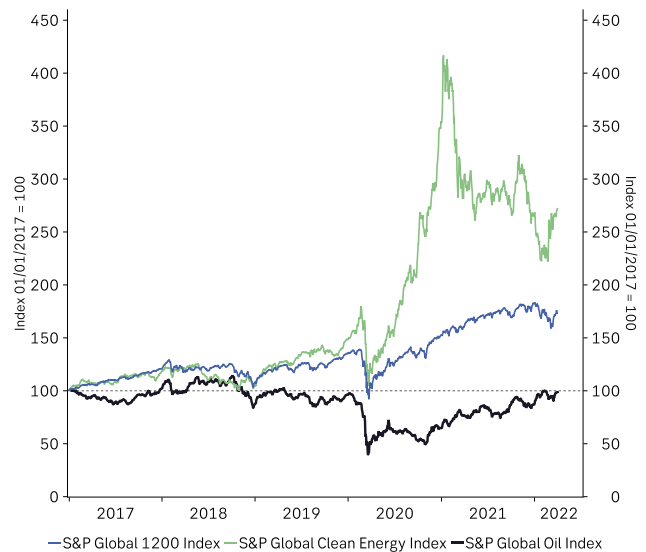
Clean energy index stabilizes after rout

The surge in energy prices has helped stabilize the S&P Global Clean Energy Index after a boom-bust cycle. The Clean energy Index (which includes Nordic companies Vestas, Orsted, Scatec and NEL) first quadrupled from its post-pandemic low in the space of nine months, but this was followed by a decline of almost 50% from its January 2021 peak by early 2022.

Relative performance bottomed in February and the Clean Energy Index has outperformed the S&P Global 1200 Index by almost 20% since the start of the war in Ukraine. This initial reaction is reasonable as the war is likely to lead to significantly higher investment in renewable energy production in the coming years. However, after the huge gyrations over the past two years, the question is whether clean energy stocks are a long-term buy again.

We do not think the post-bubble adjustment of valuation has completed and still lack evidence of the secular surge in earnings that would be needed to justify current valuation.

Figure 20 S&P Global, clean energy and oil indices



Source: Source: Bloomberg

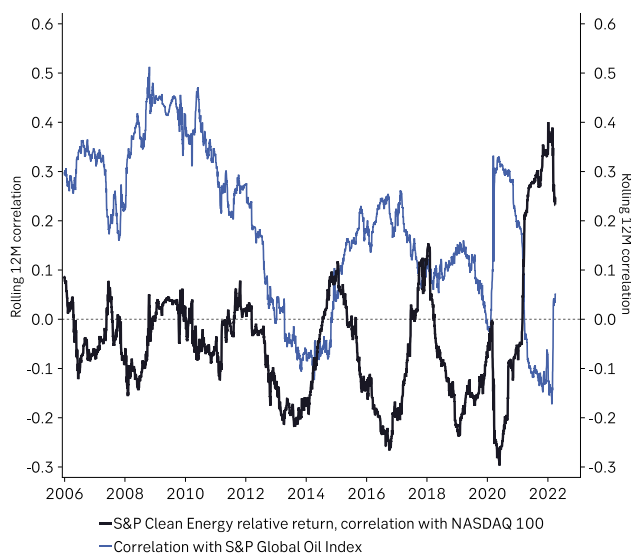
Normalization after liquidity bubble

In hindsight, there is little doubt that 2020 saw a bubble in the valuation of clean energy stocks, driven by a combination of factors that lifted growth stocks more broadly.

First of all, there was a surge in investor interest in sustainability, accompanied by hopes of a stock market valuation 'greenium' for companies that were helping to reduce climate risks. At the same time, markets overall were awash with excess liquidity, much of it in the hands of household investors with time to spare and little appetite for the extremely low interest rates offered by banks.

The result was that clean energy stocks became part of a broader re-rating of all growth stocks, reflected in a change in correlation patterns. The clean energy index has traditionally been correlated with the oil & gas sector, but in 2020 that correlation turned negative and the correlation with the Nasdaq 100 Index soared. These patterns have now started to normalize with the correlation to the oil and gas sector returning to positive.

Figure 21 Correlation patterns



Source: Source: Bloomberg

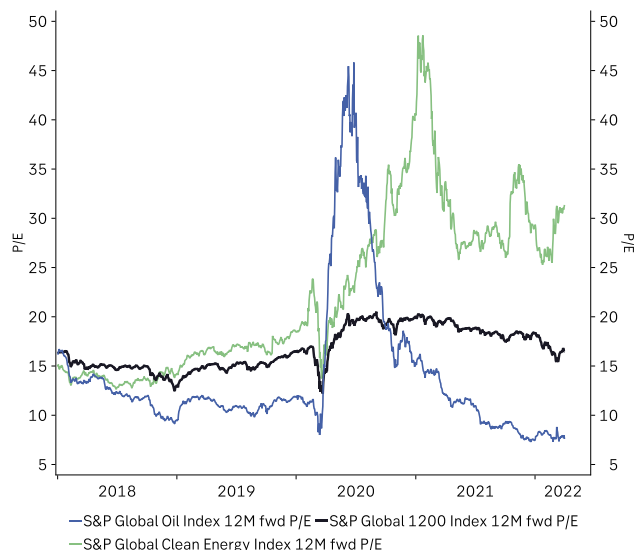
Valuation has not normalized yet

While relative returns have bottomed and correlation with the broader energy complex is turning positive, the valuation of the Clean Energy Index has not normalized yet. At the peak, the 12M fwd P/E reached almost 50 and the valuation premium to the S&P 1200 Index was close to 2.5x. This has since come down to just below 2x, but this is still relatively high, considering that before the pandemic there was no significant premium at all.

Within the broader energy segment, the S&P Clean Energy P/E is four times as high as the P/E for the S&P Oil & Gas Index. Clean Energy should probably command some

premium over Oil & Gas due to the higher long-term earnings growth during decarbonization, but right now, the prospect of higher real yields suggests the NPV of those long-term earnings could come down.

Figure 22 S&P Global, clean energy and oil fwd P/E



Source: Source: Bloomberg

Missing trigger: evidence of secular earnings lift

High valuations may ultimately turn out to be justified by a secular surge in earnings, driven by much faster investment in new energy infrastructure to gain independence from foreign supplies as well as the need to reduce emissions before a climate disaster becomes irreversible.

Figure 23 Clean energy index and 12M fwd EPS



Source: Source: Bloomberg

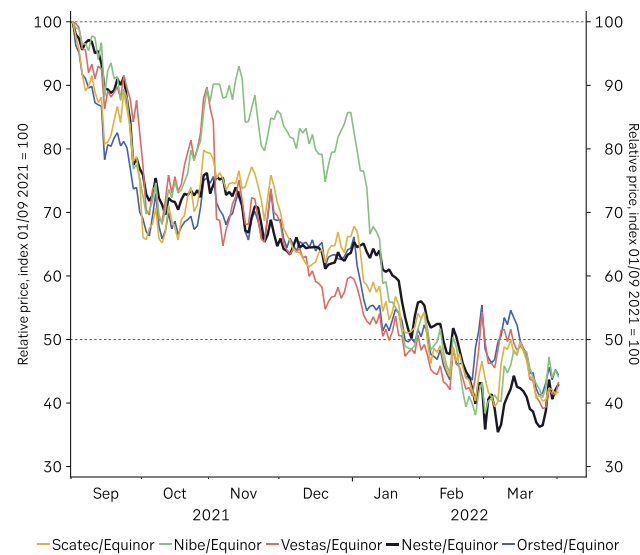
However, that is just speculation. In the real world, earnings expectations are rising strongly in the Oil & Gas Index, while the 12M forward EPS estimate for the Clean Energy Index has been drifting lower since the autumn with some companies like Vestas struggling to maintain margins while

production costs increase. As long as expected earnings are sinking for clean energy and rising for Oil & Gas, it's hard to argue for a big valuation premium based on superior long-term earnings growth.

Clean energy stocks in the Nordic market have also seen a significant derating in recent months. Relative to Equinor, the dominant Oil & Gas contender, clean energy stocks like Neste, Nibe, Orsted, Vestas and Scatec have all lost more than 50% since the start of September 2021. Is it time to have a second look?

Looking at the recommendations from SEB Equity Research, there seems to be a distinction between companies supplying equipment and facing higher supply costs and companies that produce energy. NEL and Vestas are both rated 'Sell' and Nibe is "hold", while Orsted, Neste and Scatec have a "buy" recommendation. This distinction makes sense in the stagflation environment we are currently in. If we were to see a more pronounced monetary tightening, it would probably be less meaningful.

Figure 24 Green stocks vs. Equinor performance



Source: Source: Bloomberg

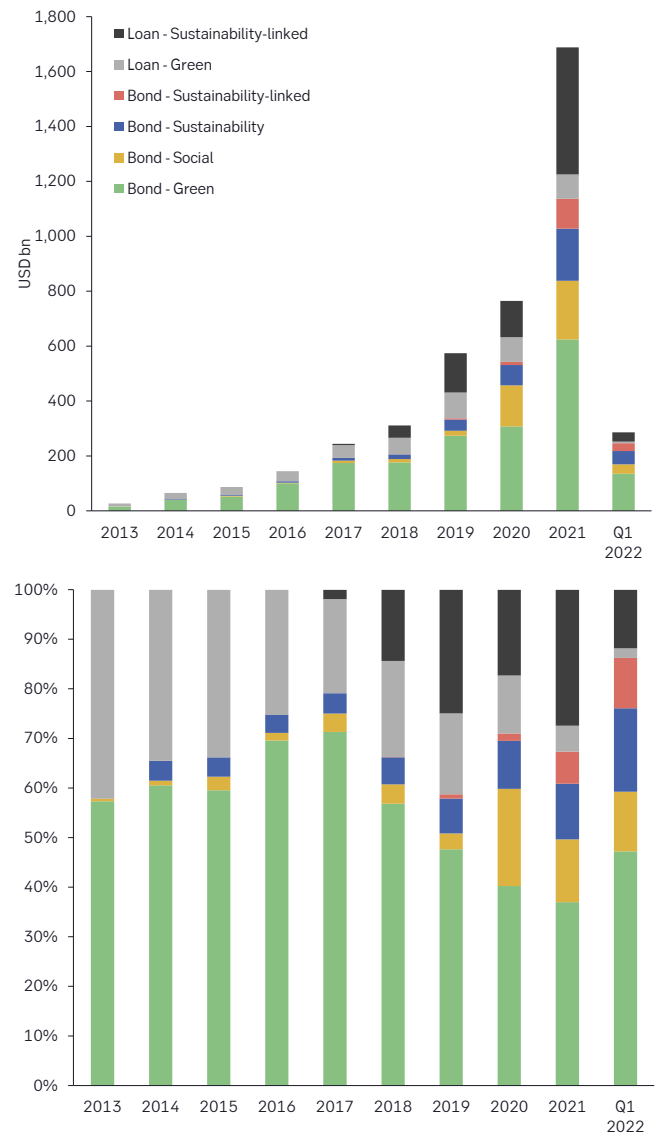
Sustainable-debt market update Q1 2022

Disclaimer: This analysis is based on preliminary data for March 2022 from the Bloomberg Terminal in addition to final data for January and February from Bloomberg New Energy Finance. We expect the record for Q1 to be higher when final numbers are available.

Product update

In Q1, sustainability-themed bonds saw an overall reduction in the volume of new issuances by 19% YOY down to USD 246.6bn. Green bonds slightly outperformed this trend falling only 11% short of Q1 of 2021 whereas social bonds plunged 64%. Sustainability and sustainability-linked bonds, however, improved in Q1 compared to the same period last year by 16% and 119%, respectively.

Figure 25 Sustainable debt market by product type



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

Performance in the labelled loan market is the main reason for the overall decline in sustainable debt in the first three months of 2022. The market for green and sustainability-

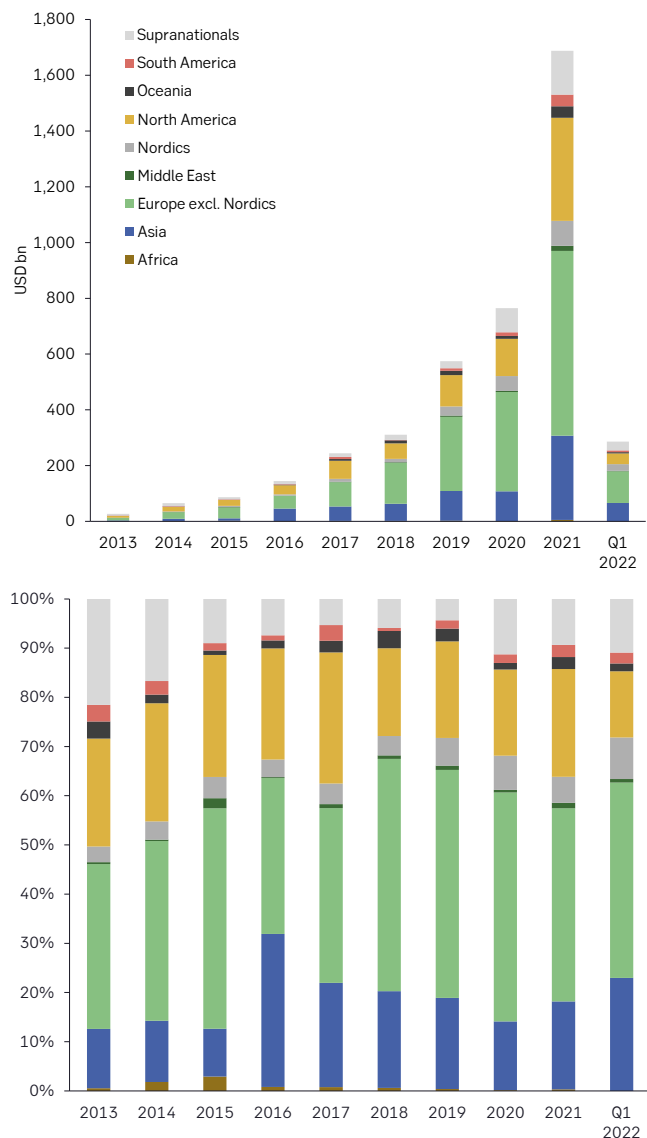
linked loans declined by a total of 66% compared to Q1 of 2021.

Partly because of the decline in labelled loans, green bonds have increased their overall market share to 47% in Q1 2022 compared to 37% in 2021. The share of sustainability-linked loans fell from 27% last year to 12% in the first three months of this year. Surprisingly, despite a sharp decline in new issuances, social bonds still account for 12% of the sustainable debt market – the same share it had in 2021.

Regional update

Looking at how different regional segments have performance in Q1 offers some important insights as to why the sustainable debt market has struggled in 2022. The largest decline in YOY transactions can be observed in Supranationals (-51%), North America (-46% YOY) and Europe excluding the Nordics (-32%).

Figure 26 Sustainable debt market by region



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

On the bright side, Asia was largely unaffected by the market contraction seen elsewhere with new sustainable bonds and loans totaling USD 65.7bn (-4% YOY). The Nordics also withstood the downturn trend with USD 24.2bn in new sustainable debt being raised in Q1 (-6% YOY).

Fewer issuance by supranational institutions in 2022 were expected given the declining need for funding to fight the pandemic. The decline in North America is largely due to a two-third drop in sustainable finance by financial institutions and the halving of new sustainable bonds and loans by corporates. In Europe, new sustainable corporate debt declined by 20% but the main culprit for the downward trend was the public sector which borrowed 55% less than in Q1 of 2021.

Corporate sector update

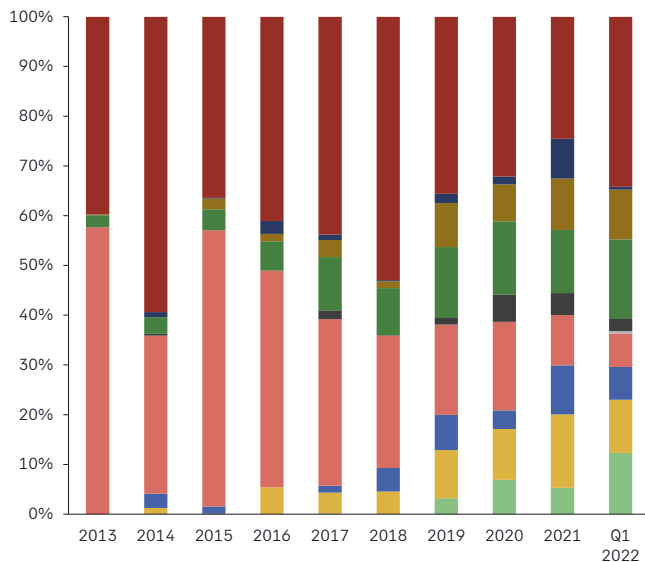
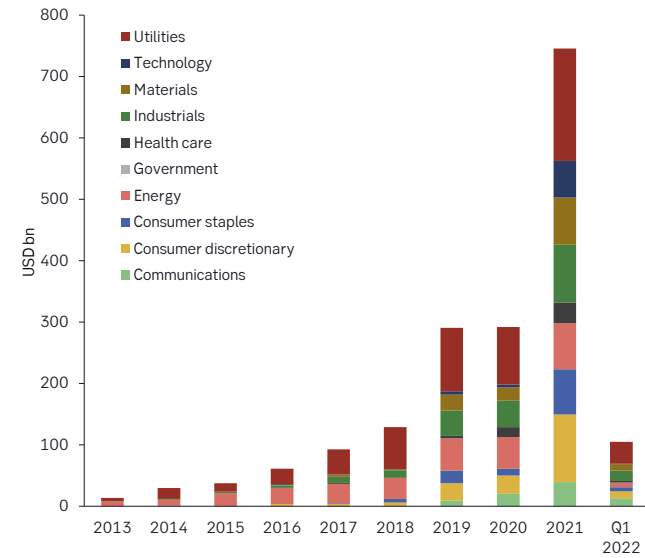
Corporate lending using sustainable debt instruments reached just USD 105bn in Q1 – a 33% reduction compared to the first quarter of 2021. However, a look at bonds and loans reveals that new corporate bonds have indeed seen a slight increase of 5% YOY reaching USD 74.9bn in 2022 so far. Corporate sustainable loans on the other hand decreased by 65% YOY to USD 30bn.

The technology sector saw the largest drop with 90% fewer labelled bonds and loans in terms of issuance followed by consumer staples which declined by 69% YOY.

Sectors which have held the largest market share were unevenly affected by the general decline in corporate sustainable lending. New borrowing by utilities and industrials which account for 25% and 13% of the market saw the volume of new labelled transactions only drop by 18% and 14% whereas sustainable borrowing from materials and consumer discretionary companies which account for 10% and 15% of the market dropped by 41% and 51% compared to Q1 last year.

Energy companies also reduced their sustainable borrowing by 55% compared to early 2021. This suggests that a lot of utilities, industrials and energy companies which have seen fossil fuel prices rise over the past six months have at least temporarily put their investments into renewables on hold.

Figure 27 Corporate sustainable debt market by industry



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

Use of proceeds

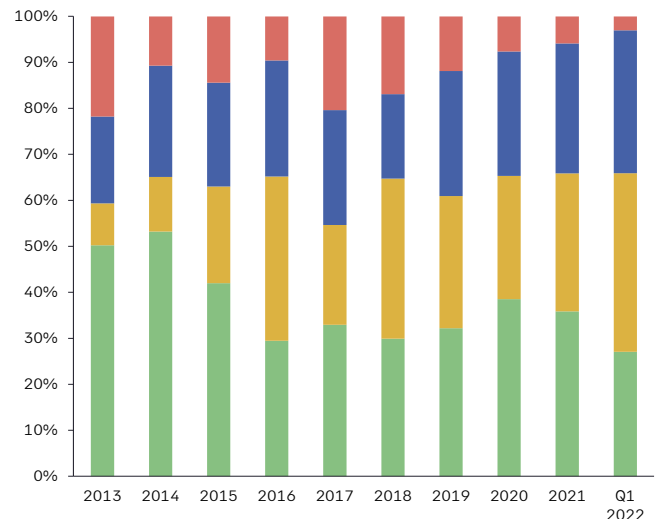
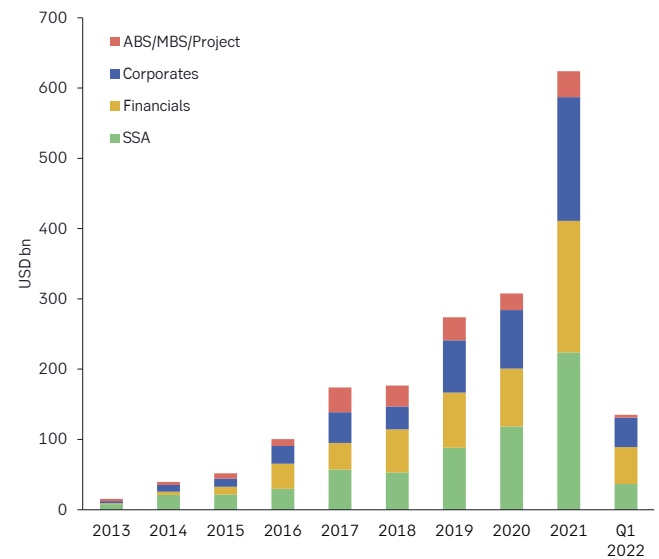
Green Bonds

New issuances of green bonds reached USD 135bn in Q1 of 2022, down 11% compared to last year. Responsible for this decline were the public sector and ABS/MBS/Project bonds which decrease by 28% and 63%, respectively.

A good indicator of the drop in public green bond borrowing is the EU: It followed up on its first and the world's largest ever green bond of EUR 12bn (USD 13.8bn) issued last October with a EUR 2.5bn (USD 2.83bn) green bond in January. Notably, the EU 10bn bond of the European Commission's second NextGenerationEU syndication for 2022 raised in late March was not labelled as green.

On the private side, corporates and financial institutions bucked the downward-pointing trend. Corporate green bond borrowing stagnated with USD 42bn in new issuance (-4% YOY) whereas financials increased their green bond borrowing by 12% to USD 52.5bn in Q1 of 2022.

Figure 28 Green bond market by sector

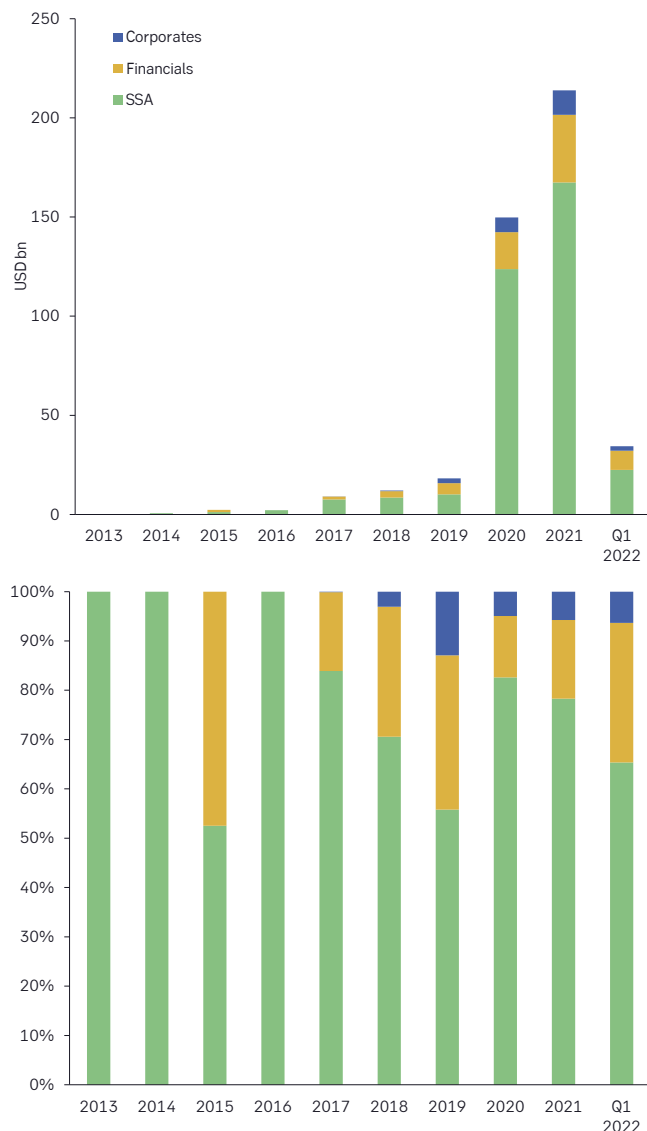


Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

Social Bonds

New issuance of social bonds by sovereigns and supranational institutions were down 73% on a year-over-year basis in Q1 of 2022. Supranational institutions cut the volume of new social bonds from US 45.3bn in Q1 last year to USD 5.3bn in the first three months of this year.

Figure 29 Social bond market by sector



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

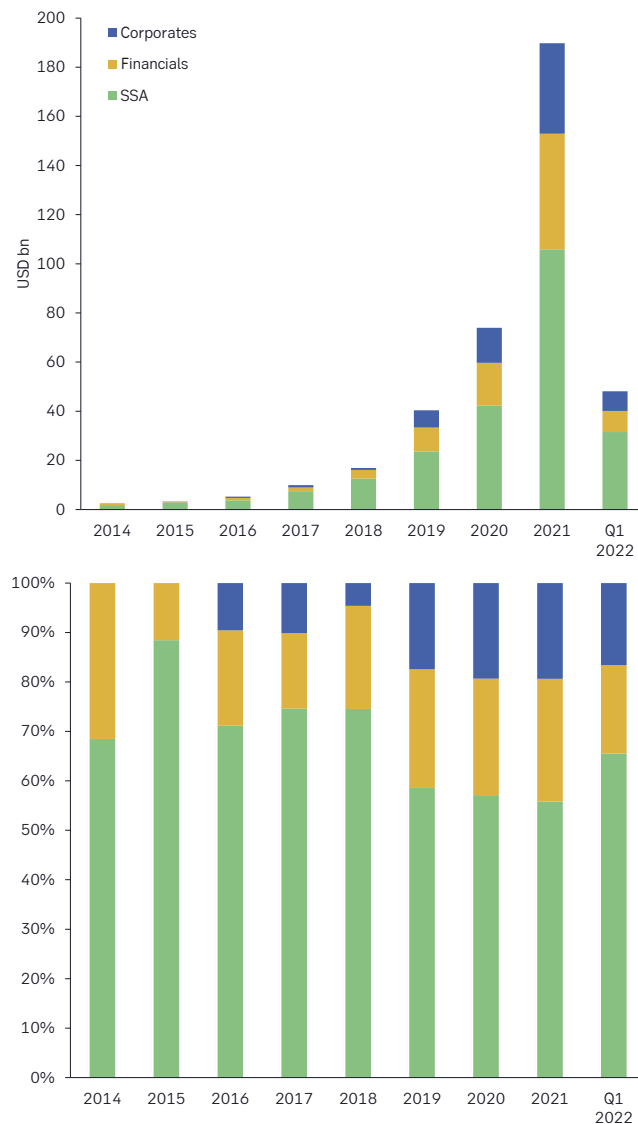
Responsible for the substantial decline in new social bond issuance is to a large extent the EU which did not raise any new social bonds in Q1 compared to USD 43.1bn in the beginning of 2021. This shows that supranational institutions have drastically downscaled they pandemic recovery funding.

With the Omicron variant taking an increasing toll in China and the war in Ukraine forcing supranational institutions to mobilize capital to address the refugee crises and – eventually – reconstruction, social bond issuance may recover in the remainder of the year.

Sustainability Bonds

Sustainability bonds is only one of two market segments that witnessed growth this year. New issuance totalled USD 48.1bn in Q1, driven – somewhat surprisingly – by a 65% YOY jump in transactions from the public sector.

Figure 30 Sustainability bond market by sector



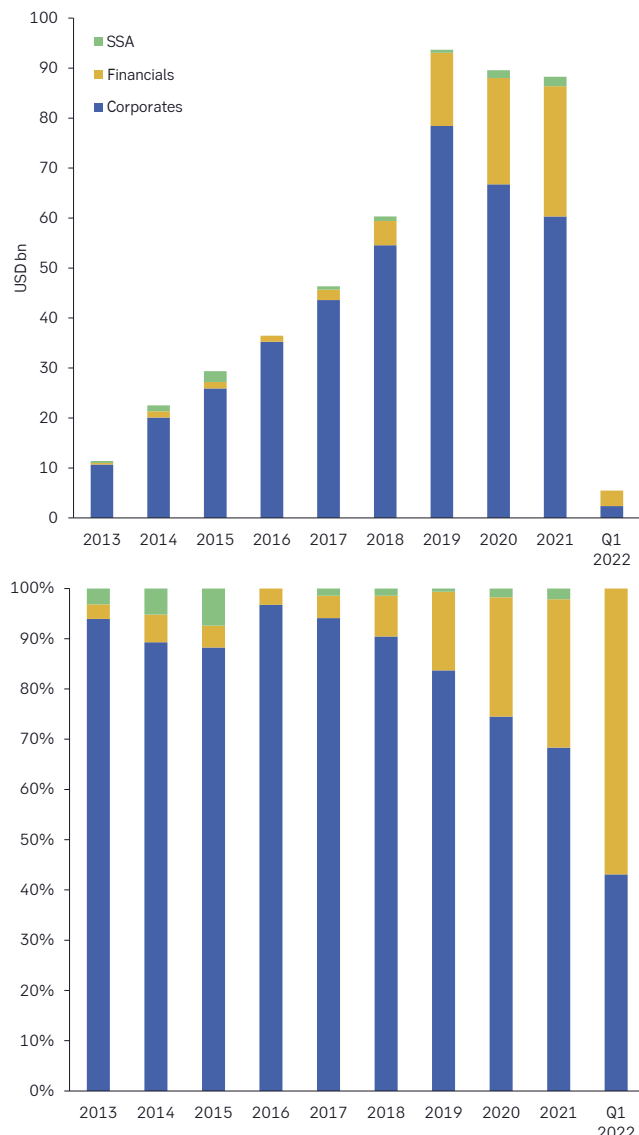
Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

Green Loans

Note on data: The green loan market is a private market with limited access to information. We use the loans listed in the Bloomberg Terminal and Bloomberg New Energy Finance which we think reflect the overall market.

The downward trend of green loans seems to have further accelerated in Q1. Green loan transactions contracted by 71% in the first three months of 2022 compare to the same period last year. While we would have previously suggested that part of the green loan market has been taken up by sustainability-linked loans, the fact that performance-based loans also shrank in Q1 points to the overall weakness of the sustainable loan market.

Figure 31 Green loan market by sector



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

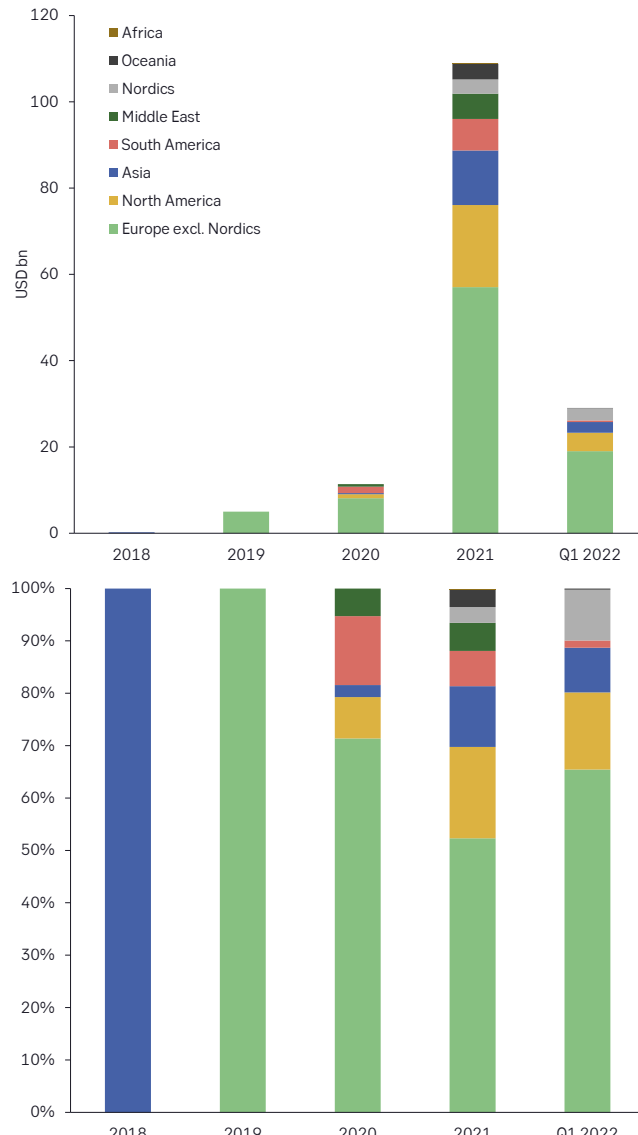
Performance-based

Sustainability-linked bonds (SLBs)

Sustainability-linked bonds are the other segment that refused to follow the market trend and instead record growth in Q1. A total of USD 29bn in new sustainability-linked bonds were issued in 2022 so far, up 118% YOY. Most of this growth was recorded in Europe with USD 19bn issued outside the Nordics and USD 4.3bn issued inside the Nordics each more than tripling the amount issued in Q1 of 2021.

Performance-based bonds also continued to increase in popularity outside of established European markets with North America and Asia recording USD 4.3bn (+52% YOY) and USD 2.5bn (+48%) in new issuances in Q1, respectively.

Figure 32 Sustainability-linked bond market by region



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

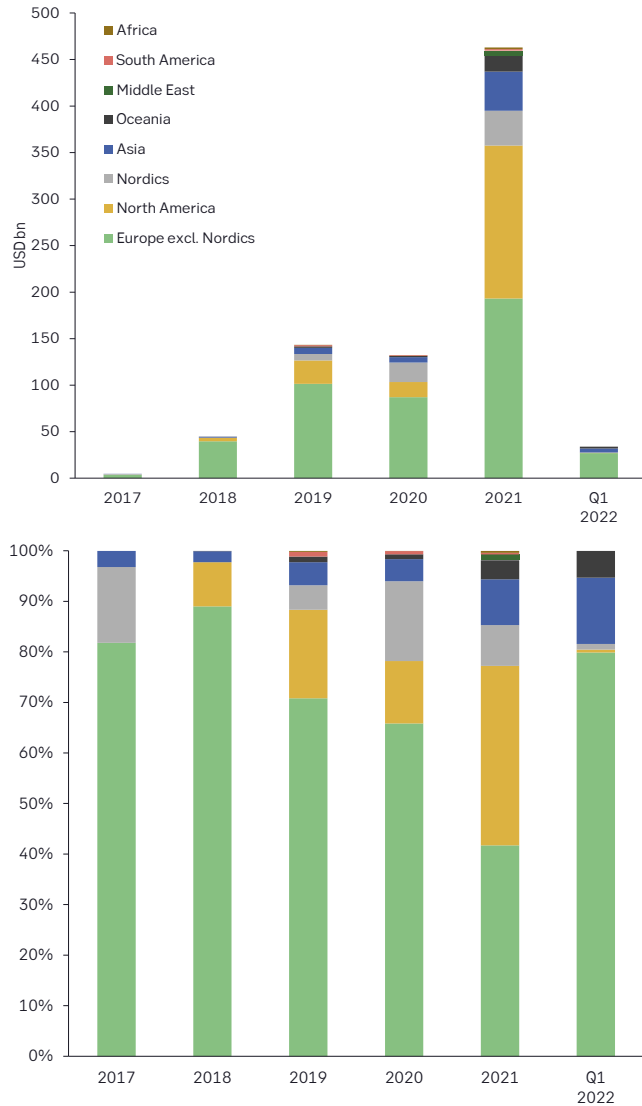
Missing from preliminary figures is a USD 2bn 20-year duration offering from Chile which is the world’s first sovereign sustainability-linked bond.

Sustainability-linked loans (SLLs)

Note on data: The green loan market is a private market with limited access to information. We use the loans listed in the Bloomberg Terminal and Bloomberg New Energy Finance which we think reflect the overall market.

While performance-based bonds continued to grow in 2022, sustainability-linked loans dropped by 65% compared to Q1 last year. However, we assume that a lot of deals have not been included in the preliminary numbers provided by Bloomberg.

Figure 33 Sustainability-linked loan market by region



Source: Bloomberg New Energy Finance and Bloomberg 31 March 2022

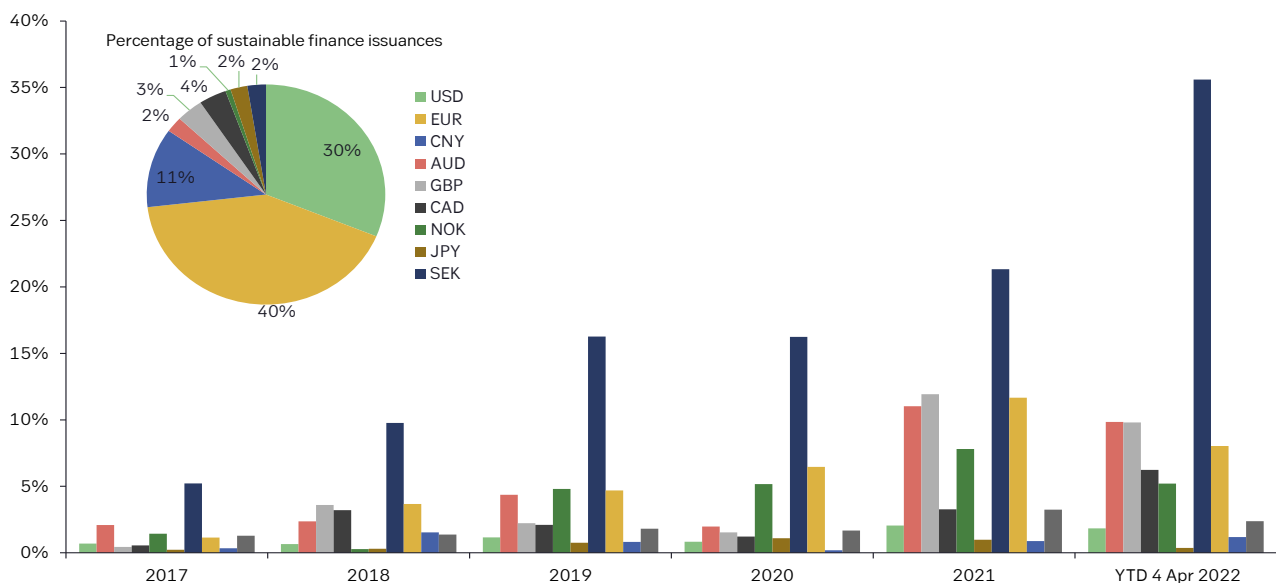
Currency analysis

Sustainability-themed use of proceeds and performance-based bonds accounted for approximately 2.4% of the global bond market in Q1 compared to 3.2% last year. The observed fall in new issuance of labelled bonds by 11% in the first three months of 2022 compares to a 30% drop in new issuances in the entire global bond market in the same period.

The absence of large new public issuance of social or green bonds in Europe has had an impact on the share of EUR-denominated sustainable bonds which fell to 8% in Q1 or 2022 compared to 11.7% in 2021. The same downward trend can be observed in other major currencies with the share of sustainable bonds in GBP and AUD again under 10%, and NOK-dominated bonds taking only 5.2% of its market.

However, labelled bonds also recorded gains in some currencies. The issuance of the Government of Canada inaugural Green Bond helped sustainable bonds to claim 6.2% of the CAD-denominated bond market in the first three months of the year. The SEK market continued to set new records, with green and social bonds taking more than a third of the market in Q1.

Figure 34 Green, social, sustainability and sustainability-linked issuances as % of total bond issuance



Source: Bloomberg New Energy Finance and Bloomberg 4 April 2022

The European Investment Bank stands behind Ukraine



Jean-Erik de Zagon
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In view of the tragic canvas of war taking in place in Europe, with a major conflict on its doorstep, the European Investment Bank (EIB) has instantly taken action to support Ukraine, in all areas of the economy, with its first support package of EUR 688mn to Ukraine.

A historic challenge

Today, we are facing an unprecedented situation in Europe, with the biggest refugee crisis since World War Two, taking place right in front of our eyes. To date, 10mn, out of 40mn Ukrainians, are fleeing, leaving their homes, family and friends, (and, sometimes, even their lovers?) behind to take up arms and fight the invaders. 3.6 mn Ukrainian refugees have fled outside its borders, mainly to Poland where more than 2mn refugees have fled. To stifle the war, the EU leaders are presently considering its fifth package of sanctions against Russia. This serious and historic state of affairs means that the EIB is continuously monitoring, and closely adapting to, the grave situation facing Europe. As we are a policy driven bank, standing behind the fundamental values of the EU, we react, and adapt, to the grand strokes of politics in Europe. We will be following the direction of our owners, namely the EU27 Member States, giving the strategic, political directions, and the European Commission, which is drafting the policy proposals in relation to the Russian invasion of Ukraine.

Consequently, the EIB will, in the following, briefly provide an overview of initial aspects of the war and the Bank's engagements to support Ukraine; first, the economic consequences and the need for the EIB's Solidarity Package for Ukraine. Secondly, on the focus on supporting those countries in the neighbourhood receiving the refugees, meaning the integration of refugees.

Economic ties with Ukraine

Firstly, taking a step back, it is important to note that the EIB and Ukraine have long standing relations, since the Bank has been active in the country since 2007. Currently, the EIB has committed projects in Ukraine for around EUR 7.5bn. Ukraine has been the main recipient of EIB support in the Eastern Neighbourhood, accounting for more than 60% of EIB lending activity in the region. The Bank has been focusing on social and economic infrastructure, transport and connectivity, local private sector development, energy efficiency, climate action and innovation.

In 2021, only, the EIB signed EUR 554mn new loans in the country. These have been focusing on e.g.: operational resilience of Ukraine's largest international airport; sustainable urban public transport in Kyiv; financing the ongoing modernisation of the country's Vocational Education Training (VET) system by establishment of some nine VET centres of excellence in up to nine oblasts of Ukraine; development of SMEs, which is a key objective of the EU's Economic and Investment Plan for the Eastern Partnership; modernisation of Ukraine's agriculture and food supply, one of the key sectors of the national economy.

To mention but a few, concrete and practical examples our support to Ukraine more in detail; the Boryspil airport development; the Ukraine Grain Storage and Equipment project; the repurposed EUR 50mn loans to assist the Ministry of Health to purchase Covid-19 vaccines, covering a significant of the needed amount for Ukraine's national vaccination plan and to support the country's health system, to be able to tackle the Covid-19 pandemic.

This plethora of key modernization projects in different sectors, demonstrates the already firm commitment of the EIB to support the Ukrainian government. Is all this now lost? Not necessarily. Even if infrastructures may have been destroyed, they can be repaired, or rebuilt. The contacts are there. The knowledge is there, which will make it easier and swifter to pick up where we left, and to rebuild what must be rebuilt, when that day arrives.

Given the clear EU signal and our previous commitments and steady connection to Ukraine, the EIB voiced its stance the day after the Russian invasion of Ukraine. In the words of the EIB President Werner Hoyer; “We stand ready to urgently mobilise further financial support to the country as part of a coordinated EU and international response to this unprecedented crisis”. The EIB has strongly condemned this unjustified military aggression and the violation of basic rights of civilians.” At an Extra Board Meeting on 4 March 2022, the EIB Board of Directors decided on a first “Solidarity Package With Ukraine” of EUR 688mn.

How could the EIB act so swiftly?

To support the Ukrainian economy, this financing benefits from our already existing relations with Ukraine, and the EU guarantee under the External Lending Mandate. It should be underlined that our effort complements other initiatives announced by the EU institutions. We are one of many actors in this. Until this day, in response to the Russian invasion, the EIB has already disbursed its initial Solidarity Package for Ukraine of EUR 688mn in tranches, to support the Ukrainian government. In practice, this was done by redirecting existing credit lines. The finance originally stems from two EIB loans approved before Russia's aggression against Ukraine, to support the country's small and medium-sized enterprises and agricultural sector. It helped the Ukrainian authorities to meet most urgent financial needs, including buying food, medical supply and fuel for its citizens. Speed and flexibility were key for us, to continue to work in close coordination with the Government of Ukraine, to ensure that the Ukrainian citizens could benefit from EIB support, at the dire times when they need it the most.

Unknown economic consequences

This war has led to an extreme situation in Ukraine, which may have major economic consequences, both for the EU and for Ukraine, for a long time ahead. The economic consequences of the war are vast. Yet, in a short, medium, and long-term perspective, it is difficult to quantify and overlook the big picture at this stage, as we cannot know when the war will end. Neither do we know exactly how this will develop. What more is there to come? The

uncharted waters we presently are in would make any long-term predictions futile.

At the same time, we have seen a sudden, much higher level of political level of unity within the EU. This is important to recognize. Europe stands united in its support for Ukraine. This is where the EU, and the EIB, as its bank, can provide some stability. Exceptional, rapid actions are being taken by the EU leaders, in joint, unanimous decisions, swiftly reacting to the consequences of the war, in many areas, to create stability. This way, the leaders of the EU are showing Europe's determination to stand up for its values, and in its clear support for Ukraine. Likewise, the Director of the Ukrainian Democracy Initiative, Olga Oleinikova, recently wrote that the Russian invasion of in Ukraine has cemented the idea of Ukraine as something distinct from Russia, with Ukrainian identity revolving around a set of shared pro-Western values. This stronger sense of belonging and clearer European identity also serves to reinforces the EIB's resolve to support Ukraine.

Figure 35 Jean-Erik de Zagon, Head of EIB Representation for Ukraine



Source: EIB

How does the EIB provide to Ukraine?

Under its Solidarity Package With Ukraine, the EIB is now pursuing further initiatives, after the first disbursement of EUR 688mn, looking into providing Ukraine with an additional EUR 1.3bn, including:

- a) Financing critical infrastructure needs in Ukraine by preparing and repurposing infrastructure project commitments to meet immediate investment and reconstruction needs. The financing will cover transport, energy, urban development, and digital investment. The money can be made available as soon as the Ukrainian authorities sign off on amendments to existing contracts.

- b) Helping to rebuild whatever the Russian army destroys, by financing new critical economic and social infrastructure needed as soon as a free and independent Ukraine is re-established after the war. For this, the EIB will use its experience with the Ukraine Early Recovery Programme that started after Russian aggression in 2014, including reconstruction of 238 municipal and social infrastructure projects involving schools and kindergartens, hospitals and social housing. In a statement of support for the Republic of Ukraine, and its people, under President Zelensky, who has become a symbol for resistance worldwide, the EIB President Werner Hoyer underlined "We have rebuilt before. We will rebuild again, in a free and independent Ukraine".

EIB focus on clean energy

Another important part of the economy is the energy sector in Europe. At EIB, we often face questions regarding how, or if, the Russian invasion of Ukraine would change our Energy Lending Policy adopted in 2019 whereby our Board of Directors decided to no longer fund coal, oil and natural gas energy projects. Yet, for the EIB, as the EU's long-term loans financial institution, our long-term energy lending policy does not change, as the EU policy goals still stands. The key policy priorities of President Ursula von der Leyen's Commission are unchanged; to accomplish the twin transitions of the green deal, and the digital transition. For this to work, clean energy is required in Europe. If anything, the war in Ukraine, and the subsequent swifter phasing out of Russian dependence of fossil fuels, only means that there will be a more rapid green and digital transition for the EU.

If we look at the broader picture, on how the EU-Russian relations may develop, given present and future sanctions, the crisis has sparked the debate on EU energy market design, and a spike in energy prices. It is clear that the EU's dependency, on Russian gas will need to change. For this purpose, the European Commission has, in its RePowerEU communication of 8 March, announced a set of measures aimed at cutting Russian gas imports by two-thirds within a year, and, in a more long-term perspective, making Europe independent from Russian gas by 2030. The following short-term measures include:

- i. Mandatory filling of gas storage and joint procurement in the EU at a level of 90%
- ii. Possibility to regulate end consumer prices
- iii. Possibility to tax windfall profits of energy companies.

Already, the EIB's Energy Lending Policy focuses on supporting energy efficiency, the rapid development of renewable energy and its integration into the power grid. These investments help to reduce dependency on fossil fuels. Consequently, the Bank is already actively contributing to the reduction of the gas dependence with the current portfolio of projects, with over EUR 10bn in signatures in energy efficiency and renewable energy in 2021 alone.

In order to increase resilience and mitigate the effects of a sudden reduction of the supply of Russian gas, the Bank should focus on measures that have the highest impact in the short term, and in particular, the support to energy efficiency projects, to reduce demand.

In parallel, the Bank will continue the support to renewable energy projects, to ensure that supply is provided from clean, indigenous sources. At the Solar Energy Summit in Brussels, on 31 March 2022, EIB Vice President Thomas Östros clarified that the Russian invasion in Ukraine only will speed up the transition for clean energy in Europe. Similarly, EIB President Hoyer clarified that the EIB is looking into how to accelerate the EU's switch to clean, renewable hydro energy projects, as soon as possible. z

Supporting refugees in neighboring countries

EIB experts are currently assessing the needs of countries in Ukraine's close neighbourhood, as well as within the EU that are welcoming refugees from Ukraine or are affected by the war in other ways. In Poland, 2.3mn Ukrainian refugees presently need support. In Slovakia, 272,000. In Hungary, 349,000. In Romania, 587,000. In Moldova, 381,000. The refugee numbers are high, and we can expect that they still will rise, if the war continues. We are ready to step up to the challenge, and do our part, as one of many international actors, to help all affected countries, whether within the EU or in its neighbourhood, to cope with the arrival of refugees from Ukraine, and with the economic damage. Therefore, the EIB is working closely with our partners, the EU institutions, as well as national and local authorities, national promotional institutions, and other counterparties to make financial and technical assistance urgently available to these countries and regions, in a coordinated and efficient manner. To provide the funds, the EIB could rapidly reprioritise existing but yet undisbursed loans to regions and municipalities. Another alternative that we are looking into is to approve new refugee-related operations, where we would be financing up to 100% of the total costs, instead of the usual maximum of 50%. This would be a substantial form of support to the countries taking up the challenge of integrating these exceptional numbers of refugees.

International cooperation for Ukraine

The EIB, as Chair of the group of multilateral development banks, also recently convened a meeting of the Heads of these international banks, IMF, WB, EBRD, and CED. The objective was to ensure that we are pooling our expertise and coordinate our financial efforts to support Ukraine in the best and most efficient way possible, in its hour of need, notably, both for refugees, and for labour market efforts.

For the EIB, using the experiences of the Balkan wars in the 1990s, for integration of refugees, civil society, and the labour markets, as well as in relation to the Syrian refugee crisis in 2015/2016, the EIB is prepared to contribute. Yet, this time, the refugee crisis is much bigger, and closer to all EU Member States. We therefore need to work more closely with all parties, to ensure that we complement our efforts, and maximize the output. At the EIB, we provide a part of the EU's response to this forced displacement and migration, economic downturns, the political crises and challenges in the receiving countries, and to support the labour markets. EIB may assist in creating jobs and economic growth in the region, by investing in key infrastructure and in private sector development. As this, eventually also may stabilize the situation on the ground, it could gradually also reduce the migration flow. To this means, the EIB could offer a package of loans and innovative financial products, while blending funds from the donor international community with EIB financing. Such an initiative would be implemented in close cooperation with EU countries, the European Commission and other partners.

In summary

Given the Russian invasion Ukraine, the consequences for human lives, and the attacks on civilian infrastructure, Europe is walking through a dark moment. The war is causing tremendous suffering, creating massive population displacements. In all, this is endangering basic social and economic needs for fellow Europeans.

We can readily expect the economic impacts to be extensive. The global economy may be affected, through slower growth, trade disruptions, and steeper inflation. Higher prices for commodities like food and energy would increase inflation, as we already have seen in Spain, with record digits. The higher level of uncertainty, for investors and the markets, may affect asset prices, and may further tighten financial conditions.

As an EU body, the EIB has reacted by using all the instruments at its disposal within its mandate, to respond with our emergency support to Ukraine and its neighbours. We have used flexibility and creativity to support Ukraine in their struggle, to protect the European values at this historic junction for Europe. We are ready to do so again.

Rapid industrial transformation necessary according to new IPCC report



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The IPCC's newest report on the Mitigation of Climate Change

Just a few days ago the third part of the sixth assessment report of the IPCC was published¹. While the first contribution² made it clear that it “is unequivocal that human influence has warmed the atmosphere, ocean and land” and the second³ that it is necessary to adapt to those effects of climate change that are already inevitable, the most recent one emphasizes the need for rapid and transformative changes to the global economy that are needed to mitigate the worst effects of climate change. We here summarize the key insights from the chapter on industry and the implications of the report for corporations and investors.

The Paris Agreement found global consensus for the goal to reach net zero emissions by 2050, meaning that all sectors of the economy must reach close to zero emissions. This is a significant shift away from historic targets of emission reductions for the industrial sector, which in the EU previously were limited to 20% by 2020 and 40% 2030. For key basic material industries and value chains (e.g., cement, metals, and chemicals) that for a long time denounced the need for structural change this is a new reality. Embracing this new reality implies that all new its emissions is the rapid expansion of zero emission energy technologies. Renewable electricity capacity such as wind

investments must not only lead to marginal emissions reductions but take steps that clearly align with the path to zero. Current policies and initiatives are still far from reaching the target of zero emissions by 2050, as **Error! Reference source not found.** shows, and it is thus crucial to accelerate the transformation.

Mark Carney, the former Bank of England governor, identified the goal of net zero as “the greatest commercial opportunity of our time”, but also warned that “companies that don’t adapt will go bankrupt without question”. There are clear risks associated with the transition – primarily for those actors that lag behind. As the goal approaches, we expect the deployment of ever stricter forms of policy and governance that could render large assets useless. Expanding industrial investments in new fossil-based production is thus an incredible risk – for the climate, global ecosystems, and livelihoods as well as for asset portfolios. Yet the financial sector still funnels billions of dollars in investments into fossil fuels⁴.

Decarbonization of the energy system is essential for the industry transition

Absolutely necessary – but not sufficient – for the transformation of the industrial sector and the mitigation of and solar are currently the cheapest and most rapidly deployed energy technologies in most regions of the world.

¹ IPCC Working Group 3 AR6 Climate Change 2021: Mitigation of Climate change, published April 2022
<https://www.ipcc.ch/report/ar6/wg3/>

² IPCC Working Group 1 AR6 Climate Change 2021: The Physical Science Basis, published August 2021
<https://www.ipcc.ch/report/ar6/wg1/>

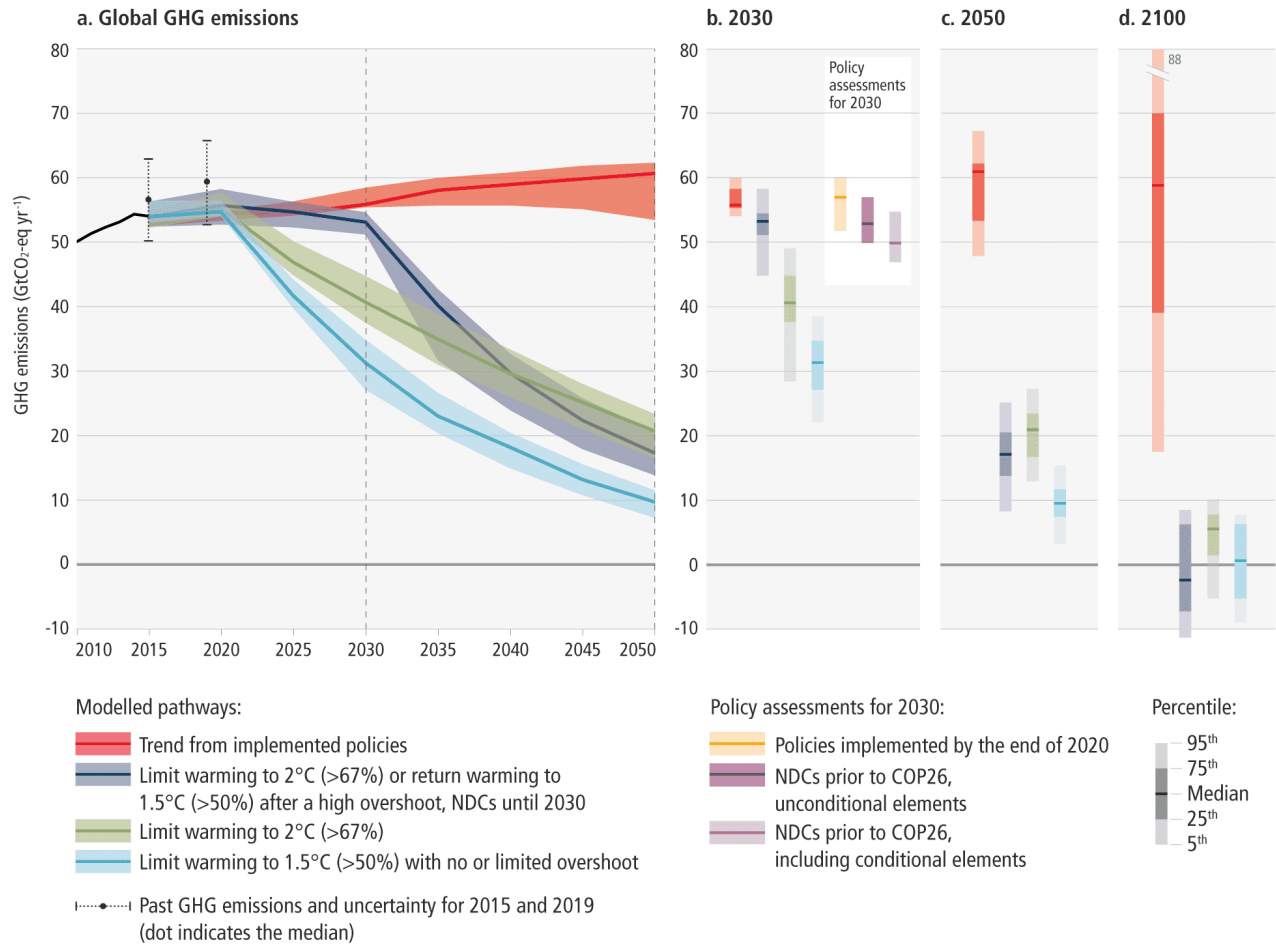
³ IPCC Working Group 2 AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability, published February 2022
<https://www.ipcc.ch/report/ar6/wg2/>

⁴ <https://www.ran.org/wp-content/uploads/2021/03/Banking-on-Climate-Chaos-2021.pdf>

A transition to electricity as the main energy carrier in industrial applications immediately reduces direct emissions from energy-intensive industrial processes such as heating and drying. Further, it also allows to produce

green hydrogen, which is increasingly recognised as a key intermediate for transforming central processes in many value chains – e.g., iron ore reduction and chemicals upgrading.

Figure 36 Projected global GHG emissions from countries Nationally Determined Contributions (NDCs) to the Paris Agreement announced prior to COP26 would make it likely that warming will exceed 1.5° and make it harder to limit warming to below 2°C



Source: IPCC 2022

Strategic partnerships key for successful industrial transformation

While some of the energy-intensive industries have historically been active in shaping the development of the energy systems, it seems they have been slower to actively engage in the current transformation. We foresee an increasingly important role for strategic partnerships between industrial and energy firms, forming alliances to shape the transformation of key value chains. In the past few years, we have seen some such partnerships forming.

A recent example is Hybrit where SSAB, LKAB, and Vattenfall have joined up to commercialise hydrogen steelmaking, or chemical firms BASF and Yara that both have invested in offshore wind farms. By taking active roles in electrification and shaping new value-chains industry firms can help accelerate the energy transition within and through the industrial sector.

As it becomes clear that we have passed the take-off point for the transformation of the energy system there will also be increasing pressure on the heavy industry sectors to eliminate their contribution to climate change across all emission scopes. Emissions are to a large degree concentrated to the basic materials production industries (steel, cement, chemicals, other metals) but uncertainties remain regarding the distribution of emissions across the scopes, as shown in the figure below. For some industries, such as cement, this highlights the problematic process emissions which are due to the very materials, e.g., calcium carbonate, used in their production. Until new chemistries are mastered, reducing cement process emissions will rely on already commercialised cementitious material substitution and carbon capture and storage (CCS). For others, such as petrochemicals, it instead emphasizes the very large use of fossil resources for energy and as

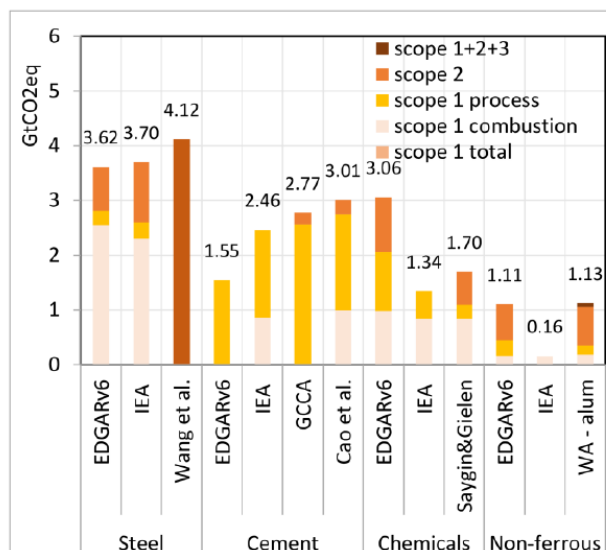
material feedstock which leads to high emissions of GHGs across the value chain (e.g., extraction, production, or after end-of-life when combusted). Reducing emissions from the production and use of petrochemicals would need to rely on a life cycle approach, including increased plastics recycling, fuel and feedstock switching to green electricity and hydrogen, and carbon sourced from biogenic sources or captured carbon. The transition may change the geographical location of GHG intensive industries and the organisation of value chains. Regions with abundant renewable energy resources have the potential to become exporters of hydrogen-based chemicals and materials processed using low carbon electricity and hydrogen.

Reducing demand for virgin materials is crucial for creating circular value chains

It has also become certain that just modifying primary material production in contemporary value chains is insufficient to reach the climate, resource, and biodiversity goals which are highly interlinked. Reducing the demand for virgin resources is a key solution to simultaneously making progress towards all these goals. This is increasingly recognised in the discourse on the need for a more circular and resource efficient economy. This challenge is however more daunting than sometimes expected, as it implies significant and structural changes to many value chains. Rather than just optimising the performance of products, it means that at all stages firms must acknowledge that their actions and choices affect the possibilities for others both upstream and downstream to integrate reused and recycled materials in production, extend the lifetime and reparability of products, and ensure recyclability at the end of life.

As energy provision and electricity systems are decarbonised there are increasing signs that companies not only care about their own emissions but also upstream and downstream emissions (e.g., scope 2 and 3 emissions). One example is electric carmaker Polestar, whose cars have zero emissions when propelled by green electricity but are associated with upstream emissions, notably in the materials production, of 26 tons of carbon dioxide per vehicle. Polestar has stated the ambition to eliminate those emissions by 2030. Also, Volkswagen are looking to use low-CO₂ steel in the production of their cars through a collaboration with Salzgitter. The need to look beyond direct emissions and also to scope 2 and scope 3 will be increasingly necessitated by growing demands for non-financial climate-related disclosure.

Figure 37 Industry sector direct emissions



Source: IPCC 2022

Reaching net-zero emissions is only two investment cycles away

Pressure from and initiatives originating in the financial sector are being highlighted as an important driver for change. Yet investments and financial flows fall short of the levels needed for sufficient climate change mitigation. This is true across all sectors and regions, and even for Europe where investment needs have been estimated to be 2-4 times higher than current flows. To make industrial low carbon investments viable requires shifts in both corporate and government policy. Broad and sequential policy strategies will be required and may combine transparent GHG accounting and standards; demand management and materials efficiency; R&D and niche markets for commercialisation of low emission materials and products; economic and regulatory instruments to drive market uptake; high quality recycling and electricity infrastructure; and phase-outs of emissions intensive production.

For many industries the target year of 2050 is just one or two investment cycles away. From now all investments in these industries must aim to reduce their emissions, and by the end of the decade investments should clearly aim to make a zero-emission world possible. Making this a reality requires commitments from both the industries and the financial sector so that investments can be scaled up to the necessary levels.

Climate Finance: Resilience and Adaptation



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An overview

The Intergovernmental Panel on Climate Change (IPCC) has recently published the contribution of Working Group 2 to the Sixth Assessment Report (AR6). This is the most comprehensive assessment to date and was compiled by over 270 coordinating and Lead Authors from nearly 70 countries.

The Working Group 2 report concluded that there is a huge discrepancy between the different flows of finance for adaptation and resilience and those for mitigation responses. More importantly there is a huge gap between the finance required for delivering adaptation and the financial resources that are being made available.

Here the focus will be upon the climate finance required for adaptation and resilience (CFAR).

There is no universally agreed definition of climate finance; however, the term is applied to the financial resources devoted to addressing climate change. The IPCC's agreed definition is:

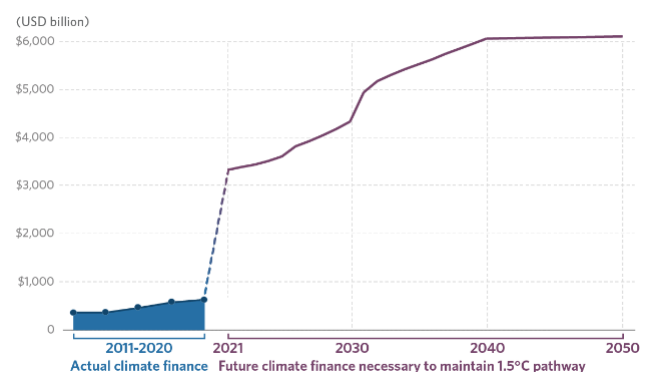
'The financial resources devoted to addressing climate change by all public and private actors from global to local scale, including international financial flows to developing countries to assist them in addressing climate change. [It] aims to reduce net greenhouse gas emissions and/or to enhance adaptation and increase resilience to the impacts of current and projected climate change. Finance can come from private and public sources, channeled by various intermediaries and is delivered by a range of instruments, including grants, concessional and non-concessional debt and internal budget reallocations.'

Adaptation, resilience and mitigation are also addressed as part of climate finance discussions; adaptation encompassing a process of ongoing change, resilience

creating positive responses against the impacts of climate change and mitigation as a means of reducing the level of risks. In many instances, adaptation and resilience, whilst fundamentally different, are used interchangeably in many contexts.

There is, however, a noticeable discrepancy in the distribution of funds into the different areas of climate finance and a lack of structure of the cash flow cycles and ROIs. The infrastructure of climate finance needs to be strengthened to meet the goals of the Paris Agreement.

Figure 38 Global Landscape of Climate Finance 2021, (Actual Finance vs Future Finance from left to right)



Source: Based on data collated by CPI (2020)

There also needs to be a new perspective on transparency and contingency to deal with the recent plateau in the amount of funds generated and to maintain, if not accelerate, the investment for a more resilient future.

At Copenhagen COP16, developed countries committed to a goal of jointly mobilizing USD 100 bn a year by 2020. Considering recent times and transitions, the USD 100bn mark is now seen as a floor and urgent up-scaling is recognized.

At COP26, led by the finance sector, it was agreed that there needed to be a shift in the whole finance system to be able to implement and accommodate an accelerated increase in CFAR as per its agenda.

The current structure

There is new evidence presented in the IPCC report on the finances needed for adaptation and resilience and on highlighting the risks and uncertainties. A snapshot of the global landscape of climate finance shows a heavily weighted dominance in mitigation and a very low distribution in adaptation and resilience.

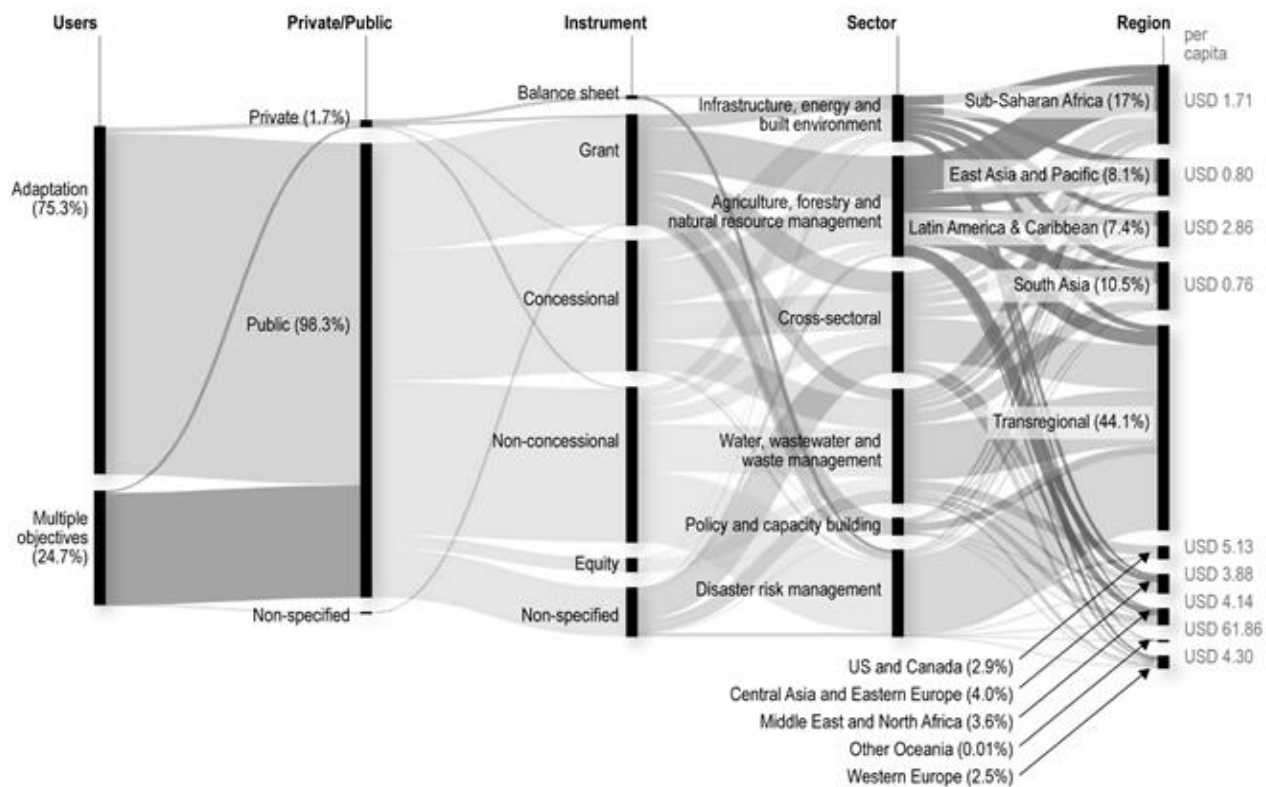
The climate finance architecture is still considered as emerging in the private and public space. Sources include accounts receivable (AR) financing, cashflows and distributions and equity considerations. Considering the availability of sources and the range of instruments there are challenges embedded in the various layers of the structure. CFAR is growing and rapidly gaining momentum even before legislation, infrastructure and regulation have had the chance to be grounded.

Voluntary principles and gold standards provide the optimal guidelines for what can currently seem suited to this market. But have the traditional methods of investment banking been applied?

The private funding sector creates an area susceptible to money laundering and untraceable funds and the types of finance sources which count towards the goal may also be questionable. Since multilateral agreements are a part of the structure, KYC (Know Your Client) and tracking may not be, hence creating an opportunity for money laundering activity. Recent trends suggest a rise in such activity, yet this cannot be directly linked to any specific part of the economy. However, the threat is still present and requires urgent attention.

Generating the required level of funding from the private sector appears more challenging as returns on investments create diseconomies of scale with high upfront costs and long-term returns. The gap between the upfront costs and ROIs, which must be parameterised in the cost-benefit analysis, proves discouraging with high levels of uncertainty.

Figure 39 The flow and distribution of globally tracked adaptation and resilience finance in 2018 from different sources, through different instruments into different sectors and regions



Source: Based on data collated by CPI (2020) and IPCC (2022). Each strand shows the relative proportion of finance flowing from one category to another (for example from private or public sources to different instruments). Categories from left to right are: (a) whether the finance is solely for adaptation or for adaptation and other objectives, including mitigation (multiple objectives); (b) whether the finance comes from public or private sources; (c) the financing instrument; (d) the broad sectoral allocation; (e) the geographical distribution of funding (proportion of total in % and per-capita allocation)

Costs

Loans require repayment, so how does this fall in line with developing countries that have limited funds in the first place? Repayment on the basis of improved resilience may generate better returns, but the repayment cost requires a concession, trade export credit or some sort of subsidisation. New and additional funds have been created, as opposed to recycling, or restructuring traditional fund infrastructure. This poses new risks to both recipients and investors, as new financial territory requires format implementation before live transitions. Climate finance is urgent and is therefore in continuous development during this period of transition. Finance needs are also dependent on change, geographical and sectoral scope, as well as the rate of returns across time. It is important to parameterise time as a cost, where applied limitations consist of over/underestimates, coverage, residuals, and the learning curve to match needs versus provision. Incorporation of these parameters can provide scenarios of different scales and extremities.

Adaptation costs are predominantly linked to developing countries, with developed countries accounting for just ~21% of the total costs. The latter are rarely reported on, perhaps based on the assumption that less change is required, or that given its status of 'developed' the infrastructure and economy is already in place for what may only be a few changes. This may be true to a certain extent, but this does not exempt developed countries from the need for climate finance. As stated in the definition from the IPCC, climate finance covers all sectors from local to global scales.

Structure and scope

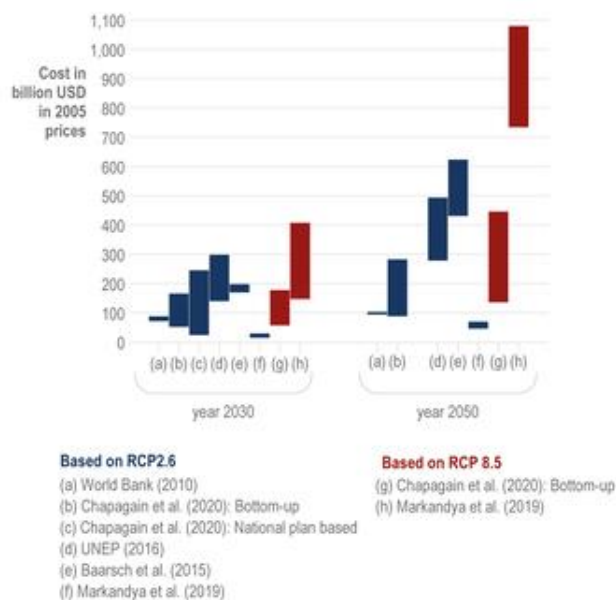
CFAR can be considered as emerging and developing, as we are yet to identify the end goal and create a model which can be applied across all future potential pathways of development. Money itself is expensive - inflation, the foreign exchange market and central bank reserves all impact a country's resilience to the fluctuations in monetary cost. Weaving these factors into the structure of CFAR would create an increased range of options for both developing and developed countries which in turn will help. Export credits and concessional debt could complement traditional financial products, creating a type of green-wrapped investment to cover all layers of finance and options. This would then create a more stable financial environment for the recipient and boost investor confidence in the rate of returns.

Structure is required to contain monetary damage control. An implementation which can be considered is applying a

percentage on high-performing portfolios to generate cashflows into a pooled investor fund for green activity/project funding. This method of cash-flow generation for climate finance carries a high level of regulation, KYC and structure due to the nature of portfolio investment. This would be highly desirable from long-standing bilateral intermediaries that offer instruments and project investment as part of their set-up and infrastructure. It would also create a more regulated guideline for allocating funds when financing projects. Country engagement and prioritisation create a gateway for bribery and corruption; some sort of regulation must therefore be applied to the allocation process. With the lack of current regulation and structure in climate finance and only voluntary principles and standards to satisfy, a back-to-back cash-flow from regulated portfolios would accommodate a more comprehensive and streamlined approach - encapsulating the cycle from investing to application and return on investments, creating a container for monetary damage control.

A model based on a developed country can also provide a more insightful forecast using back propagation and parameterisation to match current trends and investment for developing countries.

Figure 40 Comparison of recent studies that estimated developing country adaptation costs in bn USD (in 2005 prices) per year, for 2030 and 2050



Source: Chapagain et al. (2020). Major studies are World Bank (2010), Chapagain et al. (2020), UNEP (2016), Baarsch et al. (2015) and Markandya and González-Eguino (2019). The solid-coloured bars are based on RCP2.6 and pattern-bars are based on RCP 8.5; the width of the bars indicates the range of estimates (maximum and minimum) produced in each study.

An increase in the accreditation of institutions provides an indicator not only of demand but also of regulation. Market oversaturation can provide a search for institutions with structure and stability. Multilateral Development Banks (MDBs) offer a wide range of financial instruments including concessional loans, lines of credit and results-based financing. Incorporation of the latter creates flexibility in terms of repayments and generates a better cashflow on the back of developing equity. Major multilateral climate change funds such as the Green Climate Fund (GCF), Climate Investment Funds (CIF) and Global Environment Facility (GEF) predominantly offer grant-only programmes.

The challenges resurface, due to an overlap in policy, when accessing the funds. A lack of structure and regulation requires the repetition of policy application standards, tailored to the type of financial instrument - another point which can be centralised with regulation and structure using traditional models on fixed-income products. A template with flexible parameters is needed to encompass all areas of climate finance including improved resilience finance.

The positive expected ratios of return, as per The World Bank's Lifelines report, found that every USD 1 invested in resilience finance in developing countries yields a net return of USD 4. A more generic ratio referred to is USD 1: ~USD 10. The infrastructure of the cashflow returns is correlated with the development simultaneously; however, its value enveloped in resilience is exposed.

Highlighting different aspects and areas of climate finance accentuates the need not only for finance, but also for structure and regulation to optimise its acquisition and use.

Conclusions

Climate finance will always be required regardless of the future rate and magnitude of climate change; we are already committed to damaging impacts and some irreversible changes. The longer it takes to meet the Paris Commitments, the more the CFAR costs will be coupled to increasing damages from climate impacts. Focus on the private sector will increase and it is slowly gaining

momentum; however, to build the required adaptation and resilience required – the private sector needs to be the dominant contributor. Resilience and adaptation measures are in place, but they require structure and regulation from the climate finance umbrella i to achieve optimum returns and efficiency in the cash-flow cycle and distribution. Disclosure and transparency are paramount to discourage new lines of money laundering. Also, green financial instruments need a legislative framework, perhaps as per traditional fixed-income products, to boost investor confidence, creating better-performing portfolios and more stable returns on investment.

Returns on CFAR-related investments are assessed on long-term financial scenarios and require upfront costs. The lack of immediate objective satisfaction or materialisation creates a less appealing scenario and poses greater challenges for funding. Assembling a crossover of portfolios where high-performing portfolios filter a percentage of returns into resilience and adaptation finance, can create returns in the short term whilst funding long-term green investments. Using a hybrid infrastructure, we can reduce the gap between upfront costs and benefit ratios, creating an attractive investment vehicle to fund a more sustainable future whilst achieving short-term dividends and returns. Subsequently, this reduces uncertainty across the cycle of investment for both provider and recipient, creating a framework of stability.

The need and urgency for adaptation and resilience will always enforce an upward trend in funds required, not only for developing countries but also for developed countries where land use optimisation is in continuum with transition. More needs to be implemented across climate finance, paving the way for transparency and cash-flow cycles linked directly from investor to project, diminishing questionability on tracing funds.

KommuneKredit – a key player in the local green transition in Denmark



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Climate change adaptation in KommuneKredit's new Green Bond Framework

KommuneKredit is the primary vehicle for providing financing for local municipal and regional capital investments in Denmark. This includes green loans and leases financed with green bonds. The role of KommuneKredit in the local climate adaptation of Denmark, its green financing and how local ambitions and national laws support climate adaptation action is described in this article.

KommuneKredit issues green bonds to provide financing for the local climate ambitions in Denmark at the lowest possible cost. Since the inaugural green bond in 2017, KommuneKredit has issued green bonds annually and by year-end 2021, KommuneKredit had issued a total of DKK 19.1bn in green bonds and approved a total of 649 green loans worth DKK 27.2bn.

In February 2022, KommuneKredit launched an updated Green Bond Framework, which expands the number of green project categories eligible for green financing from four to six categories – one of them being Climate Change Adaptation.

A customer base with climate adaptation expectations

95 out of the 98 municipalities in Denmark are engaged in the Danish Deadline 2020 project DK2020 to launch ambitious Climate Action Plans in line with the Paris Agreement, and Copenhagen Municipality is engaged in the C40 network. Almost all the Danish municipalities are thus preparing Paris-aligned goals and plans for adapting to climate change. Considering the Danish Government's ambitions to publish a new national climate adaptation

action plan in spring 2022, and climate change mitigation and adaptation being at the center of both current and future investment planning of almost all municipalities and regions, KommuneKredit's foundation for issuing green bonds is very strong.

"We support the sustainable transition ambitions of Danish regions and municipalities, and we want to create the best possible foundation for this transition through our financing. Offering green loans financed with green bonds for local climate adaptation projects is an inherent part of this," says KommuneKredit's Chief Treasury & Sustainability Officer Jette Moldrup about the company's focus on climate adaptation in the wake of the recently updated Framework.

A well-established business model

Since its establishment in 1898, KommuneKredit's mission has offered municipalities and regions funding at the lowest possible cost. Finance is provided for many public purpose infrastructure projects, such as public transportation, energy efficiency of public buildings or housing for the elderly. The business model is well-established, and the company has never recorded a single loss on any loan during its more than 120 years of operation.

Due to the joint and several liability of its members and the non-profit basis of its business model, KommuneKredit has favorable preconditions for supporting the green transition of its members by providing long-term finance for sustainable investments on equal terms regardless of project size or location.

Case: Climate adaptation financing in Greve Municipality

Greve Municipality is actively adapting to climate change. Delaying surface runoff during extreme weather events is a top priority in the watershed, Birkedalen. Plans have therefore been set in motion to avoid overflowing wastewater systems and the damages it inflicts on nearby housing. The climate adaptation plan for Birkedalen was developed and is currently being implemented by the utility company KLAR Forsyning. The plan includes a hydraulic and socio-economic analysis for the watershed and presents the required steps to adapt to an expected increase of 30% precipitation before 2100, using IPCC climate scenarios.

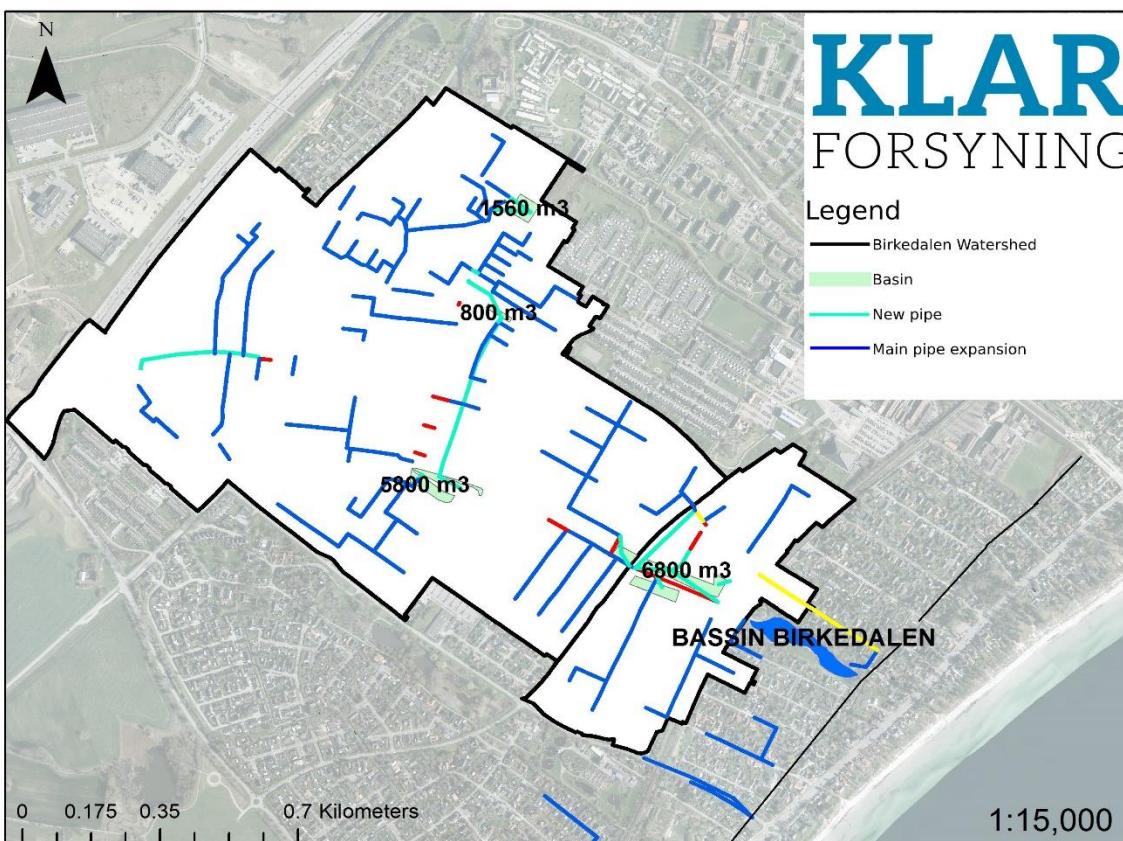
The analysis showed that several investments had to be made to effectively implement the climate adaptation plan for Birkedalen at a 10-year service level in Birkedalen, several investments had to be made. These include increased water retention systems volumes (17.000 m³), expansion of pipes, separation of sewage systems, green corridors etc. Such investments can all be financed by KommuneKredit and are potentially eligible to be

categorized as climate adaptation financing following KommuneKredit's Green Bond Framework.

The socio-economic analysis of the project has shown that the cost of the investments and the necessary future maintenance could have a cost-benefit ratio of nearly 1:2, compared to expected damages to households if the projects would not be implemented. The calculation was somewhat simple, but conservative assessment. It only considered damage to households, but not other socio-economic impacts such as traffic delays, the general environment, health, or other indirect market effects. It showed that climate adaptation action presented a financial gain. Investing in climate adaptation actions, despite presenting an immediate cost, is beneficial if a 10-year event should occur during the project's lifetime – or even more extreme precipitation events, such as a 100-year event.

Following these calculations, Greve Municipality started to invest in climate adaptation in Birkedalen. Investments to increase the resilience of the water management system are considered eligible as climate adaptation finance under KommuneKredit's Green Bond Framework.

Figure 41 Necessary retention systems and pipelines to effectively implement the climate adaptation plan for the Birkedalen watershed.



Source: KLAR Forsyning

Figure 42 One of several retention systems, included in the climate adaptation plan for Birkedalen



Source: KLAR Forsyning

Local governments drive Danish climate adaptation

Municipalities and regions in Denmark are already impacted by flooding, storms etc. resulting from climate change. Consequently, it is expected that a significant proportion of climate adaptation financed under KommuneKredit's Green Bond Framework will be linked to the management of extreme precipitation and surface runoff.

Local governments are already considering climate change impacts in new infrastructure projects including the physical and financial risk imposed on municipalities and people within any given watershed boundary. Since 2020, any Danish municipality must by law have a wastewater plan that considers the future risk of flooding using a climate factor. The climate factor aims to ensure that uncertainties of future precipitation patterns are considered. These calculations are based on climate models, including IPCC's Representative Concentration Pathways RCP 4.5 and 8.5.

Using the climate factor, the municipality will decide upon a service level for the management of surface water. As a national minimum, systems must be able to handle 5- to 10-year events, depending on whether the sewage system is separated or not. The necessary dimensions of a climate adapted surface water management system are then calculated. Furthermore, the expected socio-economic cost of a business-as-usual approach in relation to a scenario where climate change is considered must be presented. Thus, municipalities must clarify the financial cost-benefit ratio of climate adaptation action when developing projects to manage surface water runoff.

KommuneKredit's green bonds

KommuneKredit can finance climate adaptation measures within all municipalities and regions in Denmark, and these projects will form an integral part of our future green bond issuance.

To be considered a climate adaptation project eligible for green financing from KommuneKredit, the project must improve the resilience of local communities to current and expected future climate change and reduce the negative impact and vulnerability of people, nature, and assets. Having national standards that ensure that future climate scenarios are considered and that socio-economic benefits are secured, the job of discerning the climate adaptation relevancy of projects, such as those related to Birkedalen, is straight forward.

Reporting underpins green bonds

To ensure that a given climate adaptation project adheres to KommuneKredit's Green Bond Framework, we first make certain that its objectives align with the criteria specified in our Framework. Secondly, we look to the reporting principles of the Nordic Public Sector Issuers Position Paper on Green Bond Impact Reporting and the ICMA Handbook for Impact Reporting. The climate adaptation indicators, and where relevant, indicators related to water and wastewater management category, presented in these guidelines are utilized for our reporting.

Generally, we receive a qualitative description of the project explaining why it is a relevant climate adaptation measure. The information is supported with a description of the many environmental co-benefits that climate adaptation projects often have. We also strive to gather and report on quantifiable data. For instance, KommuneKredit can report on the reduced amount of wastewater treated at any given plant (in PE/m³) due to the financed project. As treated wastewater is associated with an expense of energy, which again is associated with a CO₂e-emission, quantifiable impact data is available.

Financing a green future

KommuneKredit will continue to finance the climate adaptation activities of its members to strengthen the adaptive capacity of Denmark. KommuneKredit's investors can observe the impact of these actions in KommuneKredit's Green Bond Impact Reports and the company's continued efforts to support local climate investments in Denmark.

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You may be wondering why a Scandinavian bank chose a picture of bamboo for the cover. There is a reason for that too! Bamboo is one of the fastest growing plants on the planet, which makes it an efficient mechanism of carbon sequestration. Moreover, once grown, bamboo can not only be used for food, but also used as an ecological alternative to many building materials and even fabrics. Its great environmental potential makes bamboo a perfect illustration of our work and aspirations.

This report was published on 07 April 2022.

Cut-off date for calculations was 31 March 2022, unless otherwise stated.

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