The Green Bond

Your insight into sustainable finance

22 November 2023

In this issue

Financing the (dis)orderly transition

Letter to the reader

Dear reader,

I have looked forward to this edition.

With green bond volumes continuing to grow – and the transition reflected in most (if not all) client dialogues – there is a lot of energy and resources activated to reach the Paris Agreement goals. China is leading the investments into the renewable energy infrastructure, far ahead of the rest of the world! Would we look at clean energy investments as a stand-alone, without noticing our client dialogues and corporate decarbonization efforts, I would be worried – but I am not. Awareness around the risk of refinancing and eligibility for refinancing in four to five years is increasing – and thereby treasury management and activity is activated.

We have seen a decent set-back in SLL and SLB structures – which might be backed by an increasing concern of the banking sector on its role in advising – and the need to ensure the quality and benchmarks for the frameworks. A framework is an outstanding opportunity for a corporation to guide financial counterparts and slimline internal communication – but it requires time, both to establish and to ensure its robustness.

But things could move faster – despite the green bond market reaching trillions. Mobilization of new capital, promotion of new ideas, and re-pricing of assets to reflect a new assessment of discounted cash-flows is still not moving fast enough. We can do better!

One of the challenges we have identified is the lack of data. Historically, sustainability has been managed by marketing or compliance. Only recently has it been incorporated more strategically within organizations – not least in finance. However, such an integration requires a new protocol – white-papers, strategy documents, KPIs, delegation, monitoring etc. It takes five to six before we see the output – which is time lost for scaling up. So, the trillion-dollar question is how to create certainty in the pre-data world – and guess what - we got a model! (I am sure more with us will follow!).

As always, we got several contributions including insights into the EU's take on transition finance, hydrogen, export financing, offshore wind, transition commodities and biodiversity risk – and finally – real estate, with the world's first corporate green bond issuer Vasakronan sharing learnings from their first 10 years in sustainable finance (83% of their financing is now green).

Enjoy your reading,

Christopher Flensborg

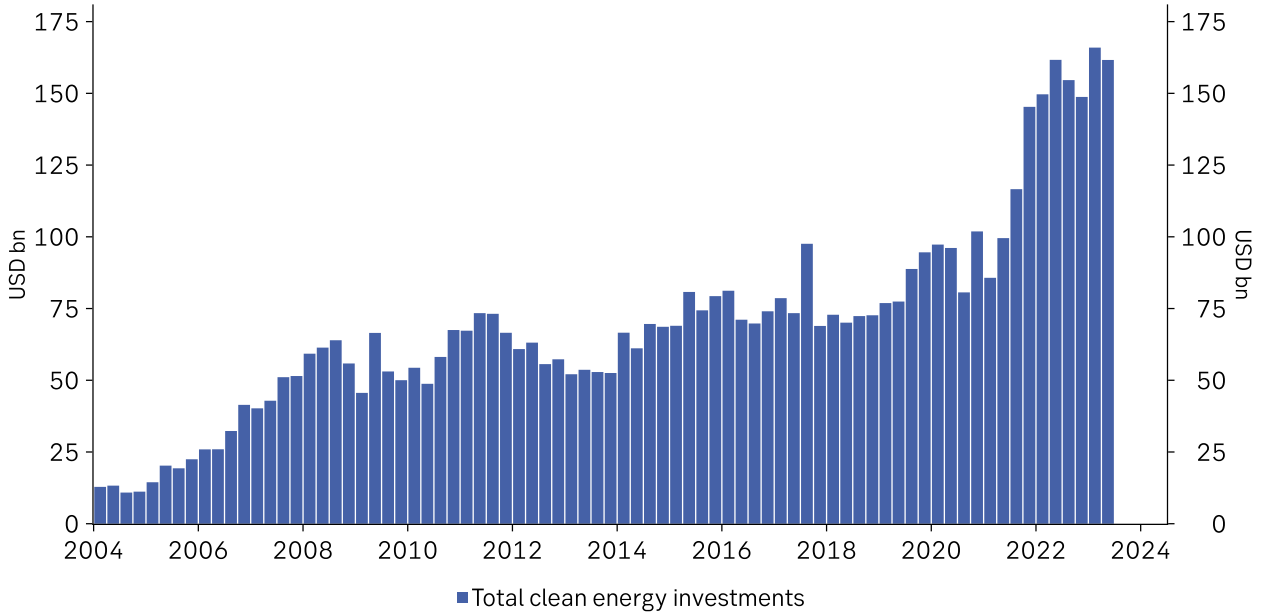
Head of Climate and Sustainable Finance
christopher.flensborg@seb.se

Transition update

Stall warning: the transition is losing steam

2023 has highlighted the challenges facing the transition. Clean energy investment and EV diffusion appear to be levelling off, and the political leadership triggered by the 2022 energy crisis is flagging, especially in Europe. Policy support is needed to get the locomotive back on the tracks

Figure 1 Investments in clean energy



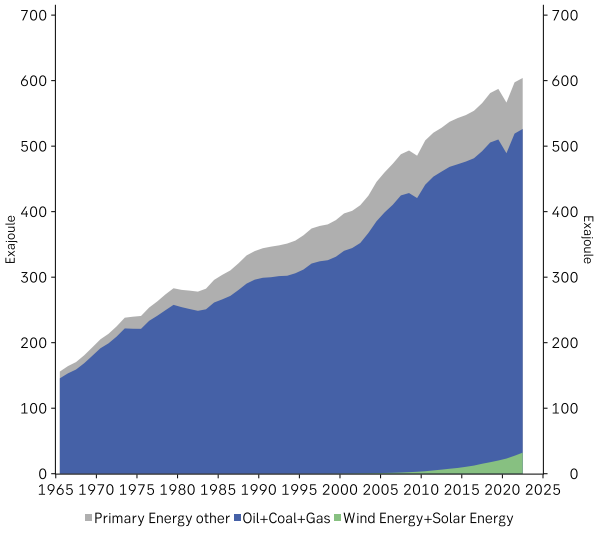
Source: Bloomberg New Energy Finance, Macrobond

During the first years of the 2020s, we finally started to see the exponential growth signs from transition investment that are necessary in an accelerated decarbonization. The energy crisis in the wake of the pandemic and Russia's invasion of Ukraine also galvanized policymakers to launch major initiatives to overcome the technological obstacles with government subsidies and direct spending.

However, in 2023 we have seen some clear warning signs that we cannot take this trajectory for granted. Renewable energy investment is thus levelling off after the 2020-2022 surge (Figure 1), EV adoption appears to be slowing and the political focus is shifting – in some case even reversing.

This is an alarming development at the current stage of the transition. Exponential curves normally only level of in technology diffusion processes once you they 50% of the ultimate market penetration. This is clearly not the case now when solar and wind energy remains a small fraction of total energy consumption of around 7%, while fossil fuels still make up over 80% (Figure 2). At this point in the process, we should see acceleration. What is the problem?

Figure 2 Current energy mix, consumption



Source: BP, Macrobond

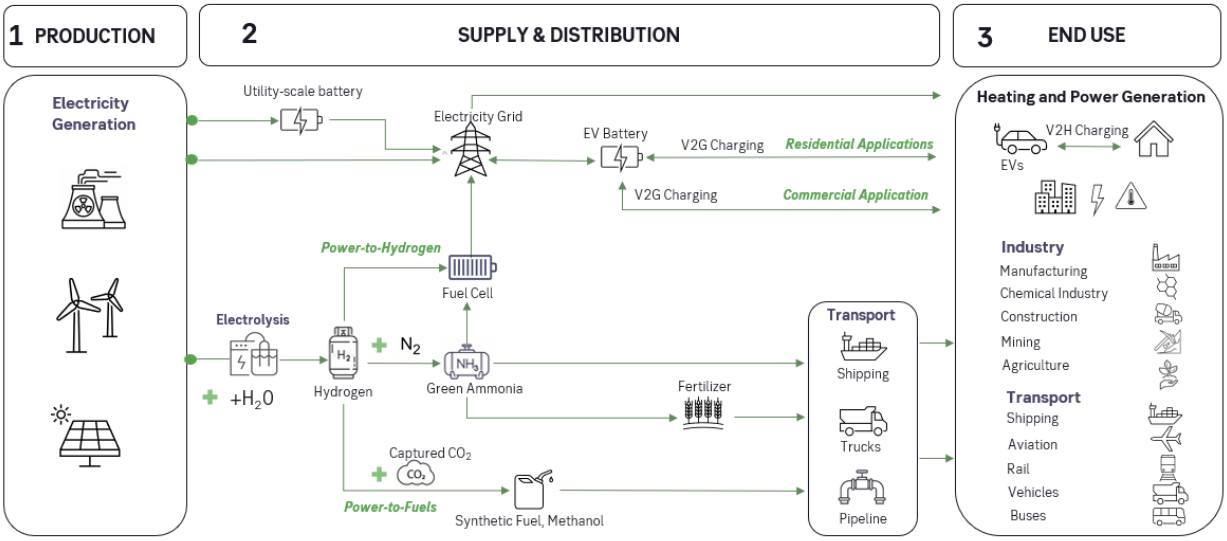
Thomas Thygesen
thomas.thygesen@seb.dk

Elizabeth Mathiesen
elizabeth.mathiesen@seb.dk

Mads Bossen
mads.bossen@seb.dk

Marina Doherty
marina.doherty@seb.dk

Figure 3 A fully electrified energy system (after the transition)



Source: SEB

The coming energy system: what is missing?

To understand the challenges involved in building a new energy infrastructure, we think it makes sense to start by looking at what it is we are trying to build. Figure 3 provides a stylized overview of a post-transition, fully electrified energy system, the one we hopefully will have in place by 2050, based on the way key technologies have developed and been used until now.

The new energy system has three main components: energy supply, energy transformation and distribution, and energy use. The supply stage, encompassing electricity generation via wind, solar, and nuclear, represents well established pathways of the green transition. Wind and solar contribute to electrolysis, harnessing renewable energy to produce hydrogen and oxygen. Simultaneously, nuclear, wind, and solar may feed directly into the electricity grid or into a utility scale battery, enhancing overall grid stability.

As we move towards the middle of the diagram, the image becomes fuzzier. The transformation taking place to effectively supply and distribute electricity adds layers of complexity. The intricacies of hydrogen production and the challenges of integrating renewable sources into the grid meet. The varied applications of hydrogen, along with the bidirectional energy flow of EVs, create a nuanced landscape that will require strategic balancing of the grid. Synthetic Fuel – CO2 + Hydrogen. Ultimately, we need to upgrade to smarter grids that allow for two-way traffic as in vehicle-to-grid (V2G) charging.

Lastly, we have energy use, representing the real-world applications of generated energy, whether it be powering EVs to supporting industrial processes. The end use stage in the energy transition faces significant challenges, particularly in sectors like aviation, shipping, and steel production. Hydrogen powered aircrafts are still in the early stages of development, and green steel faces high costs and demanding infrastructure requirements. The challenges of end-use applications illustrate the need to shift our focus from energy production to energy usage costs in the overall energy transition. Considering broader economic implications apart from high initial production costs will encourage a more holistic perspective.

Key obstacles

As we transition towards this future energy landscape, numerous challenges must be addressed. First is the need for substantial infrastructure development to support the production, distribution, and storage of hydrogen, green ammonia, and synthetic fuels. This includes an extensive network of hydrogen production, pipelines, and storage facilities. There is also a need to further establish extensive charging infrastructure for electric vehicles, to meet the demands of both residential and commercial transportation.

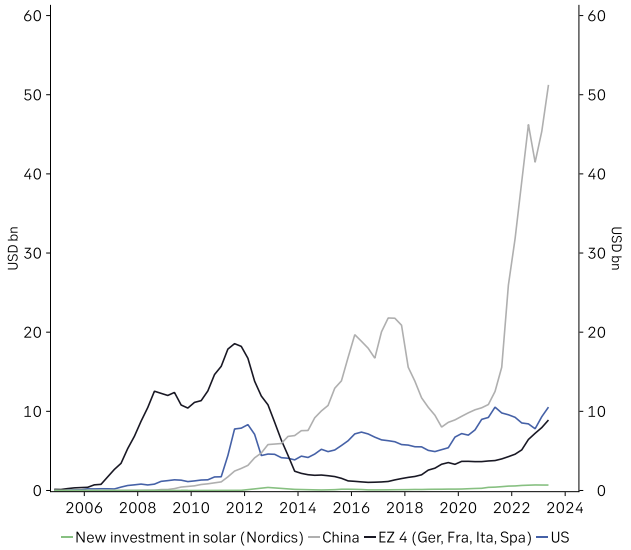
The expanding role of solar energy as a major global industry is set to bring about substantial transformations in electricity markets. Considerable room for growth exists, and the need to boost the deployment of solar PV technology implies a significant increase in the generation capacity, necessitating an expansion and strengthening of grids.

Additionally, regulatory frameworks must evolve to accommodate the complexities of this interconnected system. Standardization of hydrogen production and transportation, grid integration protocols, and sustainable practices in fuel production are essential for fostering a cohesive and efficient energy ecosystem.

Renewable energy's unbalanced deployment

The investment in new renewable energy supply continues to be unbalanced, both in terms of energy technology and regional deployment. Solar investment is advancing while wind energy is stalling, and China remains far ahead of both Europe and North America (Figure 4 & Figure 5).

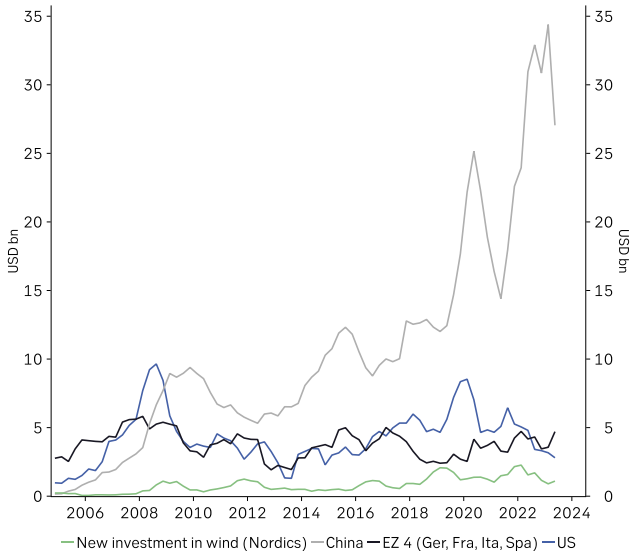
Figure 4 New investment in solar across regions



Source: Bloomberg New Energy Finance, Macrobond

China is well ahead of the pack when it comes to new solar investments, reaching north of USD 50bn in Q2 2023 five times as much as in 2019 and more than 5 times the amount invested in the US, where solar investment has levelled off in the same period. In the large European economies, solar investment is also accelerating although it has still only reached half of the level at the peak in 2011 when Europe was the global leader in this technology.

Figure 5 New investment in wind across regions



Source: Bloomberg New Energy Finance, Macrobond

New investments in wind power, on the other hand, are losing steam across the board. Again, this is happening from a higher starting point in China, where wind power investment had doubled in the first years of the 2020s.However, this has still left a clear change in the composition of renewable energy investment.

Wind had until a few years ago had the largest share of China's renewable investment, but solar investment is now almost twice as large. In other regions, the picture is even more bleak. The four largest countries in the EU have overtaken the US but at close to USD 5bn in Q2, wind investment in both regions is less than 20% of China's level and no higher than it was 7-8 years ago. In the Nordics, new wind investments amounted to just USD 1bn in Q2 2023, down by almost 50% from the 2021 peak.

From a global transition perspective, there are two clear conclusions. The first is that, among the major economic regions, only China currently appears to be investing enough to deliver an accelerated transition after a surge in renewable energy investment in the past couple of years. In Europe and the United States, investment has levelled off when it should be taking off.

The second conclusion is that solar power is starting to dominate wind power when it comes to the composition of new renewable energy investment. This may reflect the different nature of the two technologies: wind turbines are large and resource-intensive to build, transport and install, so the supply shocks of the early 2020s have most likely had a larger impact on costs. Solar can also be deployed locally in small units, which means a faster reaction when demand picks up. However, a renewable energy system based on solar comes with its own challenges.

Solar at risk from supply concentration

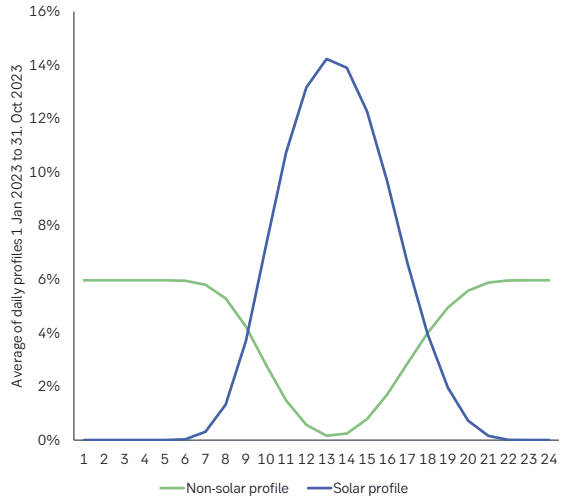
Adding solar and wind to a fossil power system is easy in the beginning. Then harder and harder. According to a new analysis from Bjarne Schieldrop and SEB Commodity Research, in the beginning it is easy to build solar- and wind power into a power system where fossil energy, which can be turned on and off, is a significant part of supply.

Fossil based power in the system can then back off whenever the sun is shining, and the wind is blowing. And the more solar and wind you build, the more the fossil part of supply has to back off. The problem is that there is no way to ensure that supply doesn't overshoot when supply peaks. Just a tiny bit of power surplus and the power price drops to zero or negative.

As power production from solar and wind grows year by year there will be more and more hours in the year where unregulated power will overshoot demand resulting in zero or negative prices. Solar power is in many ways the most

extreme of the two as it is highly concentrated during the day (Figure 6) and highly concentrated during summer. As solar power supply grows it rapidly moves upwards towards the "demand ceiling" and then kills the prices just when it produces the most volume.

Figure 6 German power, avg daily solar power production profile from 1 Jan – 31 Oct 2023



Note: Profiles are normalized to sum = 100% for solar and non-solar
Source: Bloomberg. SEB

In 2017 prices were in general low at night. Then they rose rapidly into the morning, a bit softer midday before an evening rally and then softer at night. But this pattern has now flipped around due to rapidly rising supply of solar and wind power production. Prices are instead higher during the night before being crushed during the day.

If we add all the other sources of unregulated power supply, predominantly offshore and onshore wind and run of river, then we get the illustration in Figure 6, where we see that unregulated German power supply increasingly is hitting right up and into the "demand ceiling". And that is typically when power prices collapse or go negative.

Figure 7 Monthly average volume weighted solar power price vs. avg volume weighted non-solar power price

Source: Bloomberg, SEB

Loosely interpreted one can say that solar power basically earned the average power price in the system back in 2017. If the average power price in the system, then was say EUR 100/MWh, then solar power producers would earn EUR 100/MWh as well. As supply of solar and wind power grew year by year, we can see how the solar power price earned is increasingly sinking below the non-solar-power-price. First down to 90%, then to 85%, then 70% and now only 62% in September vs. the non-solar price (Figure 7).

There is a clear risk that this is a process of "first gradually, then suddenly". This is what we have seen over the past few years. The discount for what solar power actually earns when it produces power versus what the power price is when it is not producing is increasing rapidly as more unregulated power supply hits into the "demand ceiling".

Renewable energy has a profit problem

The main risks to the continued diffusion of renewable energy supply are thus costs and profitability. Wind power appears to have become more expensive to produce than governments are willing to pay for, and the whole supply chain appears to be struggling to pass on rising costs; this was highlighted this autumn when losses in Siemens Wind Power forced the company to ask for financial support from the government.

Solar energy faces a different kind of problem: negative electricity prices when supply is high – and no supply in other periods when prices are high. If solar supply continues on an upward trajectory and storage either in batteries or alternative fuels are not scaling at the same time, then solar energy could end up being unprofitable and thus unlikely to scale as fast as required. The result was a sharp decline in expected earnings (Figure 8).

Figure 8 S&P Global Clean Energy index and EPS

Source: Bloomberg. Macrobond

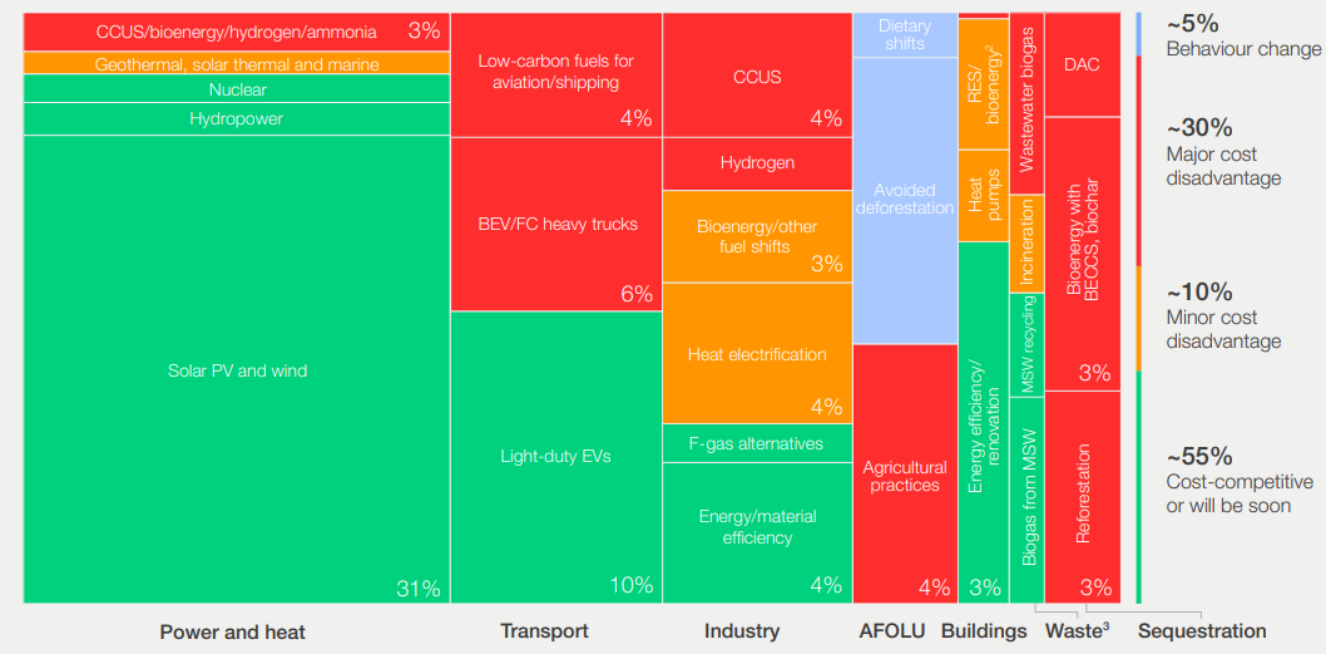
Supporting technologies are not ready

The problems in the renewable energy sector highlight how interconnected the various elements of the new energy system are and how problems may arise if they do not move in lockstep. 9, which illustrates this point, is taken from the World Economic Forum (in collaboration with BCG), "The State of Climate Action", mapping out where the difficult parts of decarbonization are found.

The 'easy' part is power generation, where both solar and wind currently are cheaper than fossil alternatives and it's essentially just about providing electricity from a different source. It will involve major investment in primary energy production, grids, and storage, but it is technologically feasible without increasing the cost of power. Light battery-powered vehicles are also already offering a cost-competitive alternative.

But this will only take us halfway towards zero emissions. As soon as we move into heavy transportation, shipping, aviation, green hydrogen and other alternative fuel types, the cost advantage is on the incumbent side. So, according to this study, once we get to around 50% of the required reduction in emissions, things start to get complicated.

Figure 9 Global greenhouse-gas mitigation required by 2050 to reach 1.5°C, split by sector and technology



Note: Unit measure is % of net Gt CO2e p.a.
Source: International Energy Agency; Intergovernmental Panel on Climate Change; Lena Höglund-Isaksson et al., "The Role of Anthropogenic Methane Emissions in Bridging the Emissions Gap", in Emissions Gap Report 2021: The Heat Is On, pp. 47–55; desk research; BCG analysis.

Batteries, hydrogen not ready to scale

The problems with concentrated supply in solar energy and 'random' supply of wind power could thus be overcome if the electricity produced by these sources could be stored and deployed at other times in a commercially viable way.

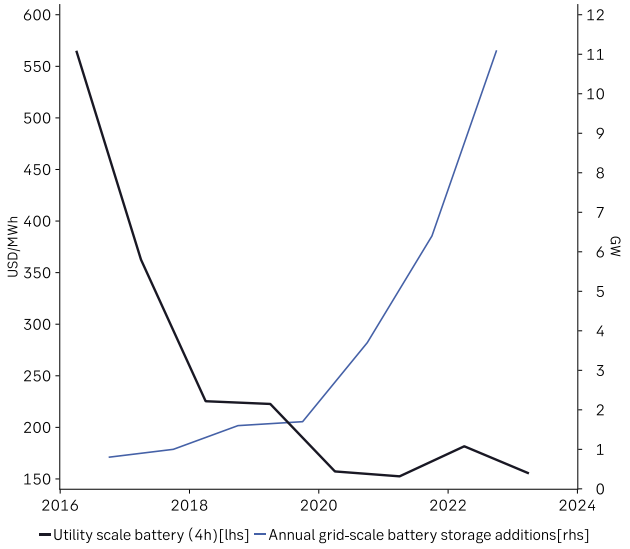
The two main technologies that are expected to make this possible are utility-scale batteries and transformation of electricity into hydrogen that can be transformed back to electricity, heat or into synthetic fuels. The problem is that neither technology currently appears to be ready to scale.

Utility-scale battery prices have levelled off in the 2020s after falling in the past decade, raising the risk that the nascent surge in demand will also level off. Current technologies are also very resource-intensive, and this could also limit scaling potential,

New battery technologies like Northvolt's Sodium-ion batteries suggest both cost and dependence on critical resources can be reduced. However, they have yet to be tested and it is typically only when you scale you realize the decline in cost. Smaller batteries distributed locally could also contribute, but this would require major investments in smart grids capable of managing and distributing two-way traffic and e are not investing enough in grids to match the expected increase in electricity supply (Figure 10).

High hopes are pinned to green hydrogen, which can be used to produce electricity but also can produce heat and propulsion directly as well as providing the basis for a range of synthetic fuels. It currently costs at least 2-3 times more to produce than the 'regular' fossil-based hydrogen currently used for a range of purposes in industry.

Figure 10 Utility scale battery LCOE and growth



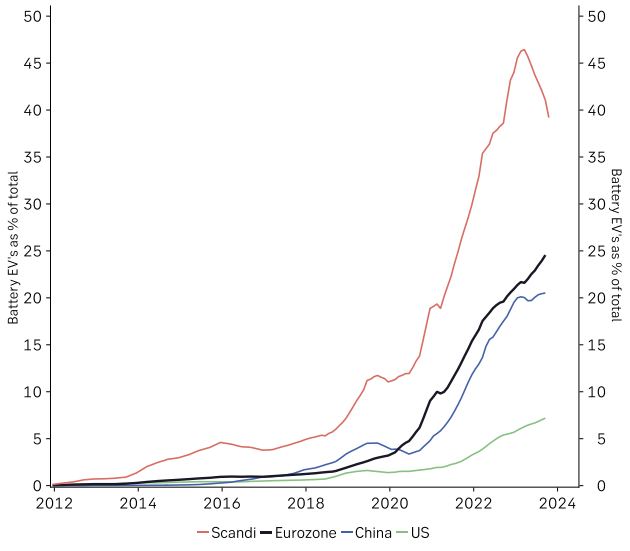
Source: Bloomberg. International Energy Agency (IEA), BNEF, Macrobond

The most optimistic estimates suggest that the cost curves could converge over the next decade, but this will require a steep decline in the cost of electricity, which is possible but will require a massive increase in renewable energy supply. And as we described above, such an expansion of supply is unlikely to be profitable unless it is accompanied by a rapid cost decline and increase in storage capacity. With current technologies unable to deliver this at a commercially viable cost, it will be difficult to get the scaling process going.

EV sales levelling off too soon?

At the same time as investment in the supply of renewable energy is showing signs of premature stabilization, there are signs that the transition among energy users is also losing steam.

Figure 11 Battery EV sales as % of total

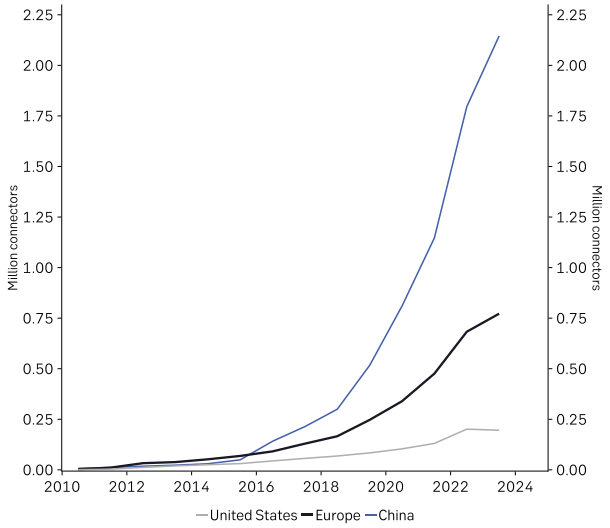


Source: Bloomberg New Energy Finance, Macrobond

EV sales are struggling to convincingly move along an exponential trajectory. Even in Scandinavia, the EV share of total auto sales has rolled over, edging closer to 40% rather than crossing above 50%. Meanwhile China and Europe are competing to approach 30% first, albeit with signs that the second derivative is turning lower. The US remains the laggard (Figure 11), however the IRA has put significant subsidies in place and the expectation is that the US trajectory will change considerably.

Infrastructure is still being put in place, but more is needed to facilitate a broader roll-out. While China continues an almost horizontal trajectory, Europe is struggling to maintain the pace while US is levelling off (Figure 12).

Figure 12 Public EV chargers



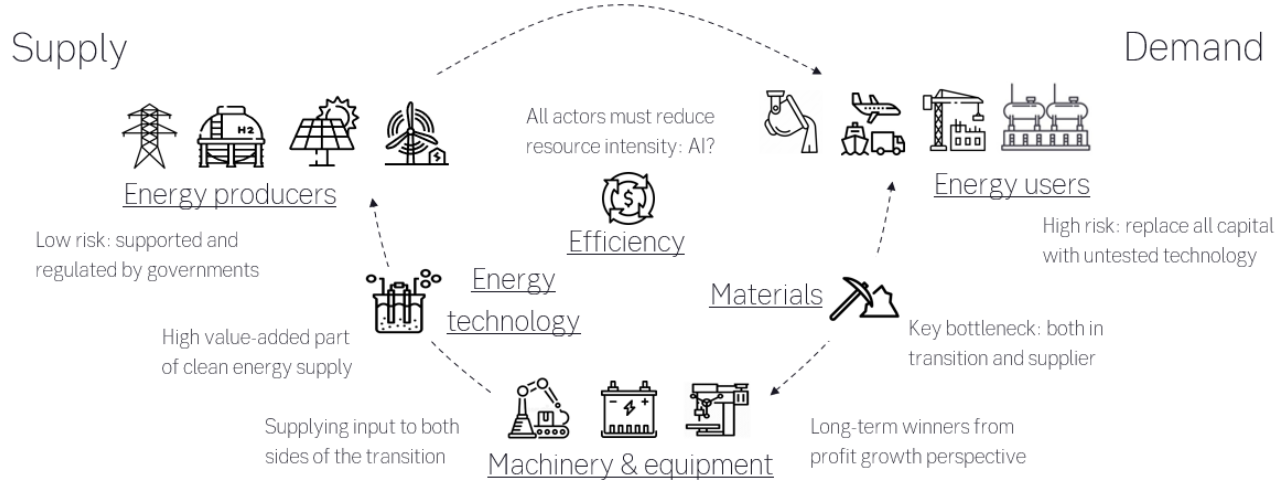
Source: Bloomberg New Energy Finance, Macrobond

The chickens and the eggs

It is not the cost of producing energy but the cost of using it that ultimately matters, and this is where it gets complicated. There are numerous intermediate technologies between wind turbine/solar panel and end user grids, storage, transformation into fuels, transmission/chargers. Over time these problems are likely to be resolved by falling costs. Historical evidence suggests cost of renewable energy could continue its exponential decline for another 15-20 years. At some point this will make most technologies commercially viable - but we do not have enough time. This is the chicken and egg problem.

The problem appears to be a lack of coordination across the supply chains (Figure 13). To some degree, policymakers may be underestimating the internal linkages between different parts of the system. Why else would you pay to expand the supply of renewable energy, but not pay for the simultaneous development of grids, chargers, batteries, PtX, EVs and other electrified technological alternatives to fossil energy use that it will require to work?

Figure 13 Energy transition requires coordination of multiple technologies



Source: SEB

Too little renewable or too much fossil?

The lack of political funding and coordination to drive the transition could potentially render the decarbonization too slow to prevent an irreversible global warming. On a shorter time-horizon, the lack of guidance and certainty about the longer-term availability of zero-emission alternatives could also open the door for continued investment in fossil fuel alternatives.

Figure 14 Investments in renewables vs. fossil fuels

Source: International Energy Agency (IEA).

Investments in renewable energy are increasing at a faster pace than for fossil fuels (Figure 14). But according to IEA in a report published in October 2023, this could jeopardize the 1.5-degree goal, as this is equivalent to close to double the level of investments in fossil fuels mapped out in the net zero-emissions scenario.

Given the uncertainty about the speed of the deployment of a new energy system, it does make sense to make sure alternatives are available. However, the more fossil capacity there is in the energy system, the more difficult it is to make renewable energy profitable, and this could in itself slow down the deployment. At the same time, if we ultimately do commit to decarbonization, a lot of the projects currently being developed in the fossil space will end up creating huge financial end economic losses. This is another reason why early commitment to long-term policy plans makes sense.

Companies left in the dark

The lack of long-term visibility also creates problems for companies trying to develop their long-term transition strategies. If there is no clarity about the availability of different energy types and energy technologies and no profitable way to start the transition today with existing technologies, it is difficult to set tangible long-term plans for decarbonization.

This might explain why so many large companies still have not committed to such plans. Figure 15 shows how far the world's top 1000 companies have come. Less than 10% have committed to a public transition or ambitious emission reduction plan, and the share that have prepared is clearly lower in the sectors facing the biggest decarbonization challenges.

This is another example of the chicken and egg coordination problem. If the take-up from energy users was guaranteed, it would be easier to build up large facilities to produce green hydrogen or alternative fuels. But if the supply volume and cost of such fuels was secured by governments, it would also be easier for energy-using companies to commit to a long-term investment in decarbonized capital equipment. Without some kind of coordination, both between supply and demand and inside the two supply chains, the transition will be too slow.

Policy: Europe risks getting left behind

At the end of the day, it all comes down to political leadership, because the transition will be far too slow if we leave the coordination to market forces. Looking at current policy frameworks, there is a clear difference among the major regions.

China currently appears to be the only major economy with a comprehensive gameplan for the transition – covering all the bases from primary energy production from investing in both renewable energy and nuclear power to building a new electrified infrastructure and dominating the supply chains that will deliver it. China is the world leader in the deployment of all the key transition technologies from solar panels over batteries and electrolysis to EV chargers.

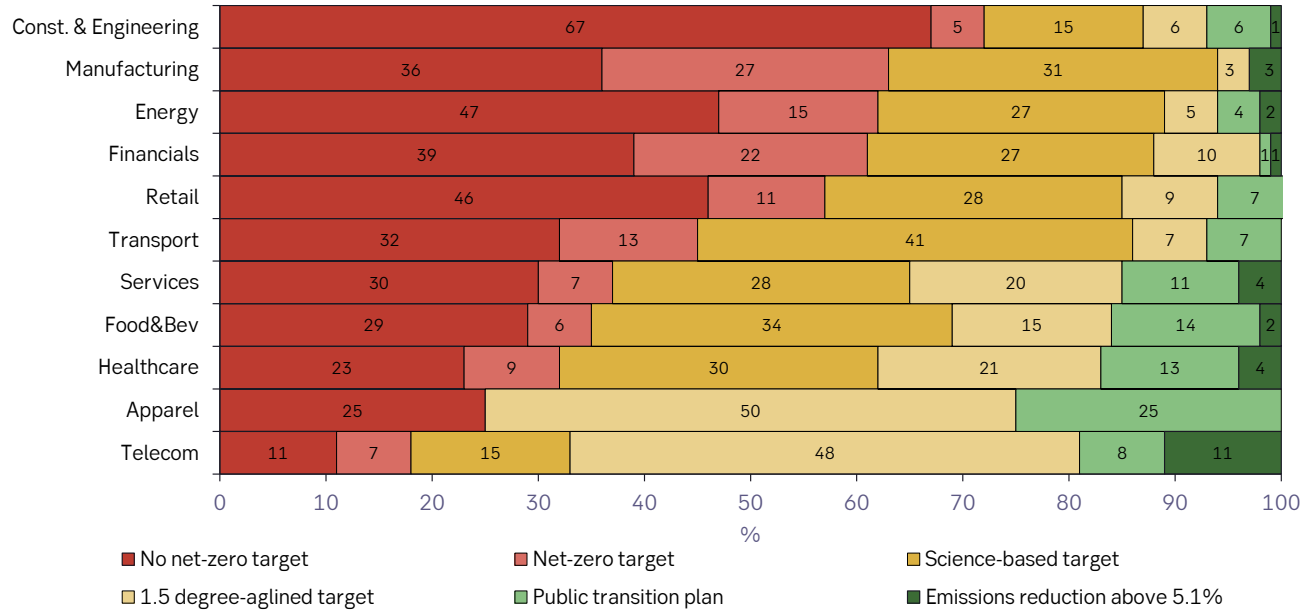
Both Europe and the US are far behind, but at least for now, the US benefits from a more comprehensive policy support in the shape of the open-ended IRA framework. President Biden capitalized on the political situation in 2022 and put a long-term plan in place that could provide unlimited subsidies for a wide array of transition technologies produced in the US in the coming decade. Due to the intricacies of the US political system, it will be difficult to roll back for a future administration, although next year's presidential election, with fossil-supporting former President Trump as the likely contender, obviously constitutes a potential watershed.

Europe has not been able to sustain the political willingness to think outside the convention box into 2023. The EU has launched plans to emulate the IRA's success, but they leave the responsibility for funding to the national governments, and the end of last year's energy crisis appears to have weakened their resolve.

The overriding problem with this strategy is that it does not pave the way for a coordinated European energy system. Germany and France, the two dominant economies, do not even agree on the role of key power sources like nuclear power in the energy supply. If coordination and long-term planning are key to success, a joint European energy policy would be more likely to succeed.

The EU's plans to restore the pre-pandemic budget rules limits the ability of the weaker countries to implement the necessary subsidies. Even in fiscally relatively strong economies like Germany, funding is under challenge after the constitutional court struck down the government's EUR 225bn off-balance sheet climate fund. The Danish government has shelved plans for a DKK 70bn energy island in the North Sea because of rising costs. In moves highlighting a change in the political climate, governments in Sweden and the UK have launched subsidies for fossil fuel consumption, apparently seeing this as a way to gain popularity among voters.

Figure 15 Progress on how many percent of the top 1000 companies across sectors with 1.5 science based targets



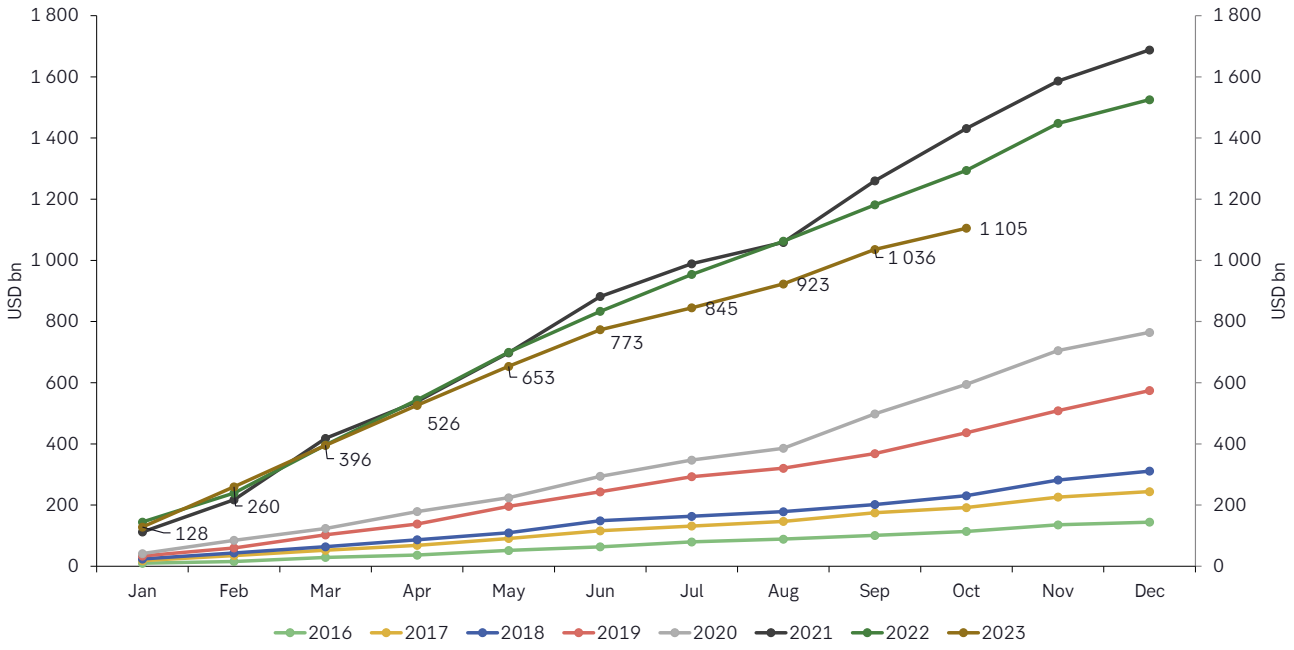
Source: CDP data, 2018–2021; Glasgow Financial Alliance for Net Zero, 2023; Net Zero Tracker, 2023; Refinitiv, 2023; Science Based Targets initiative, 2023; BCG analysis

Sustainable Finance Market Update

Frontier markets looking for growth

The sustainable finance market in 2023 has already exceeded USD 1.1tn. As the next climate summit beckons, sustainable finance in non-established markets needs to grow further to make a difference. Transition bonds are a niche market but may benefit from new regulatory guidance. Recent profit warnings add pain to downward trending clean-energy equity valuations.

Figure 16 Cumulative sustainable debt transactions



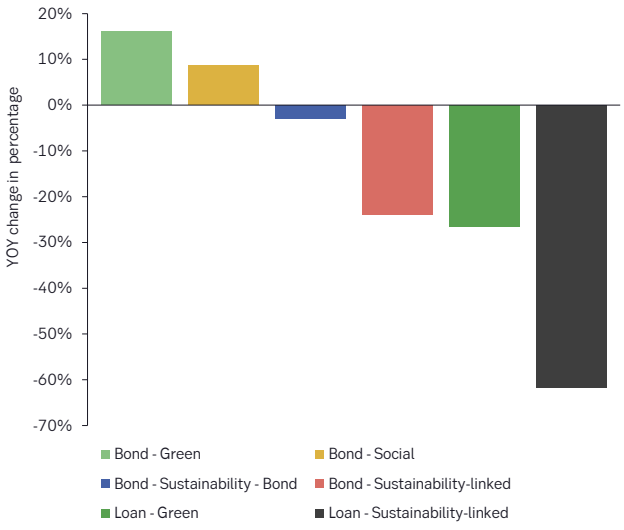
Source: BloombergNEF 31 October 2023

Market bifurcation continues with use of proceeds bonds rising, loans falling

Cumulative transactions of green, social, sustainability and sustainability-linked (GSSS) bonds and loans continue to trail historic records. Until October, just above USD 1tn in labelled debt has been transacted, which is 15% and 23% below the same period in 2022 and 2021, respectively.

In spite of the overall decline, green bonds continue to grow by 16% to a total of USD 571bn. Social bonds are the only other segment of the sustainable finance market which have recorded a Y/Y increase, growing by 9% to USD 123bn. Sustainability-linked loans continue to slide, with cumulative transactions in the past 10 months down more than 60% compared to 2022. As we mentioned in our last report, we expect performance-based banking lending to recover in the medium term as lenders need to refinance and interest rates decrease.

Figure 17 Y/Y sustainable debt transactions by product, Jan-Oct

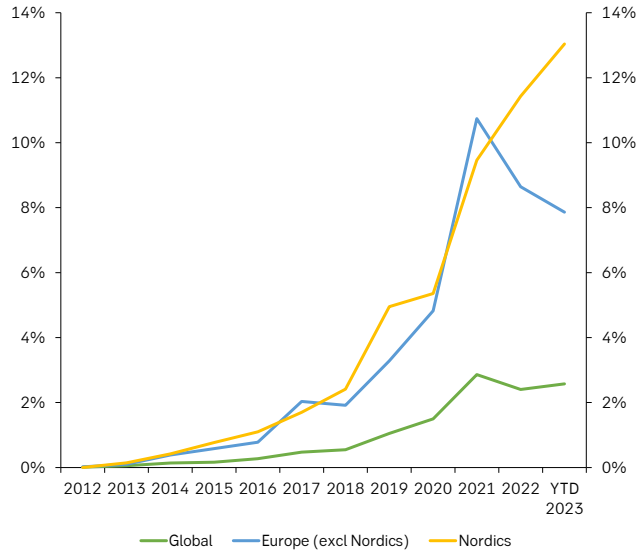


Source: BloombergNEF 31 October 2023

Gregor Vulturius, PhD gregor.vulturius@seb.se
Thomas Thygesen thomas.thygesen@seb.dk
Ben Powell ben.powell@seb.no
Filip Carlsson filip.carlsson@seb.se
Alison Mariko Rhatigan alison.rhatigan@seb.no

Diverging trends in the sustainable finance market are also evident in the market share of GSSS bonds. Sustainable bonds' share of the global governmental and corporate bond market has remained at around 2.7% since 2021, whereas its share of the European bond market (excluding the Nordics) as fallen from 7.9% to 5.9% over the past two years. In the Nordics, in contrast, GSSS bonds reached 13% of the bond market so far in 2023. The difference within Europe can be explained by the drop in social bond issuances which had taken a larger market share outside the Nordics during the pandemic. Another explanation is new issuance of SLBs which have stayed level in the Nordics while they dropped 40% Y/Y in the rest of Europe.

Figure 18 Share of sustainable bonds by region



Source: Bloomberg 14 November 2023

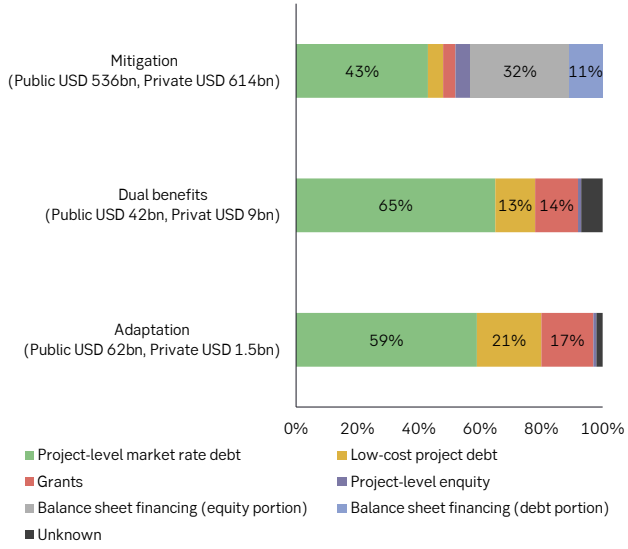
Finance for climate action surges, but struggles to reach where it's needed the most

As the world turns its attention to this year's climate summit, COP28 in Dubai, closing the investment gap between what is being spent today and the around USD 8tn needed by 2030 to keep the 1.5°C target in sight and adapt to the unavoidable impacts of climate change is becoming ever more urgent [1].

According to the Climate Policy Initiative (CDP), average annual investments in climate action reached USD 1.3tn in 2021/2022, almost doubling 2019/2020 levels. Mitigation efforts received 91% of the total of investments globally in 2021/2022. Adaptation continues to be a blind spot particularly of the private sector which has spent only around USD 1.5bn annually on preparing for climate change impacts in the past two years.

The split between mitigation and adaptation can also be recognized in the use of funding instruments, with mitigation depending equally on market-based debt and balance-sheet financing, while adaptation relies to a much higher degree on concessional financing.

Figure 19 Finance for climate action by use and instrument in 2021/2022



Source: Climate Policy Initiative 2023

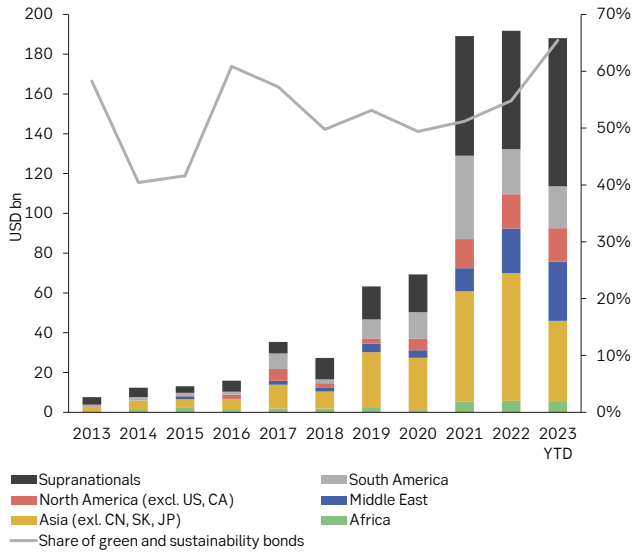
Delegates at COP28 will be pressed to channel more investments into regions where funding for emission reduction and risk mitigation is needed the most: Emerging Markets and Developing Economies (EMDE) and Least Developed Countries (LDCs). In 2021/2022, only around 2% of global climate finance went to LDC, while 14% went to EMDE excluding China according to CDP.

Figure 20 shows that sustainable finance even outside of established markets has grown quickly in the past ten years – but also that it has stagnated since 2021. Most of this funding is coming from Supranational institutions[2]. Green and sustainability bonds – the latter being mostly issued by the World Bank Group – have accounted for more than half of sustainable finance in EMDE and LDCs globally. This suggests that while progress has been made to export the concept of sustainable finance globally, more efforts are needed to both increase the size and reach of the sustainable finance market.

[1] Climate Policy Initiative Global Landscape of Climate Finance 2023

[2] Supranationals included in this analysis are Africa Development Bank, Asian Development Bank, Asian Infrastructure Investment Bank, Inter-American Development Bank, International Fund for Agriculture Development, New Development Bank, World Bank Group

Figure 20 Sustainable debt transactions by region, Jan-Oct

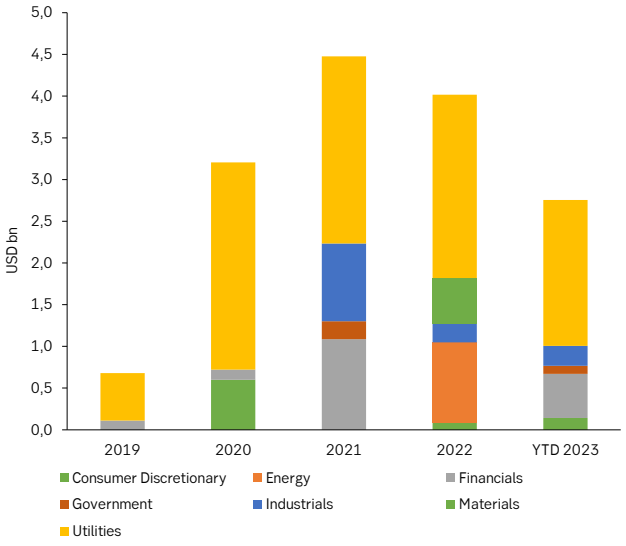


Source: BloombergNEF 31 October 2023

Transition bonds revisited

The transition bond market is a relatively new and undefined category within the labelled bond market. Figure 21 shows a total of 74 transition-labelled bonds by sector, illustrating that the majority of transition bonds have been issued by utilities and other entities in energy-intensive sectors as well as financial institutions which earmark proceeds for loans to customers that are contributing to a transition within carbon intensive sectors.

Figure 21 Transition labelled bond issuance by sector

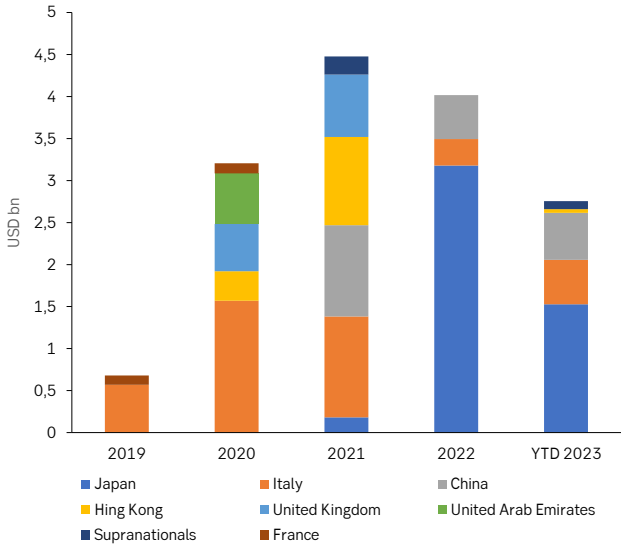


Source: Bloomberg 3 November 2023

Sustainability-linked transition bonds are primarily comprised of KPIs on CO2 emissions, with penalties in the form of donations or purchase of carbon offsets rather than traditional coupon or redemption step-ups. Use of proceeds transition bonds are often focused on decarbonization and green project categories such as renewable energy and clean transportation, with some including transition-focused categories which would not be eligible for green bonds like natural gas, thermal energy efficiency, and transitioning away from fossil fuels such as oil and coal.

Still, transition bonds remain a niche market compared to GSSS bonds. More than 50% of the global transition bond issuance volumes since 2019 have been issued in Japan, China, and Hong Kong. Japan alone makes up 32% of global volumes, driven by the Japanese Government's plan to raise up to YEN 20tn in so-called green transformation economic transition bonds (GX bonds) to reach the country's 2030 climate targets. However, and in spite of recent improvements, Japanese transition bonds received little interest from foreign investors, with remaining concerns around funding of controversial technologies.

Figure 22 Transition bond issuance by country, 2019 - YTD 2023



Source: Bloomberg 3 November 2023

The main reason why transition bonds have so far failed to scale is the lack of standardization and comparability across instruments in the absence of market consensus about eligible transition activities, KPIs and targets. The prevailing uncertainty about credible transition pathways and benchmarks exposes both issuers and investors to considerable greenwashing risks.

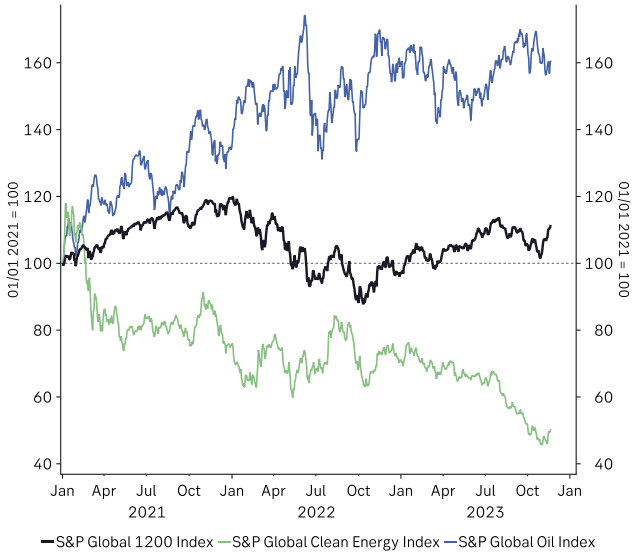
Existing and upcoming guidance may help to bring necessary clarity, standardization and comparability to the market for transition labelled bonds. ICMA has issued its Climate Transition Finance Handbook, proposing guidelines that allow for both use of proceeds and sustainability-linked bonds to be issued under a transition bond label. As discussed in detail in the regulatory update in this report, the EU Commission has taken a similar stance that transition

finance takes shape in both use of proceeds and performance-linked instruments. The EU Commission also expects that entities raising transition finance establish a transition plan including scenario-based targets. Additional voluntary reporting guidelines for green and sustainability-linked bonds will also be developed as part of the EU's Green Bond Standard, which may further standardize reporting on these instrument types.

Equities: the profit problem

In equity space, the meltdown in the clean energy sector continued into the late autumn before getting some respite from a decline in rates. Relative to the global stock market, the clean energy index has now lost almost 70% in value in two years. During this period, the clean energy index is down 50% in absolute terms, while the oil index is up 60%. This has obviously been a painful wake-up call.

Figure 23 S&P Global, Clean Energy and Oil Indices



Source: Bloomberg, Macrobond

While the extreme valuations no longer present and obstacle, the accelerating sell-off this autumn was triggered by the realization that aggregate earnings in the sector were going to be a lot lower than anticipated.

The uneven rollout of new technologies and the rising funding cost has led to a squeeze on clean energy profits. This has been revealed by a series of severe profit warnings, so the relatively low valuation we noted in the last issue of the Green Bond was at least initially a value trap.

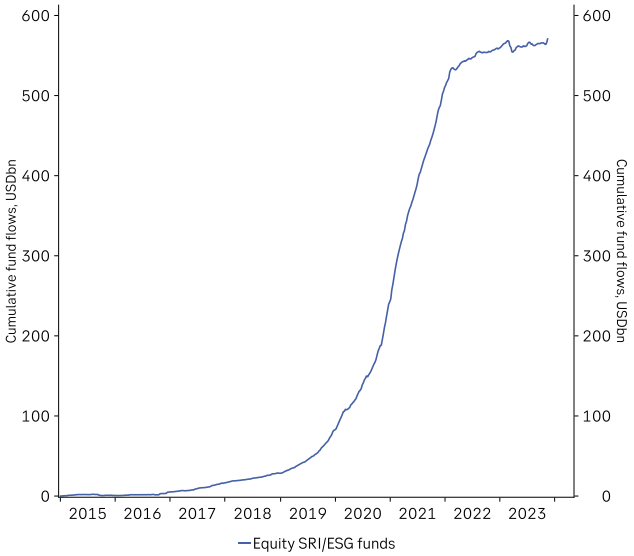
The question now is whether earnings can be stabilized. There does appear to be a growing understanding among the governments that most often are the ultimate buyers of energy that it has to be priced at a level that allows suppliers to make a reasonable profit. The long-term volume growth case still appears to be intact.

Figure 24 S&P Global Clean Energy Index, 12M fwd EPS

Source: Bloomberg, Macrobond

However, until storage solutions start scaling, there is also a clear risk that excess supply will continue to push market-based selling prices lower and funding costs are likely to remain higher than in the past. Stabilization of earnings is the key condition for stepping back in.

Figure 25 Equity SRI/ESG fund flows



Source: EPFR, Macrobond

As the clean energy sector struggles, it is perhaps not surprising that flows into equity ESG/SRI funds continues to languish (Figure 25). It is too for energy-using companies in transition to reward investors, and the clean energy suppliers are not delivering returns either. The deeper problem is that the complexity of the transition makes it hard to capture with simple mechanical screening in passive benchmarks. Ultimately, we think this space will be inhabited by active investors.

Sustainable Finance Regulation Update

The EU Transition Finance Package

The EU Commission's has taken a flexible approach to transition finance which stands in sharp contrast to the prescriptive nature of the EU Taxonomy. Corporates can choose from multiple science-based pathways and benchmarks to develop transition plans; and use labelled use-of-proceeds and performance-linked financing to meet transition targets

EU Commission recommendation on transition finance

The European Commission's "Recommendation on facilitating finance for the transition to a sustainable economy", published in June, constitutes the first time the regulator has expressed a view on how to approach transition finance. As the transition topic per se targets companies and sectors that are not yet sustainable, greenwashing concerns have been one reason for the more cautious treatment of transition finance by market participants.

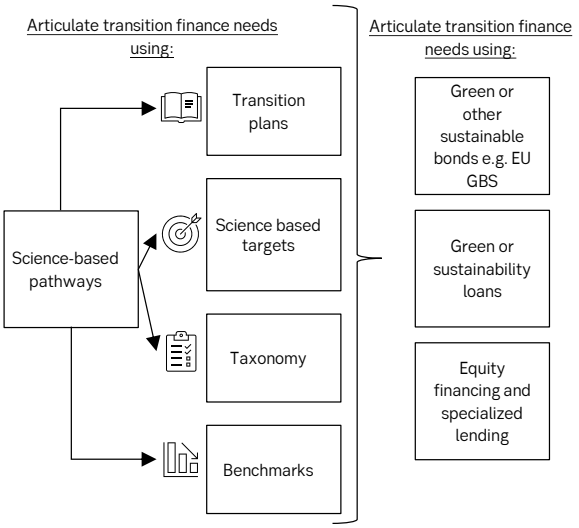
The recommendation addresses this concern directly by reassuring markets on the legitimate use of transition finance terminology, financing instruments and reliance on existing frameworks, such as the EU Taxonomy. The document is not a regulation or a proposal for regulation. It is a recommendation: a display of the various options for engaging in transition finance, building on well-established tools that will be familiar to readers of this report.

A new approach to transition finance

The recommendation takes a broad view on what it means to be in transition and leaves great space for flexibility with respect to the starting point of different undertakings. This marks a break in the regulators' so far prescriptive approach to the area of sustainable finance and will certainly be welcomed by financial markets.

What remains firm throughout the recommendation is the question of what an entity in transition should actually be transitioning towards, and by when. Being in transition is, in the eyes of EU regulators, conditional on aligning with the EU climate and environmental goals by the announced deadlines. Specifically, climate targets include limiting the global temperature increase to 1.5°C in line with the Paris Agreement and, for undertakings and activities within the EU, the objective of achieving climate neutrality by 2050 and a 55% reduction in greenhouse gas emissions by 2030 in the EU. In addition, there are the other environmental objectives on e.g. biodiversity and pollution. Transition finance, in turn, consists of funding that supports undertakings in meeting these goals by their target year. Overall, the EU recommends the use of several tools for assessing an undertaking's transition finance needs and for raising transition finance.

Figure 26 Options for articulating transition finance needs and raising transition finance



Source: European Commission

Science-based pathways as a cornerstone

Although also not mandatory, the general expectation is that undertakings seeking to engage in transition finance establish a transition plan including scenario-based targets. Pathways such as the IEA 1.5 degrees and IPCC (no/limited overshoot) are suggested, however undertakings are encouraged to take a pragmatic approach in defining the relevant benchmark.

Karl-Oskar Olming
karl-oskar.olming@seb.se

Lina Norder
lina.norder@seb.se

Gregor Vulturius, Phd
gregor.vulturius@seb.se

Cross-sectoral or sector-specific pathways, adapting the pathway to the starting point of the relevant undertaking and even using science-based targets without a transition plan, if deemed proportionate to the complexity of the undertaking, are all possible. If no suitable science-based sectoral pathway exist, the EU Climate Benchmark methodologies of yearly 7% decarbonisation can equally be used to identify 1.5°C aligned climate transition plan for activities or the undertaking.

The Taxonomy as a tool for transition target-setting

When it comes to setting targets, the Commission encourages the use of existing frameworks. Entities are recommended to use the taxonomy to not only define what is green, but also as a tool to set intermediate targets on a pathway to becoming green. As such, the taxonomy becomes a core tool to concretise the components of the transition plans discussed above. This broadened role of the taxonomy builds on a report for an "extended taxonomy" of the first EU Platform on Sustainable Finance, which attempted to add nuance to what it means to be a non-aligned activity (the report itself never made it into law). This extension is an important clarification, as it protects undertakings that want to rely on the taxonomy to articulate their transition needs from greenwashing accusations.

Outlined below are possible ways of using the EU Taxonomy to set transition targets. These can be set at an overall entity or activity level. It is primarily the last two

- Increase taxonomy alignment
- Increase taxonomy alignment within 5 (exceptionally 10) years
- Increase taxonomy alignment within a longer timeframe that is still compatible with EU climate and environmental objectives
- Improve performance to reaching beyond do no significant harm criteria, towards substantial contribution criteria, combined with activity-based transition plans aligned with EU climate and environmental objectives

Financing transition needs

Lastly, the recommendation addresses financial instruments in the transition finance context. Once again, the message is to not reinvent the wheel – instead, use what is already out there. Use of proceeds bonds and loans can be useful tools to raise capital for specific investment needs, whereas instruments linked to transition KPIs at undertaking or activity level are suggested for general purpose financing.

In conclusion, the message from the Commission to corporates with transition needs is clear: produce transition plans referencing a science-based pathway and/or benchmark in a manner suitable to your situation. Indeed, under the proposed Corporate Sustainability Due Diligence Directive (CSDDD), setting such a plan may soon be mandatory (more on this in a future regulatory update). Set relevant targets, for which the taxonomy constitutes a recommended but not in any sense exclusive tool. And then, seek financing, labelled if you like, to start transitioning.

Perspectives on the role of hydrogen in the energy transition

Anna Douglas
Senior Sustainability Specialist
anna.douglas@seb.se

Sustainability and hydrogen

The energy transition needs significant changes in technology, business models, and mindset. According to the IEA, hydrogen is one of the key pillars of decarbonizing the global energy with the potential of contribute around 6% of emissions reductions to reach net zero.

Low-emission hydrogen is produced from water using electricity generated by renewables or nuclear, from fossil fuels with minimal associated methane emissions and processed in facilities equipped to capture CO2 emissions or derived from bioenergy. This is essential for hydrogen as an end product but also for decarbonizing the final products that it is used in, such as synthetic fuels or fertilizers.

In 2022, more than 99% of global hydrogen demand was produced from fossil fuels, and the production and use of hydrogen accounted for 900 million tons CO2e emissions.

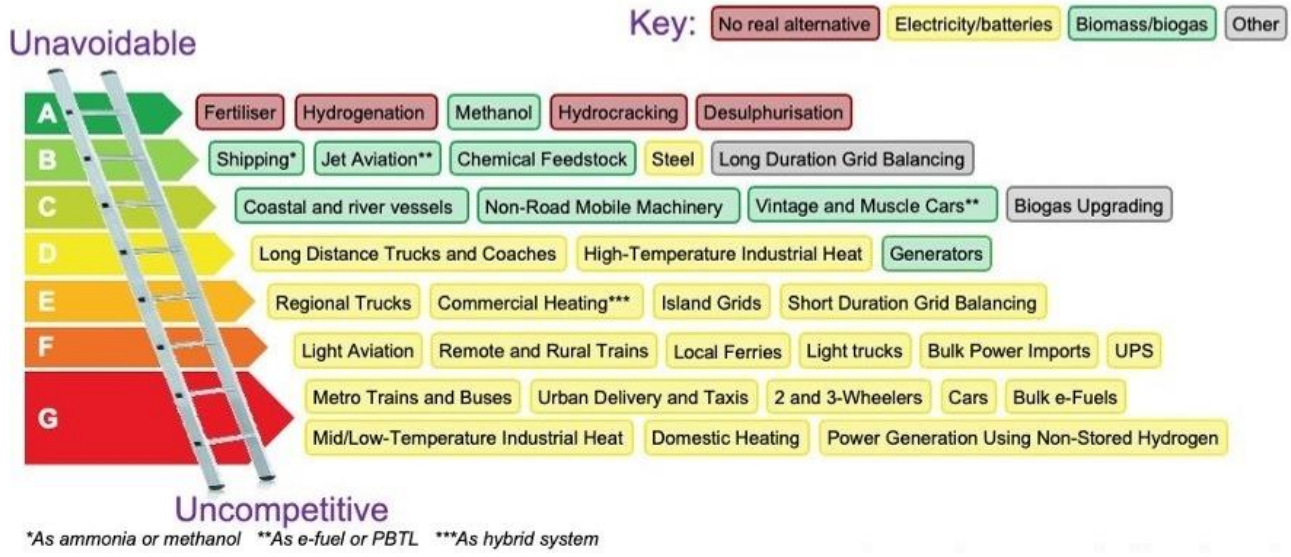
Average carbon intensity of the hydrogen was at 12-13.5 kg CO2e/kgH2, equivalent to 390gCO2e/kWh.

Hydrogen carbon intensity varies significantly depending on its life cycle emissions. The emissions intensity of hydrogen produced with electrolysis is determined by the electricity that is used. Onshore wind in Sweden is as low as 13g CO2e/kWh, with 1kg hydrogen equivalent to 33kWh. This results in 433 CO2e/kgH2, 62x lower carbon intensity than if produced from coal.

Hydrogen use cases and challenges

The "Clean Hydrogen Ladder" categorizes the likelihood of hydrogen playing a significant role in decarbonizing different use cases around 2035. At the top are "no regrets" use cases like fertilizers and petrochemicals, driven by regulatory changes, especially in the EU.

Figure 27 Clean hydrogen ladder



Source: Michael Liebreich/Liebreich Associats, under CC by 4.0 Deed

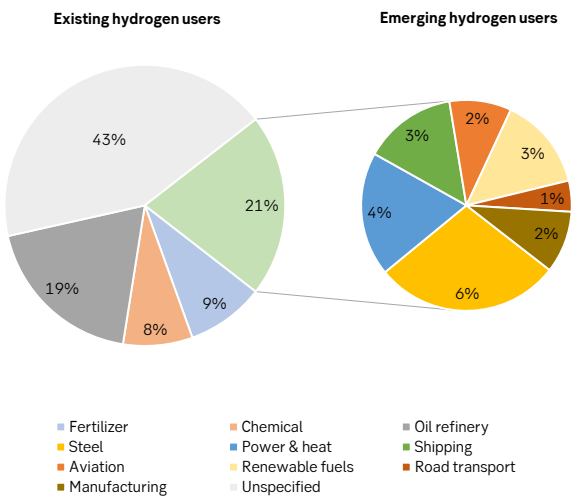
However, the ladder may not consider industrial colocation and availability, where the potential for hydrogen deployment in industrial hubs and ports can also enable other 'rungs' in the ladder, such as heavy transportation, machinery, and for grid balancing. This sector coupling adds complexity and opportunity in equal measure. Both place and case must be considered, where slides running down from higher rungs to the lower rungs of the ladder may emerge, where anchor industries act as broader ecosystem enablers for hydrogen deployments. What goes up may well come down!

Technology and Market Overview

In 2022, the global hydrogen market reached $155.9 billion, supplying 91 Mt, predominantly to large-scale industrial off-takers in petrochemicals and steel industriUses, relying on ca. 99% fossil-based hydrogen. By 2050, the production of low-emissions hydrogen is expected to reach 30 Mt under stated policies and 470 Mt under a net-zero scenario.

Despite progress, challenges persist. Only 10% of planned low emission hydrogen capacity for 2030 has identified off-takers, primarily in ammonia production. As shown in Figure 28, the end users with committing to offtake agreements are the existing hydrogen use sectors in rung A of the Hydrogen Ladder. This highlights that reducing carbon intensity of hydrogen can have significant emissions reduction benefits most immediately in the existing industrial hydrogen users where investments are most secure.

Figure 28 Low-carbon hydrogen offtake by end use



Source: BloombergNEF 19 September 2023

State of Play in Europe

Europe's hydrogen market is evolving, fueled by substantial regulatory initiatives, including but not exclusively:

- EU Fit for 55 framework supporting hydrogen production investments with an initial funding of 800 million Euros from the European Hydrogen Bank as part of the Net Zero Industry Act.
- Infrastructure development, including the European hydrogen backbone, is gaining momentum with the support of the EU Important Projects of Common European Interest scheme.
- The EU has set requirements for enabling infrastructure, mandating targets for electric recharging and hydrogen refueling infrastructure.
- The revised Renewable Energy Directive (RED III) sets quotas for the mandatory use of renewable fuels, including green hydrogen, in EU industry consumption.

Scaling a renewable energy system

Scaling is crucial for reducing costs, and industries like fertilizers and carbon-free steel production are seemingly willing to pay a premium for low-emission hydrogen. These industries may drive demand that can rapidly scale the low emission hydrogen industry

Another potential scaling driver is renewable energy itself. Renewable energy self-cannibalization, driven by oversaturation on the grid, poses challenges for renewables profitability. Hydrogen emerges as a potential solution, offering long-duration storage and energy offtake to absorb overcapacity, particularly in locations with low costs for renewable electricity.

Mindset Change

The energy transition's scale and complexity require a mindset shift. Recognizing that there is no universal silver bullet, stakeholders must embrace multiple solutions, including low-emission hydrogen. The concept of value flows, where hydrogen and renewable electricity mutually benefit each other's business cases, can maximize overall system efficiency. Decentralized and distributed energy systems enhance resilience, and affordability hinges on maintaining demand-supply balance.

Full utilization of the by-products from hydrogen production is also a priority. Waste heat, oxygen or indeed carbon are all valuable resources that can be utilized as resources for society. Using and not wasting give great opportunities for a circular energy system in the future.

In conclusion, addressing the challenges and realizing the full potential of hydrogen requires continued policy support, infrastructure development, and a shift in mindset towards integrated, sustainable energy systems that focus on resource efficiency and circularity.

Sustainable transition through increased Swedish exports

Maria Simonson
Head of Sustainability
maria.simonson@sek.se

The mandate of the Swedish Export Credit Corporation

There is a pressing global need to transform companies, societies and economies to enable the transition to a more sustainable future and minimizing our environmental footprint. Swedish companies are pioneering innovation, technology and digitalization to develop sustainable solutions. This creates new export opportunities, contributing to jobs and growth in Sweden. A successful Swedish export industry with knowledge and solutions for sustainable development is also one of Sweden's greatest contributions to the climate transition.

The Swedish Export Credit Corporation (SEK) specializes in international export financing with an explicit mission to support Swedish export with financing that is both commercially and sustainably viable.

Since 1962, SEK has offered financing that have enabled Swedish companies to grow their business. With lending in some 60 countries, SEK provides companies with competitive advantages when conducting business internationally by granting access to an entire ecosystem of banks, companies, and business partners across the globe. SEK is also administrator of the officially supported CIRR system (Commercial Interest Reference Rate).

The role of the financial sector to finance the transition

International trade and exports are important engines for global development and societal transformations have been made possible by financing of infrastructure projects and industrial growth. The climate transition is no different and the financial sector plays a key role, not only to mobilize the required capital but also to ensure that this capital is used constructively and for operations and activities that are socially, environmentally, and financially sustainable.

Exporting Swedish solutions and innovations is an important contribution towards a global sustainable development. SEK's mission - to finance Swedish exports on a commercial and sustainable basis - means that we have an excellent position to make a real difference. Increasing our ability within sustainable financing is therefore the core of our strategy in the coming years.

SEK's work on transition finance

SEK is fully committed to contribute to the achievement of the Paris Climate Agreement goals and is working to enable access to finance exports in compliance with local laws as well as international guidelines in the areas of environment, anti-corruption, human rights, labour, and business ethics. With specific reference to help prevent climate change, SEK does not finance sectors or activities related to fossil fuels and we have developed solutions to enable finance for activities and projects that already now meet the criteria for a low-emission economy. We are continuously striving to enhance our ability to support our customers.

This also means exploring methods and new financing models to help finance areas that have not yet transitioned. Specifically, in transactions related to activities with high GHG emissions how to consider the activity's total life cycle GHG emissions, carbon lock-in risks and transition plans in line with the 1.5°C goal of the Paris Agreement. Through international cooperation including with international banks and other export credit agencies we work actively to develop new and best practice in order to enhance sustainable finance practices globally. To finance businesses and projects important for the transition will be a key focus for us in the years to come.

Integrated Wind Solutions Green Financing Framework: An enabler of the energy transition

Victor Solberg
Group Controller
vs@integratedwind.com

Integrated Wind Solutions (IWS) is an offshore wind service and consultancy company that integrates Commissioning Services Operation Vessels (CSOVs) with construction, engineering, product and manpower services in a wind farm's installation, commissioning, and operations phases. The company is listed on Euronext Growth (Oslo) with ticker IWS.

IWS is committed to contributing to the ramp-up of offshore wind power as part of the transition to renewable energy sources. The group aims to take a leading role in this transition by offering a fleet of state-of-the-art vessels to the offshore wind industry combined with a suite of adhering services to reduce the levelized cost of energy (LCOE) for offshore wind. The group is divided into three business segments:

- IWS Fleet is a CSOV operator with six high-end newbuildings + two options, in a market where CSOV demand is expected to increase 3x by the end of the decade
- IWS Services provides comprehensive solutions to the offshore wind industry, including construction, engineering, consulting and services
- Peak Wind (30% ownership) is a leading renewable energy consultancy, operations & asset management service company

IWS Fleet's vessels are identical "Skywalker class" vessels designed specifically to support commissioning works during the construction of wind farms, as well as supporting operations and maintenance during the lifetime of offshore wind farms, bottom fixed and floating.

Figure 29 Offshore wind power installation vessels supporting the energy transition

Source: IWS

The role of offshore wind in the energy transition

The energy transition to a low-carbon future is a core component of the IWS business plan. The offshore wind industry is expected to grow significantly over the coming decades,[3] and will be an important element in the energy mix and the transition from fossil fuels. In Europe alone, the projected outlook for 2030 anticipates 127 GW of offshore wind capacity, a significant rise from the 32 GW installed by June 2023, which includes 2.1 GW of new offshore wind in the first half of 2023. This outlook implies substantial growth in the industry in the coming years.

According to Wind Europe, the EU should aim to construct an average of 11 GW of offshore capacity annually between now and 2030. Additionally, approximately 5 GW per year should be built in the UK to meet its 2030 targets. While offshore wind developers have recently encountered cost pressures due to inflation and increased finance expenses, resulting in some project delays and cancellations, it hasn't significantly affected the overall outlook in Europe.

CSOVs with lower emissions and noise impact

IWS Fleet is delivering vessels that meet the demands of wind farm developers and operators. The ships feature several "industry firsts", including the largest battery pack with solar panels for additional charging, hull and propulsion design with increased operability and reduced emissions, and an energy consumption estimated to be 20% lower than comparable CSOVs currently under construction. The vessels are also the first in the industry to have the "DNV SILENT" notation, which focuses on minimising the negative impact of noise on marine life below water.

IWS Fleet's vessels feature a plug-in hybrid solution that reduces emissions and optimises fuel consumption by allowing more efficient use of the onboard combustion engines through peak-shaving and working as a spinning reserve. The vessels are also optimised in several areas, such as hull and propeller design, dynamic positioning technology capabilities and hotel/Heating, Ventilation, and Air Conditioning (HVAC) power configuration, all to ensure the lowest emissions possible. In total, IWS Skywalker-class vessels are estimated to have 60-75% lower emissions compared to Tier 2/3 CSOVs, and are built with the option to convert the vessels to be fully zero-emission at a competitive cost in the future.

Figure 30 Green financing for innovative CSOV fleet. Picture of IWS Skywalker

Source: IWS

IWS Green Financing Framework

In November 2023, IWS published its first Green Financing Framework to highlight the company's sustainability strategy to its lenders and investors. Proceeds from green financing raised under the framework will be used to finance hybrid power vessels with the main purpose of supporting the construction and maintenance of offshore wind farms, as well as investments in research and development related to decreasing CO_2 emissions and improving the energy efficiency of the vessels and operations. SEB acted as the sustainability structuring advisor, and the framework received a Second Party Opinion from S&P Global, which awarded the framework a Medium Green shading.

The establishment of the inaugural Green Financing Framework is a key step in integrating sustainability into the company's financing, and IWS will continue to drive progress towards a transition to clean energy as the CSOVs enter operations. The fleet's hybrid-powered vessels qualify for green financing under the framework.

[3] IEA World Energy Outlook 2021, Statnett Langsiktig Markedsanalyse Norden og Europa 2020-50

Green bonds driving the transition in the real estate sector

Anna Denell
Head of Sustainability
anna.denell@vasakronan.se

Thomas Nystedt
Group Treasurer
Thomas.nystedt@vasakronan.se

Vasakronan

Celebrating ten years since issuing the world's first corporate green bond

Ten years have passed since we, with the help of SEB, issued the first ever green corporate bond. In late summer 2013, we were contacted by SEB who wanted to discuss a new financing opportunity. At that point, we had already been in the bond market for 13 years and we therefore thought that alternative bond financing sounded interesting.

After a few meetings it was clear to both us and SEB that Vasakronan was well equipped to be able to issue a green corporate bond. But it was also clear that if we wanted to make it as the first company in the world, we needed to move quickly. And we did. On the morning of November 18, 2013, we issued the world's first green corporate bond, to the value of SEK 1.3bn. Just a couple of days later, EDF issued the world's second green corporate bond.

Green bonds opened up new green lending opportunities

Our first corporate green bond was priced in the same way as Vasakronan's conventional bonds, but overnight the number of interested investors tripled, and investors who had never bought Vasakronan's bonds before signed up to buy. It was a clear signal that there was a great demand for green investments in a market with basically no supply. Since then, the green bond market has flourished, with subsequent green loan opportunities from banks as well as the emergence of other green loan instruments. Vasakronan was the first in the world to offer a green commercial paper to the market in 2018.

Role of green bonds in accelerating the transition

Since we issued our first greed bond, we have experienced what clear connection between sustainability and financing can do to increase the pace of the transition. We noticed how keen the project managers of our construction projects became to obtain environmental certification, an important requirement for green financing. When in 2017 we chose to also include refinancing of existing buildings, requiring, among other things, to get below a certain energy level, we again clearly saw how commitment to and focus on energy efficiency increased.

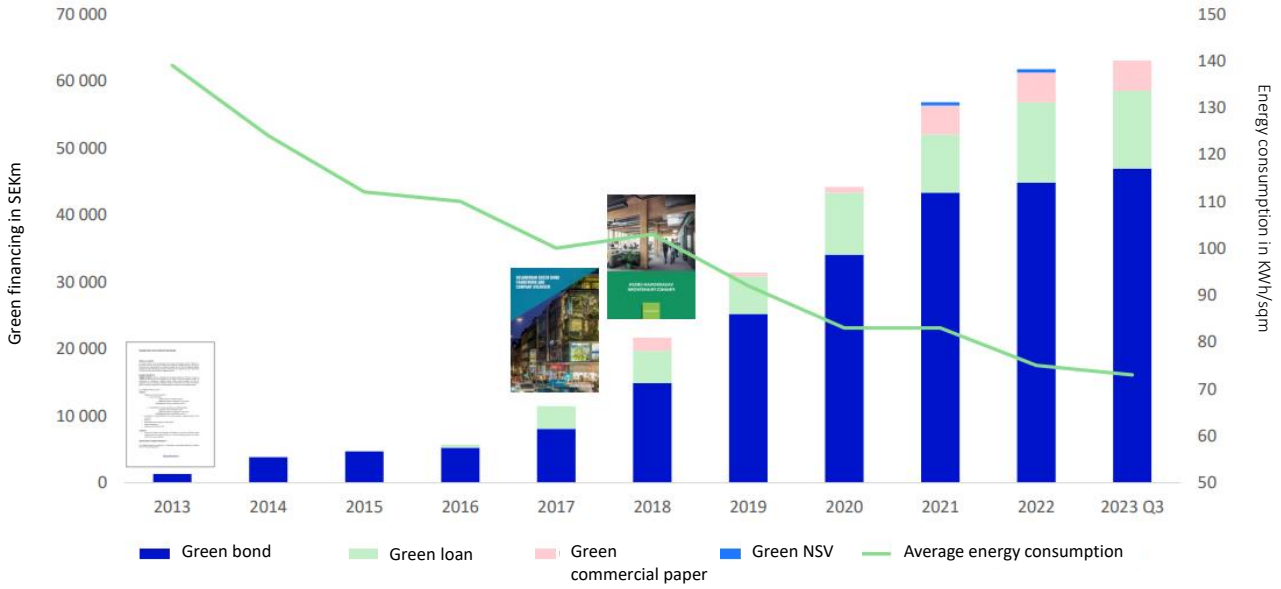
We derive clear financial benefits from this increased focus on transition and energy efficiency. When buildings use less energy, it leads to lower operating costs for the company, something that became particularly clear in the fall of 2022 when Europe was hit by extremely high energy prices. In addition, we are now seeing a clear shift in the rental market, where tenants who have previously been content with the property being environmentally certified, also demand that it is aligned with the EU taxonomy. For an existing office building in Sweden, this means that it must be below 80 kWh per square meter and year.

Finally, low energy consumption provides the opportunity for green financing. It both increases the availability of capital and affects the cost of it. We are today Sweden's largest issuer of green corporate bonds and a whopping 83 percent of our total debt of SEK 77bn is today green.

New framework with tougher threshold values

As we have improved Vasakronan's sustainability performance and increased its share of green financing, our environment has changed. Not least regulations such as the EU taxonomy and CSRD are reshaping the landscape for green investments. This is in many ways a desirable change which over time will increase comparability between companies and likely leads to significantly reduced risks for greenwashing.

Figure 31 Vasakronan's green financing and energy consumption



Source: Vasakronan

To adapt to the new regulations and make Vasakronan's framework more transparent, we have chosen to launch a new updated framework for green financing where we choose to include performance thresholds from the EU taxonomy. However, the taxonomy's screening criteria for construction and real estate-related activities are still in many cases set very low. We have therefore chosen to have tougher eligibility requirements than those found in the taxonomy. We have also chosen to maintain the requirement that new construction and major renovation projects as well as existing properties be LEED-certified.

A threshold which, according to our Second Opinion provider, S&P, is among the toughest they have seen in construction and real estate, is the climate impact of construction, so-called. embodied carbon. Here, Vasakronan has set a requirement for 275 kg CO2 per square meter for new constructions, which is to be compared with the statutory level of 380 kg CO2 per square meter which is expected to be introduced In Swedish legislation by July 2025.

Priority areas in Vasakronan's transition efforts

According to S&P's assessment, Vasakronan's new framework "only" achieves the Medium Green rating even though that the requirements in the framework are among the toughest of any real estate company in the world. We initially had some difficulty accepting this because several of the sub-activities were rated Dark Green.

That the overall rating still lands at Medium Green is due to our large share of refinancing of existing buildings. These can only get Dark Green if they are already now considered to be in line with the Paris Agreement, i.e. if the building has close to zero emissions calculated as the building's total energy consumption, including tenants' electricity consumption, converted to "location based" carbon emissions. Despite many years of successful energy efficiency work, we are not there yet. To get there, we need to focus further on three areas in our value chain but beyond our own control.

1. We need to help our tenants to reduce their electricity consumption

2. We must rely on the fact that the average emissions from Swedish energy networks (electricity, district heating and cooling) will decrease in the coming years.

3. We need to better tackle embodied carbon emissions. For a construction project to be considered in line with the Paris Agreement, the construction of the building must not cause any net emissions, which is currently extremely difficult for us to manage on our own. This is despite the fact that it is an area we have worked with for a long time and that the emissions related to our projects are far below the industry average.

Things we can do on our own, however, is to consider how how many new square meters are actually needed. And, if it is possible to rebuild instead of demolishing and build new, which we have done in the Lumi project in Uppsala. We also need to build more in wood instead of concrete and steel. Building elements in wood cause significantly lower emissions than the equivalent in steel or concrete and also sequesters carbon dioxide as long as the building is allowed to stand. Here, our property Magasin X in Uppsala is a good example

Rocks and hard places: The complicated nexus of energy transition minerals and biodiversity

Esther Whieldon
Senior Writer
esther.whieldon@spglobal.com

Joerg Rueedi
Senior ESG Analyst

Shirley Yap
Senior Data Scientist

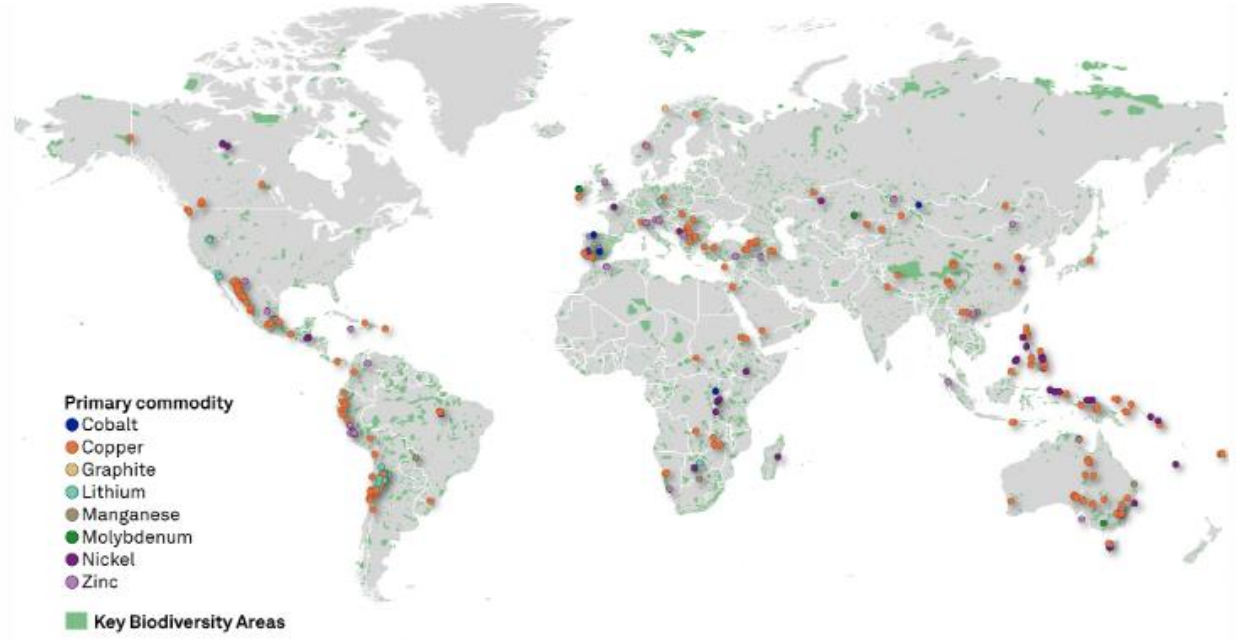
Gautier Desme
Head of Data Innovation

S&P Global Sustainable1

Low-carbon energy transition pathways predict a massive expansion in the supply of rare minerals, and companies are exploring hundreds of new sites globally that have mining potential. More than 1,200 mining sites lie within Key Biodiversity Areas (KBAs), and 29% of those sites are for energy transition minerals, according to an analysis from S&P Global Sustainable1 based on data accessed through collaboration with UNEP-WCMC.

Accessing more of these minerals to expand low-emissions technologies like electric vehicles, solar energy and batteries can create pressures on biodiversity, undermining the resilience of ecosystems and their role in addressing climate change. This presents a complicated problem: How does the world attain the mineral resources needed to enable the energy transition while managing the potential negative impacts on biodiversity? How do we minimize trade-offs arising between efforts to conserve nature and reduce emissions? These questions take on greater urgency as the world better understands that trillions of dollars of economic activity rely on biodiversity. Looming above this challenge is the basic fact that failing to lower greenhouse gas emissions will continue to cause dramatic losses to biodiversity in the coming decades.

Figure 32 Map showing 29% of all mines in key biodiversity areas are for transition minerals



Operating, closed and exploration transition mineral mines that overlap with Key Biodiversity Areas. Source: S&P Global

The energy transition's demand for minerals

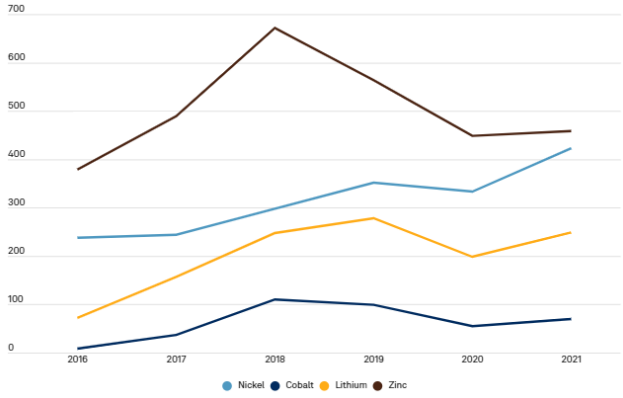
Despite its potential harm to ecosystems, mining for energy transition minerals is a key part of transitioning toward low-carbon energy and technologies. The world needs to act quickly to reduce greenhouse gas emissions to limit global warming and avoid potentially catastrophic impacts to society and nature alike.

The low-carbon transition will require a massive expansion of renewable generation, high-voltage power lines and electric vehicles, according to the International Energy Agency's (IEA's) World Energy Outlook Special Report released in May 2021. Many low-carbon technologies will require significantly larger amounts of certain minerals than their fossil-fuel based counterparts. For example, the IEA estimates that electric cars — which rely on lithium, nickel, cobalt, manganese, and graphite for electric batteries — need about 6x the amount of minerals of a conventional combustion car.

Exploration budgets on the rise

One indication of where companies are considering developing new mines or expanding existing ones is their exploration budgets. Companies use the exploration process to determine if there are sufficient minerals under the ground to warrant moving forward with development. Of the energy transition-related mining sites in KBAs around the world, 67% are exploration sites. Meanwhile, mining companies have collectively ramped up their exploration budgets for many of the minerals needed for technologies such as wind and solar power, utility-scale battery storage and electric vehicles.

Figure 33 Annual nickel, cobalt, lithium, and zinc exploration budgets have climbed since 2016 ($M)



Data complied Aug 2022, includes aggregate exploration budgets by mining companies worldwide. Source: Sustainable1

From 2016 through 2021, the aggregate exploration budgets of mining companies worldwide increased for copper, nickel, lithium, cobalt, molybdenum and zinc, according to S&P Global Market Intelligence data. The biggest increase over that five-year period was for cobalt, which is a key component to electric vehicle batteries and battery storage. The global aggregate exploration budget for cobalt increased by 733% from 2016 through 2021, from $8.4 million to $70 million. Even so, cobalt's exploration budget is still far lower than many other transition minerals.

Global production may struggle to meet demand

While exploration budgets are rising for transition minerals, global production may struggle to meet demand in the near term, which could affect the pace of the low-carbon transition. Exploration does not mean production is coming online quickly. If a company does decide to pursue an exploration site, obtaining development permits can take up to 10 years, depending on the country of jurisdiction.

Demand for some minerals is particularly durable. S&P Global Market Intelligence in its World Exploration Trends 2022 report projected that "soaring demand for lithium as a major battery component will keep the market in deficit in the near and medium terms, as growth in supply will lag due to pandemic-related disruptions."

Meanwhile, demand for copper will double by 2035, creating a supply gap that could threaten climate goals and pose serious challenges to reaching net-zero emissions by 2050, according to research by S&P Global's Economics & Country Risk, Commodity Insights, and Mobility teams. In the face of potential supply shortfalls, alternatives to mining for critical minerals are emerging. Some of those alternatives, such as minerals and metals recycling, could also reduce threats to biodiversity to the extent that they decrease the need for mining.

A 2022 study by researchers at Belgian university KU Leuven found that Europe faces critical shortfalls in transition minerals in the next 15 years, but those shortfalls could be reduced if Europe invests more in metals recycling. Up to 75% of Europe's clean energy metal needs could be met through local recycling by 2050 if Europe quickly ramps up investments in the circular economy, the study found.

The IEA has also suggested a circular economy approach could help reduce primary supply requirements for minerals for electric vehicle batteries by about 10% by 2040.

A version of this research was originally published by S&P Global Sustainable1 in November 2022; Read the full original report here.

The Green Bond Editorial Team

Gregor Vulturius, PhD
Advisor
Climate & Sustainable Finance
gregor.vulturius@seb.se

Thomas Thygesen
Head of Strategy & Equities and a transition specialist,
Sustainable Banking
thomas.thygesen@seb.dk

Elizabeth Mathiesen
Senior Strategist
Equity Strategy Research
elizabeth.mathiesen@seb.dk

Ben Powell
Head of Sustainability Fixed Income
DCM/Bond Origination
ben.powell@seb.no

Karl-Oskar Olming
Head of Sustainability Strategy and Policy
Sustainable Banking
karl-oskar.olming@seb.se

Lina Apsheva
Sustainable Finance Specialist
Climate & Sustainable Finance
lina.apsheva@seb.se

Tine Vist
Senior Quantitative Strategist
Equity Strategy Research
tine.vist@seb.dk

Mads Skak Bossen
Quantitative Strategist
Equity Strategy Research
mads.bossen@seb.dk

Lina Norder
Sustainability Business Developer
Sustainable Banking
Lina.norder@seb.se

Alison Mariko Rhatigan
Sustainable Finance Analyst
DCM/Bond Origination
alison.rhatigan@seb.no

Filip Carlsson
Junior Quantitative Strategist
Macro & FICC Research
filip.carlsson@seb.se

Contacts at SEB

Hans Beyer
Chief Sustainability Officer of SEB
hans.beyer@seb.se

Christopher Flensborg
Head Climate & Sustainable Finance
christopher.flensborg@seb.se

The Climate & Sustainable Finance Team
greenbonds@seb.se

SEB Norway:
Øystein Stephansen
Head Climate & Sustainable Finance in Norway
oystein.stephansen@seb.no

SEB Finland:
Anssi Kiviniemi
Head of Sustainability in Finland
anssi.kiviniemi@seb.fi

SEB Germany:
Alexandra Themistocli
Head of Sustainable Banking in Germany
alexandra.themistocli@seb.de

SEB UK:
Renato Beltran
Client Executive, LC&FI
renato.beltran@seb.co.uk

SEB Singapore:
Eng Kiat Ong
Financial Institution Coverage Singapore
eng-kiat.ong@seb.se

SEB Denmark:
Lars Eibeholm
Head of Sustainable Banking in Denmark
lars.eibeholm@seb.dk

SEB USA:
John Arne Wang
General Manager
john.wang@sebny.com

SEB Baltics:
Aušra Šamšonienė
Sustainability Officer, Baltics
ausra.samsoniene@seb.lt

Viktors Toropovs
Sustainability Officer in Latvia
viktors.toropovs@seb.lv

Audrius Rutkauskas
Sustainability Officer in Lithuania
audrius.rutkauskas@seb.lt

Evelin Allas
Sustainability Officer in Estonia
evelin.allas@seb.ee

“The Green Bond” is SEB’s research publication that strives to bring you the latest insight into the world of sustainable finance – one theme at a time. Even though the publication covers all kinds of products and developments in the sustainable finance market, we decided to keep its historic name – “The Green Bond” – as tribute to our role as a pioneer in the Green Bond market.

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 22 November 2023.

Cut-off date for calculations was 31 October 2023, unless otherwise stated.

Subscribe/Unsubscribe to The Green Bond by sending an e mail to: greenbonds@seb.se

This statement affects your rights
This report is a marketing communication produced by the Climate and Sustainable Finance team, a unit within Large Corporates & Financial Institutions, within Skandinaviska Enskilda Banken AB (publ) ("SEB") to provide background information only. It does not constitute investment research or a solicitation offer. It is confidential to the recipient and any dissemination, distribution, copying, or other use of this document is strictly prohibited.

Good faith & limitations
Opinions, projections and estimates contained in this report represent the author's present opinion and are subject to change without notice. Although information contained in this report has been compiled in good faith from sources believed to be reliable, no representation or warranty, expressed or implied, is made with respect to its correctness, completeness or accuracy of the contents, and the information is not to be relied upon as authoritative. To the extent permitted by law, SEB accepts no liability whatsoever for any direct or consequential loss arising from use of this document or its contents.

Disclosures
The analysis and valuations, projections and forecasts contained in this report are based on a number of assumptions and estimates and are subject to contingencies and uncertainties; different assumptions could result in materially different results. The inclusion of any such valuations, projections and forecasts in this report should not be regarded as a representation or warranty by or on behalf of SEB or any person or entity within SEB that such valuations, projections and forecasts or their underlying assumptions and estimates will be met or realized. Past performance is not a reliable indicator of future performance. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related investment mentioned in this report. Anyone considering taking actions based upon the content of this document is urged to base investment decisions upon such further investigations as they deem necessary. This document does not constitute an offer or an invitation to make an offer, or solicitation of, any offer to subscribe for any securities or other financial instruments.

Conflicts of Interest
This report is marketing communication. It does not constitute independent objective investment research, and therefore is not protected by the arrangements which SEB has put in place designed to prevent conflicts of interest from affecting the independence of its investment research. Furthermore, it is also not subject to any prohibition on dealing ahead of the dissemination of investment research, SEB or its affiliates, officers, directors, employees or shareholders of such members (a) may be represented on the board of directors or similar supervisory entity of the companies mentioned herein (b) may, to the extent permitted by law, have a position in the securities of (or options, warrants or rights with respect to, or interest in the securities of the companies mentioned herein or may make a market or act as principal in any transactions in such securities (c) may, acting as principal or as agent, deal in investments in or with companies mentioned herein, and (d) may from time to time provide investment banking, underwriting or other services to, or solicit investment banking, underwriting or other business from the companies mentioned herein.

Recipients
In the UK, this report is directed at and is for distribution only to (i) persons who have professional experience in matters relating to investments falling within Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (The ''Order'') or (ii) high net worth entities falling within Article 49(2)(a) to (d) of the Order (all such persons together being referred to as ''relevant persons''. This report must not be acted on or relied upon by persons in the UK who are not relevant persons. In the US, this report is distributed solely to persons who qualify as ''major U.S. institutional investors'' as defined in Rule 15a-6 under the Securities Exchange Act. U.S. persons wishing to effect transactions in any security discussed herein should do so by contacting SEB Securities Inc. (SEBSI). The distribution of this document may be restricted in certain jurisdictions by law, and persons into whose possession this document comes should inform themselves about, and observe, any such restrictions.

The SEB Group: members, memberships and regulators
Skandinaviska Enskilda Banken AB (publ) is incorporated in Sweden, as a Limited Liability Company. It is regulated by Finansinspektionen, and by the local financial regulators in each of the jurisdictions in which it has branches or subsidiaries, including in the UK, by the Prudential Regulation Authority and Financial Conduct Authority (details about the extent of our regulation is available on request); Denmark by Finanstilsynet; Finland by Finanssivalvonta; Norway by Finanstilsynet and Germany by Bundesanstalt für Finanzdienstleistungsaufsicht. In the US, SEBSI is a U.S. broker-dealer, registered with the Financial Industry Regulatory Authority (FINRA). SEBSI is a direct subsidiary of SEB.