

## SPEECH

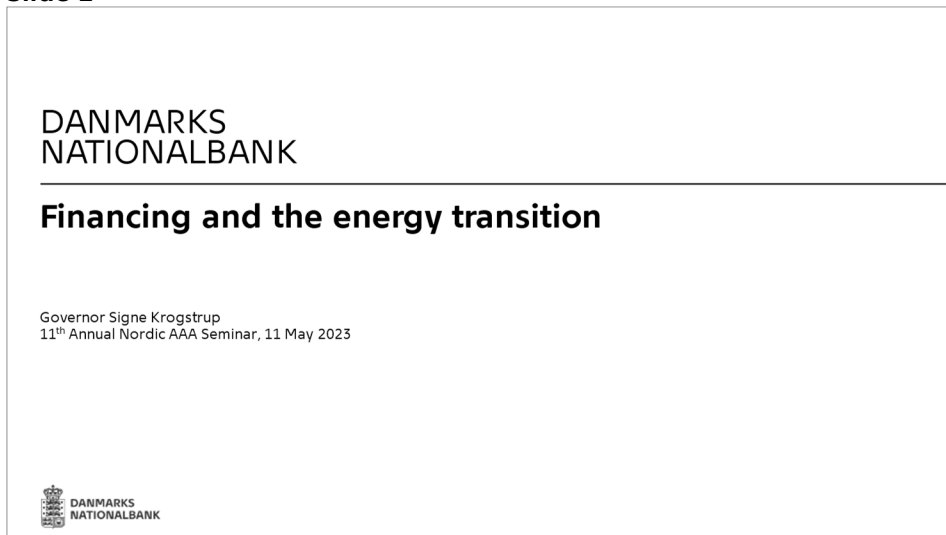
# Governor Signe Krogstrup's speech at Nordea's 11<sup>th</sup> Annual Nordic AAA Seminar about financing and the energy transition

---

11 May 2023

## CHECK AGAINST DELIVERY

### Slide 1




DANMARKS  
NATIONALBANK

---

**Financing and the energy transition**

Governor Signe Krogstrup  
11<sup>th</sup> Annual Nordic AAA Seminar, 11 May 2023



Many thanks to Nordea for inviting me today.

You might question the relevance of discussing climate change and financing the transition amid inflationary pressures and banking turmoil.

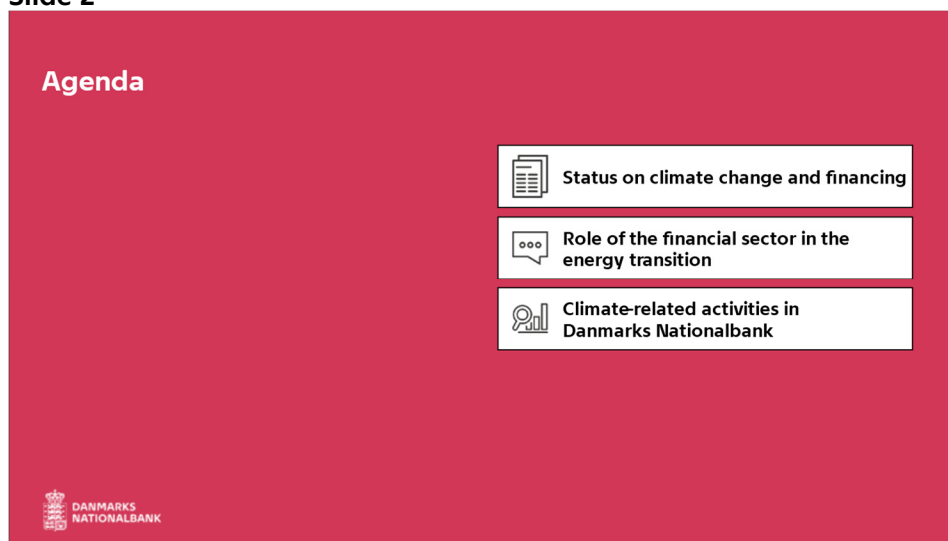
I would argue that these phenomena are intimately connected.

Climate change and the needed energy transition have contributed to the supply-driven energy price volatility, which has been a primary driver of the current high levels of inflation in Europe.

- Climate considerations were a key factor underlying the growing dependence on Russian natural gas in Europe prior to the invasion of Ukraine.

- A higher proportion of renewables in the energy mix in Europe means that the energy supply, and hence energy prices, have become increasingly sensitive to heat, drought and lack of wind, as we experienced last summer.
- While we have no counterfactual, it is likely that the European energy mix, and thus inflation and interest rates, would have developed very differently in the absence of global warming.

## Slide 2



**Agenda**

- Status on climate change and financing
- Role of the financial sector in the energy transition
- Climate-related activities in Danmarks Nationalbank

DANMARKS NATIONALBANK

This is the agenda for the presentation.

First, I will give a status on climate change, with a focus on financing needs.

Then, I will discuss the role of the financial sector in supporting the green transition and managing climate-related risks. The financial sector as a whole – including Danmarks Nationalbank – still has much work to do to understand climate-related risks.

Finally, I will turn to Danmarks Nationalbank's role and efforts in the green transition.

### Slide 3

## Status on climate change and financing

DANMARKS NATIONALBANK

Thursday, 11 May 2023 3

We start with a status on the climate.

### Slide 4

## The world's energy supply remains fossil-based, and electrification challenges remain

The world's energy supply remains largely fossil-based, and global temperatures continue to rise

Exajoule

Renewable energy  
Nuclear energy  
Gas  
Oil  
Coal

Temperature increase relative to the average temperature in 1951-1980 (right axis)

Note: The chart shows the annual global energy consumption by source and temperature increase. Source: Macrobond.

### Challenges to an electrification of the European energy supply

- Stability of supply
- Untested technologies, e.g. Power -to-X
- Access to minerals and rare earths

DANMARKS NATIONALBANK

Thursday, 11 May 2023 4

Global energy systems are still largely based on fossil fuels.

- The use of oil and gas continues to grow, while the use of coal has stagnated.
- Missing de-carbonisation of energy, notably, mirrors insufficient climate policies to support pricing of carbon emissions.

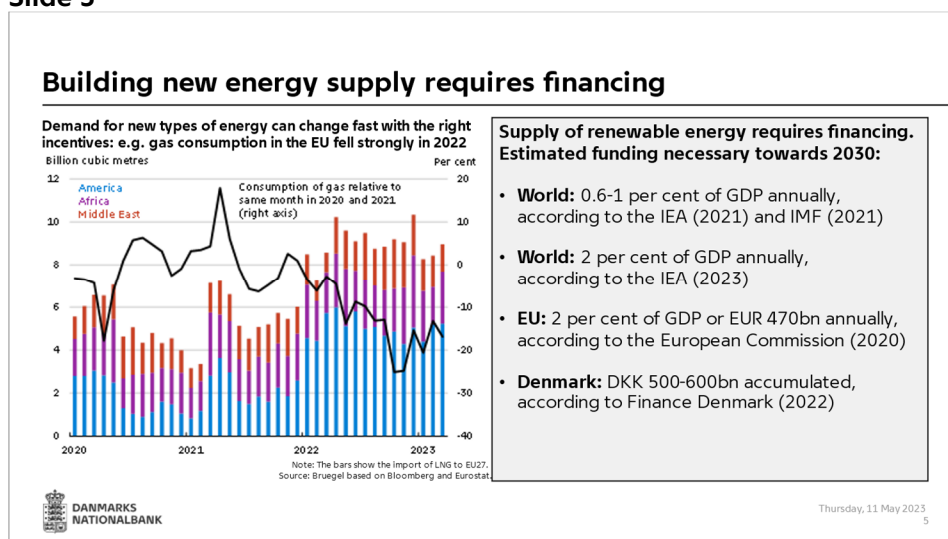
We are far from reaching the climate goals of the Paris Agreement.

- As a result of the sustained growth in carbon emissions, temperatures continue to rise.
- The recent 6<sup>th</sup> IPCC Synthesis Report – published in March – concludes that even with the current nationally determined contributions, it will be hard to limit global warming to below 2 °C.
- With the current nationally determined contributions, global temperatures are likely to increase by 2.8 °C by 2100.

Challenges to an electrification of the European energy supply remain.

- Solar and wind generation challenges the stability of supply. Fuel-based power plants provide a more stable supply of electricity than solar and wind energy, which are sensitive to the weather.
- Plans to ensure the stability of supply of renewable energy rely on untested technologies, e.g. Power-to-X or e-fuels. Because these solutions are under development, they have yet to be tested at a large-scale, and some technology risk remains.
- Electrification requires access to necessary minerals and rare earths. Global demand for critical minerals is set to rise two- to four-fold by 2030, according to the IEA. A key challenge is that geopolitical risk and security concerns increasingly call for diversification of supply chains. This is, however, hampered by the fact that critical minerals extraction is geographically highly concentrated.
- The increasing importance of critical minerals could become a bottleneck for green energy deployment.

## Slide 5



Demand for energy can shift rapidly when incentives are sufficiently strong.

- Europe has rapidly reduced its dependence on Russian gas during 2022.
- Consumption of energy has been reduced all together, and consumption has switched to alternative energy sources.
- At the end of 2022 and early 2023, European consumption of gas was around 20 per cent below the average for the corresponding months in 2021 and 2022.
- At the same time, Europe has increased its import of liquified natural gas from Africa and the Middle East.

In order to take the energy transition further – and make it greener – policies that shift incentives and promote stability will help support financing. Thus, access to finance to enable green investment can be supported by:

- Policies to make green solutions profitable, e.g. carbon taxation.
- Stable planning horizons, which allow these companies to think long-term.

Lower growth is not the solution to reaching the climate goals.

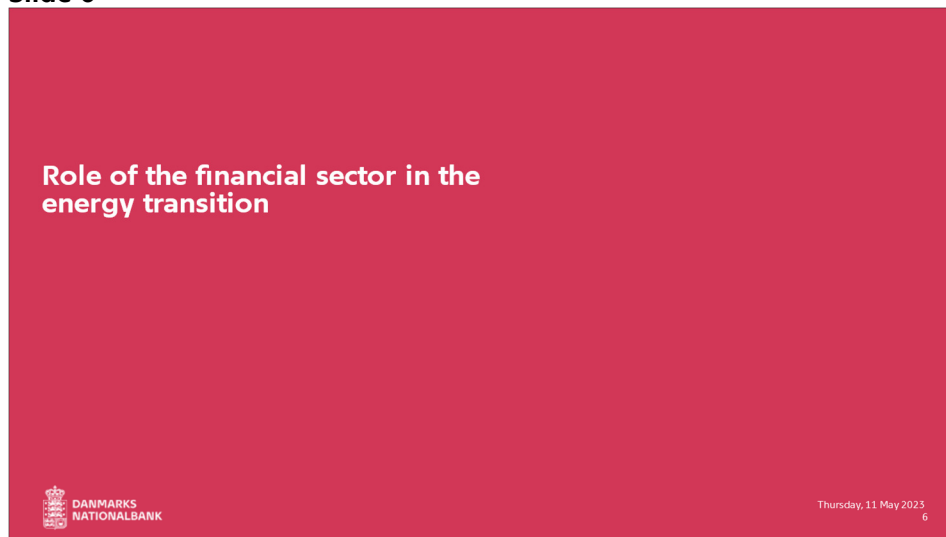
- ‘Degrowth’ is sometimes advocated as a solution to climate change.
- Recent developments underline how we cannot rely on lower growth for reducing emissions. In 2020, fossil fuels consumption fell by only 5.4 per cent, despite a substantial drop in global economic activity, related to the covid-19 pandemic.
- Growth would have to fall to an unrealistic degree to make a meaningful dent in emissions.
- Instead, policy action can shift incentives in favour of renewable energies and away from fossil fuels, such as carbon taxes and emission standards, in addition to technical solutions.

Different estimates of the need for financing are illustrated in the box to the left.

- The right-hand box contains different estimates for the world, EU and Denmark.
- The estimates are based on net-zero scenarios for the world, Fit for 55 scenarios for the EU and the 70 per cent goal of the Climate Act for Denmark.
- These figures are associated with many uncertainties, and I do not want to focus on any specific figure.

- The point is: Vast amounts of funding are necessary for the global economy to transition.

## Slide 6



The final point on sustainable finance brings me the next topic: the role of the financial sector in the green transition. First, two important points:

- We cannot and should not expect the financial sector – and here I include the central banks – to solve the climate problem. The tools to shift behaviour, demand and supply away from fossil fuel-based energy are fiscal and regulatory.
- However, the financial sector can support the transition by performing its role of intermediating capital and managing the associated risks.
- I will elaborate on this role in the next slides.

## Slide 7

**The financial sector's role – in the transition and otherwise – is to provide capital, supported by sound risk-return analysis**



DANMARKS  
NATIONALBANK

Thursday, 11 May 2023  
7

Climate change and the transition bring both opportunities and risks to the financial sector.

- Any economic transition requiring investment is a business opportunity for the financial sector to apply its skills in risk pricing as well as return and profitability assessments.
- The green transition is no different. The financing of green projects is paramount for the transition. Without financing, the world cannot make the necessary investments.
- The green transition faces a special set of challenges for risk management, which I will get back to.

From a central bank and financial stability perspective, proper risk assessment associated with climate change and the energy transition is particularly important.

- Sound risk management means that risks should be held on balance sheets that have the capacity to absorb these risks if they materialise.
- Banks and investors must take account of climate- and energy-related risks in their credit policies and capital allocation.
- This implies a special focus on the risk assessment of investments in assets that may become 'stranded' in the transition, such as fossil-intensive investments.
- Green companies must undergo the same scrutiny as regular companies.

The recent energy crisis in Europe illustrates how climate- and energy-related risks are already first order.

## Slide 8

### Climate-related risks are often not well priced

DANMARKS NATIONALBANK

Investors pay a premium for green equities

Corporate climate communication is not associated with fewer emissions

Flood risk discounts in the Danish housing market

A gradual green transition supports financial stability

Opportunities and risks in the residential sector during a green transition: House prices, energy renovations and rising energy prices

Do banks manage their flood risk exposures? Evidence from the Danish credit register

Are climate change risks priced in the US stock market?

DANMARKS NATIONALBANK

Thursday, 11 May 2023  
8

Climate-related risk pricing is difficult, but essential, in the financial sector. And often, climate-related risks are not well priced.

Poorly priced climate-related risks are a financial stability concern, the extent of which we investigate at Danmarks Nationalbank.

- We analyse how climate change and transition risks will affect the Danish economy and financial system.
- The aim of this work is to facilitate a dialogue with the financial sector about risks and opportunities.

The slide offers some examples of our analytical work.


- The pieces include work on flood risk in the housing market, energy requirements on real estate and pricing of risk in equity markets.
- The gist of the analytical work suggests that climate-related risks tend to be underpriced, although the extent to which this is the case seems to be decreasing.
- Climate-related risks are becoming increasingly salient in financial markets.



## Slide 9

### Disclosure standards and a systematic collection of data support risk management

- Climate-related exposures are opaque**
  - Climate change and the green transition have no historical precedent
  - Companies lack data on their supply chains' reliance on greenhouse gas emissions
- Lack of transparency hinders risk management**
  - Banks and investors need data to assess the impact on corporate profitability of a company's failure to transition
- Disclosures contribute to transparency**
  - Voluntary standards are expanding these years (e.g. TCFD and IFRS/ISSB)
  - EU requirements take effect these years (e.g. CSRD and SFDR)

 DANMARKS NATIONALBANK Thursday, 11 May 2023  
9

Proper risk pricing is challenged by the fact that climate-related exposures are opaque.

- The assessment of climate change and transition-related risks cannot be based on historical data and distributions in the way that risk assessments are traditionally made. New scenario-based techniques for risk pricing are being developed.
- Moreover, properly assessing climate-related risks requires new data and a higher level of transparency of exposures in balance sheets.
- Many companies lack knowledge about – or do not share – the greenhouse gas emissions in their supply chains.
- This makes it difficult for banks and investors to assess how a company's failure to transition will impact its profitability.

A higher degree of transparency and systematic and standardised collection of data across companies and value chains, including financial portfolios, is necessary.

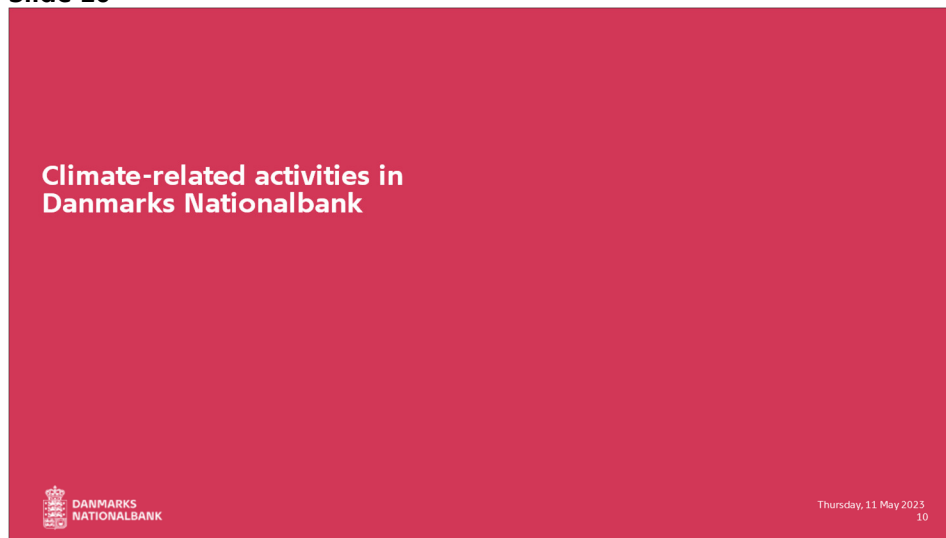
- Many initiatives to increase the level of transparency of climate-related exposures are under way or being implemented.
- The Task Force on Climate-related Financial Disclosures (TCFD) has been central in expanding voluntary disclosures.

New EU regulation introduces stricter requirements for both financial and non-financial businesses' disclosures.

- The Corporate Sustainability Reporting Directive (CSRD) and Sustainable Finance Disclosure Regulation (SFDR) are prominent examples of disclosure regulation.
- Climate-related transparency is also adhered to by European central banks, with the introduction of the *common minimum disclosures* of the Eurosystem.

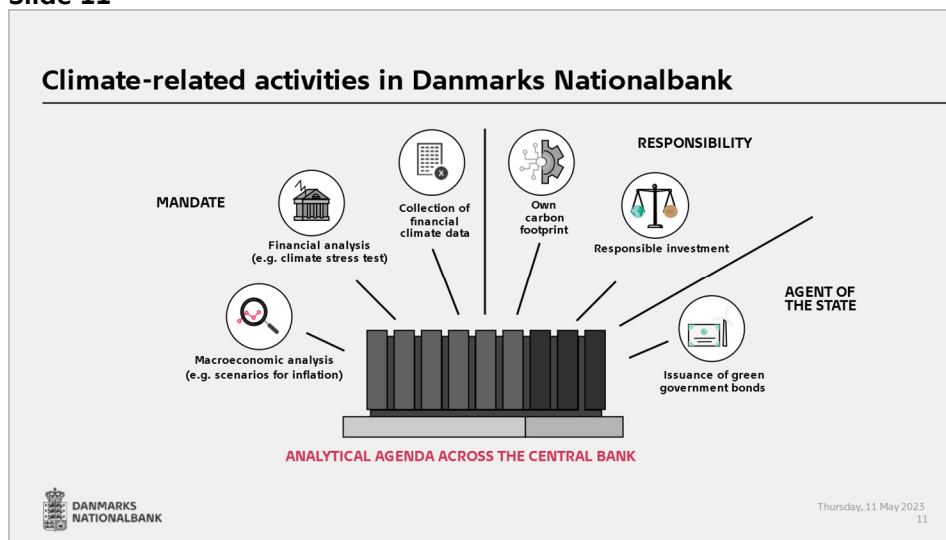
I will come back to Danmarks Nationalbank's own disclosures later in the presentation.

#### Slide 10



Finally, I will turn to how climate change affects our work at Danmarks Nationalbank.

## Slide 11



Danmarks Nationalbank's climate-related activities can be categorised under three headings.

- They relate to our central bank mandate, our aim to fulfil this mandate in a responsible way and our role as a government debt manager.
- The activities are anchored in a cross-bank analytical agenda, reflecting their interdisciplinary nature.

Under our mandate, we analyse how climate change and the green transition will affect the Danish economy and financial system.

- The work results directly from our objective to ensure a robust economy with stable prices and financial stability.
- Our most prominent role in – and contribution to – the transition is to live up to our mandate of ensuring a robust economy with financial stability. This supports stable planning horizons for transition policies as well as for companies and financial planning.

As a public institution, we aim to organise our work responsibly.

- We aim to invest our financial portfolios responsibly, and this includes an aim to meet the climate goals of the Paris Agreement to transition to net zero by 2050.
- We have similar goals for our own carbon footprint as an organisation.




We issue green government bonds on behalf of the Ministry of Finance.


- Our debt management office manages Denmark’s government debt.
- This includes the management of government funds, preparation of an issuance strategy and issuance of government securities. Under this heading, we started issuing so-called green government bonds last year.

I will comment on each of these aspects in the final part of my presentation.

## Slide 12

### Climate change, the green transition and Danmarks Nationalbank’s objectives

 <p><b>CONSEQUENCES OF CLIMATE CHANGE</b></p> <p>Shocks to prices and income because of a warmer climate and natural disasters</p> <p>Financial losses due to natural disasters</p>	 <p><b>CONSEQUENCES OF GREEN TRANSITION</b></p> <p>Effects of climate policies, such as a carbon tax or subsidies</p> <p>More volatile energy prices</p> <p>Financial institutions’ exposure to ‘stranded’ assets</p>	 <p><b>IMPLICATIONS FOR DANMARKS NATIONALBANK</b></p> <p>Understanding implications for price and financial stability</p> <p>Recommendations for other authorities and the financial sector</p> <p>Pricing analyses</p> <p>Transparency and systematic collection of data on exposures</p>
--	--	---



Thursday, 11 May 2023  
12

Climate change can challenge price and financial stability.

- Heat stress or lower crop yields lead to chronically lower output abroad, with spill-over effects for Denmark.
- Heat waves, droughts and floods cause prices and income to fluctuate in Denmark and abroad.
- Flooding, or expectations of flooding, reduces the market value of mortgaged real estate and can lead to losses among credit institutions.

The green transition can also challenge price and financial stability.

- Transition policies can change relative prices. Policies that result in carbon emissions being priced can lead to higher prices for certain goods and services. Subsidies, on the other hand, can reduce certain prices and hamper the competitiveness of non-subsidised products.

- An increased reliance on solar and wind energy could lead to greater short-term volatility in energy prices because their supply is more inelastic and fluctuating.
- 'Stranded' assets – e.g. if polluting companies go bankrupt or prices of homes that are expensive to heat drop – could lead to credit losses.

We work to understand how climate change and the transition will affect the price and financial stability objectives of Danmarks Nationalbank.

- This includes analyses of the impact of energy prices on inflation and stress testing the banking system for climate risks.
- Based on our analyses, we make recommendations to other authorities or the financial sector about how climate-related risks are best addressed, to reduce price and financial stability risks.
- We also investigate the pricing of climate-related risks among market participants. This sheds light on the current salience of these risks.
- We support standards for transparency as well as a systematic collection of data on companies' climate-related financial exposures. Climate-related financial data allow financial firms to benchmark themselves against peers.
- The aim of this work is to raise awareness and support the pricing of climate-related risks.

### Slide 13

## Disclosure of the climate footprint from Denmark's FX reserve

**Disclosure currently covers 10 per cent of the FX reserve**

- Disclosure standards do not exist for the remaining asset classes
- We monitor the development in metrics and data to broaden the disclosure in the future

**Disclosure standards are not without problems**

- Double-counting and other inconsistencies exist across asset classes
- Disclosed figures do not express the effect on actual emissions of investors owning the assets

**The disclosure covers bonds issued by governments and regional authorities as well as ETFs**

Per cent

Asset Class	Percentage
Money market products	79
Bonds issued by supranational institutions etc.	10
Covered bonds	1
Bonds issued by central governments and regional authorities	10

Asset Class	Percentage
Covered bonds	8
Equities and corporate bonds (ETFs)	2

■ Money market products  
■ Bonds issued by supranational institutions etc.  
■ Covered bonds  
■ Bonds issued by central governments and regional authorities  
■ Equities and corporate bonds (ETFs)

Note: The holdings are stated at market value as of 30 December 2022, excluding gold and IMF loans. Source: Own calculations.

DANMARKS  
NATIONALBANK

Thursday, 11 May 2023  
13

We expect financial firms to increasingly assess and disclose climate relevant data, and this includes ourselves.

Danmarks Nationalbank published its first climate-related disclosure report in March this year, as part of our annual reporting.

- The disclosure covers bonds issued by governments and regional authorities as well as equities and corporate bonds invested via exchange-traded funds, ETFs.
- These asset classes amounted to approx. kr. 50 billion – or 10 per cent – of the market value of foreign reserves at the end of 2022.

Disclosure is currently not possible for the remaining part of the foreign exchange reserve.

- There is not sufficient data or widely accepted definitions of climate footprints for the remaining asset classes.
- It is our ambition to broaden the disclosure as disclosure standards and data are developed.

Some caveats are in order before interpreting the disclosed figures.

- Climate-related disclosure of financial portfolios is an area under development. One should therefore be careful when interpreting the disclosed figures.
- The metrics measure emissions of greenhouse gasses from the economic activity generated by the issuers.
- The metrics do not express the effect on actual greenhouse gas emissions when individual investors issue, purchase or sell the associated assets.
- On top of these limitations, there are unresolved issues with double-counting and other inconsistencies across asset classes.


We do not use the disclosed numbers as a parameter in the management of the FX reserve.

- The primary objectives of the FX reserve are to support the fixed exchange rate, financial stability and international obligations of Danmarks Nationalbank.
- Given these objectives, we aim, as far as possible, to invest our financial portfolios in line with our policy for responsible investing, and notably, in line with the Paris Agreement.
- The metrics are based on *current* carbon emissions, whereas the Paris Agreement sets a goal of climate neutrality *by 2050*.

## Slide 14

	Bonds issued by central governments and regional authorities		Equities and corporate bonds (ETFs)	
	2022	2021	2022	2021
<b>Allocation of emissions</b>	Production-based		Scopes 1-2	
<b>Weighted average carbon intensity</b> <i>(tonnes of CO<sub>2</sub>e per million euro in GDP or revenue)</i>	198	216	56	106
<b>CO<sub>2</sub>e footprint</b> <i>(tonnes of CO<sub>2</sub>e per million euro invested)</i>	175	248	19	53
<b>Absolute financed emissions</b> <i>(tonnes of CO<sub>2</sub>e)</i>	965,691	2,107,460	26,806	98,176
<b>Share of market value of foreign exchange reserve in 2022</b> <i>(per cent)</i>	7.9		2.0	

Note: The holdings are stated as of 30 December 2021 and 30 December 2022, excluding gold and IMF loans. Emissions, GDP, revenue, EVC, as well as total bond issuances by central governments and regional authorities for 2021 have been used in 2022, as data for 2022 were not available at the time of disclosure. Source: UNFCCC, World Bank, Bloomberg, MSCI and own calculations.

 DANMARKS NATIONALBANK Thursday, 11 May 2023  
14

Following the approach of the ECB, we report the climate footprint using three distinct metrics.

- The metrics are the weighted average carbon intensity (WACI), carbon footprint and absolute financed emissions.
- The metrics measure different aspects of the emissions associated with the investments, and all three have advantages as well as drawbacks.
- I will not go into these here, as it quickly becomes technical.

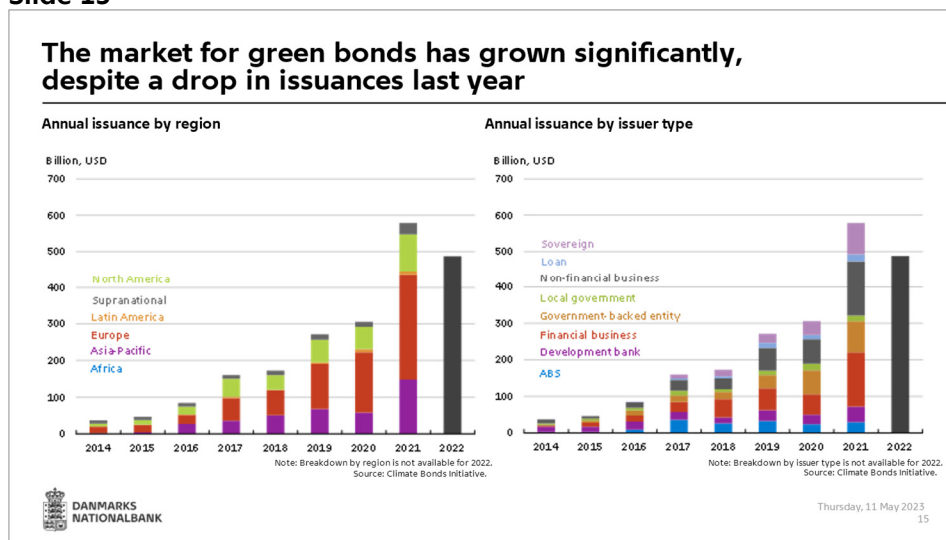
The footprint from government bonds fell slightly from 2021 to 2022.

- The lower WACI reflects that the share of our bond holdings that was invested in countries with high emissions relative to GDP dropped in 2022, as compared with 2021.
- This reflects a restructuring of the bond holdings that had nothing to do with the climate.

The footprint from the ETFs also fell from 2021 to 2022.

- The lower WACI indicates that a smaller part of our ETF holdings was based on equity and corporate bonds issued by companies with high emissions relative to revenue in 2022, as compared with 2021.
- This was intended, as the ETF holdings were shifted towards ETFs that comply with the EU's Paris-Aligned Benchmark.

Slide 15



I now turn to our issuance of green governments bonds on behalf of the Danish state, which we started in 2022.

First some background: The green bond market has increased significantly over the previous years, but it remains small.

- Prevailing market conditions caused debt issuance volumes to decline in 2022, across all categories of bonds, green bonds included.
- Sovereign green bonds made up around 14 per cent of total green bond issuance globally, see the right-hand chart. More than 50 per cent was issued by companies.
- However, the green government bond market remains small, with around 3 per cent of overall bond issuances.


We decided, together with the Danish government, to issue green government bonds starting in 2022.

- Issuance of Danish green government bonds is expected to be around 15 per cent of our total issuance of domestic bonds in 2023.
- The green government bonds are still a small share of outstanding government bonds, constituting just around 2.5 per cent.



## Slide 16

<b>Danish green government bonds: Aim and design</b>	
<b>Motivation</b> <ul style="list-style-type: none"><li>• Support the <b>development of green financial markets</b></li><li>• Maintain a broad and <b>diversified investor base</b> in Danish government bonds</li></ul>	<b>Follows the highest market standards</b> <ul style="list-style-type: none"><li>• Largely aligned with the EU Taxonomy</li><li>• Dark Green rating</li></ul>
	<b>Issuance by twin bond concept</b> <ul style="list-style-type: none"><li>• Well-known and proven concept</li><li>• Supports the liquidity of the green bond</li></ul>

 DANMARKS NATIONALBANK Thursday, 11 May 2023  
16

Our motivation for issuing green bonds is two-fold.

- First, we aim to contribute to the development of the green financial market, which has the potential to play an increasingly important role in directing investment towards sustainable projects.
- We notably help set a standard for the Danish green bond market and add critical mass with a high-quality dark green and AAA-rated green bond.
- Second, issuance of a green bond contributes to maintaining a broad and diversified investor base for Danish government bonds and accommodates increased demand for green assets from investors.

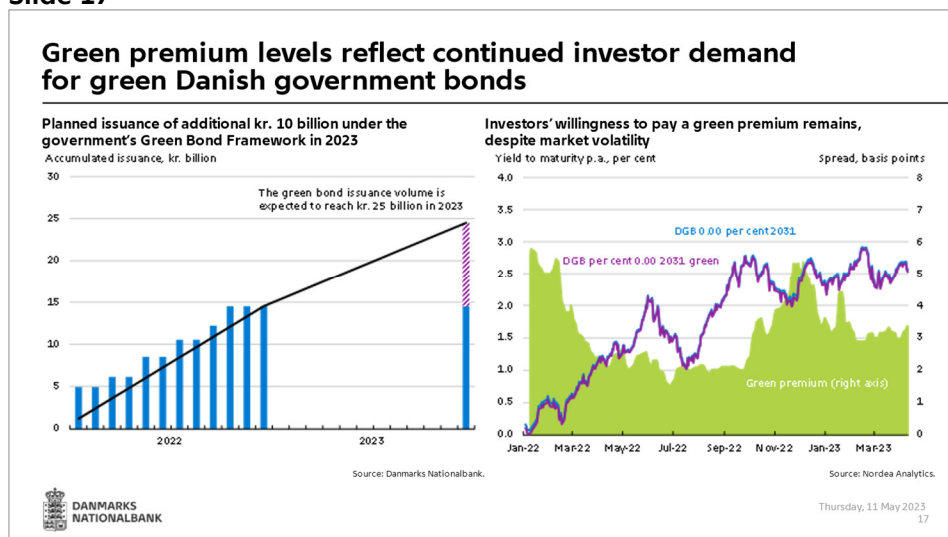
The Danish government green bond follows the highest standards.

- It is important to follow best practice and support regulation that enhances transparency.
- We are at the forefront of market standards by evaluating and selecting green spending on the basis of the EU's taxonomy for sustainable activities. This helps promote transparency, which is crucial to building trust between the issuer and investor.
- The high quality and transparency are supported by the Dark Green rating, which is the highest climate and environmental accreditation possible by the external verifier Cicero.
- We monitor market developments – including the EU Green Bond Standard – and gradually seek to adapt our programme to the best market practice and to meet requirements and expectations from the investor community.

We use a 'twin bond' concept to ensure adequate liquidity.

- The concept was first launched by Germany in 2020.
- Green bonds are issued with the same financial characteristics as a regular Danish government bond, i.e. same cashflow.
- Investors have the option to swap their green twin bond one-to-one with a corresponding and more liquid conventional twin bond.
- The twin model means that price differences, if any, are quite transparent. The 'greenium' is clearly identified.

**Slide 17**



Our goal is to issue up to kr. 10 billion this year. In comparison, total government issuance is kr. 65 billion.

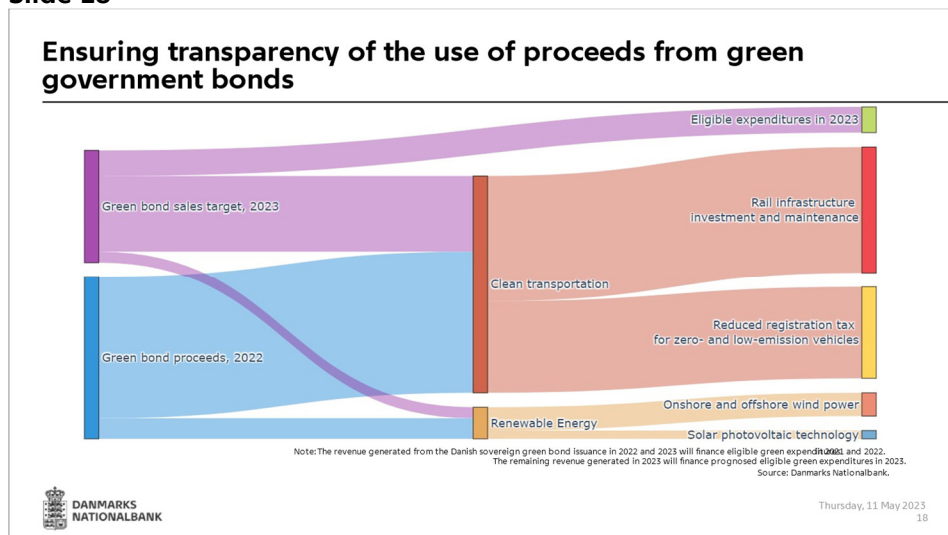
- As the figure shows, we issued an amount of 15 billion of green government bonds in 2022.
- This will bring the total outstanding amount of Danish green government bonds up to kr. 25 billion in 2023.
- The new 10-year green government bond series will be issued in the 2<sup>nd</sup> half of 2023 in accordance with the central government's Green Bond Framework.
- The series will follow the twin bond concept and thus have the same financial characteristics as the new benchmark 10-year nominal bond maturing in 2033.

There is currently a green premium of 3-4 basis points on the existing 10-year Danish green government bonds.

- The opening of our first green bond in January 2022 was met with overwhelming demand and an initial 'greenium' of 5 basis points.
- This was more than expected and higher than most other European green government bonds.
- Since then, the size of the green premium has varied between 1-5 basis points.
- The green premium declined in the early part of 2023, at a time when market volatility was high and market focus was elsewhere, at least for some investors.

It is difficult to predict the green premium of the new 10-year green bond. It is not our goal to issue at a specific green premium.

### Slide 18



Transparency about the use of proceeds from the green government bonds is essential for buyers of green bonds.

- An allocation and an impact report are published to achieve sufficient transparency.
- The impact report for eligible expenditures in 2021 was published earlier this year.

Allocation report: The central government is committed to reporting that proceeds have been allocated in accordance with the current Green Bond Framework.

- Eligible green expenditures under the current framework are focused on Denmark's two highest-emitting sectors: transportation and energy.
- These expenditures are largely aligned with the EU's Taxonomy.
- In the transportation sector, the framework includes direct operating and capital expenditures for the rail network infrastructure and indirect expenditure through a tax exemption for zero- and low-emission vehicles.
- The framework includes direct subsidy schemes and indirect expenditures through a tax exemption scheme, to incentivise the transition to solar and wind power.
- With the proceeds from 2022 and the proceeds planned for 2023, issuance of approx. kr. 20 billion will be allocated to clean transportation, and approx. kr. 3 billion will be allocated to renewable energy.

Impact report: The central government is committed to reporting on expected climate and environmental impact through an impact report.

- The report includes detailed descriptions of the allocated green expenditures along with an estimation of environmental impacts.
- Approx. 5 Mton CO<sub>2</sub>e emissions were avoided in 2021, according to the aggregated impact metric.
- Other output and environmental impact metrics are included in the report, such as an estimated production capability of 12,000 GWh in renewable energy.

## Slide 19

### Concluding remarks



The green energy transition is behind schedule, and its financing needs are enormous



Improving climate-related risk pricing is essential for the financial sector to provide financing for the transition



Danmarks Nationalbank supports the transition through economic stability, macro risk analysis and development of green capital markets

We are still far from reaching the climate goals of the Paris Agreement. The energy transition is behind schedule and has much ground to cover.

Recent events have shown that an abrupt transition with supply stops is costly in terms of risks to inflation and can lead to financial turmoil.

Climate-related risk pricing is central to directing financing for green projects. The attention of the financial sector to climate issues has grown in recent year.

- Some evidence that attention to – and pricing of – climate risks is increasing, but more needs to be done.
- Progress toward disclosures to support risk management is welcome.
- I expect we will continue to see new issuers supporting the development of green capital markets.

Climate change is macro-critical, and most activities and objectives at Danmarks Nationalbank are affected by climate considerations.

- Our most important contribution to the transition is to live up to our mandate of ensuring a robust economy with price and financial stability.
- This means taking account of and assessing climate-related risks to the macroeconomy and financial system.
- Moreover, together with the Danish government, we support the development of green capital markets by issuing green government bonds.

DANMARKS  
NATIONALBANK

---

# Financing and the energy transition

Governor Signe Krogstrup  
11<sup>th</sup> Annual Nordic AAA Seminar, 11 May 2023

# Agenda



**Status on climate change and financing**



**Role of the financial sector in the energy transition**



**Climate-related activities in Danmarks Nationalbank**

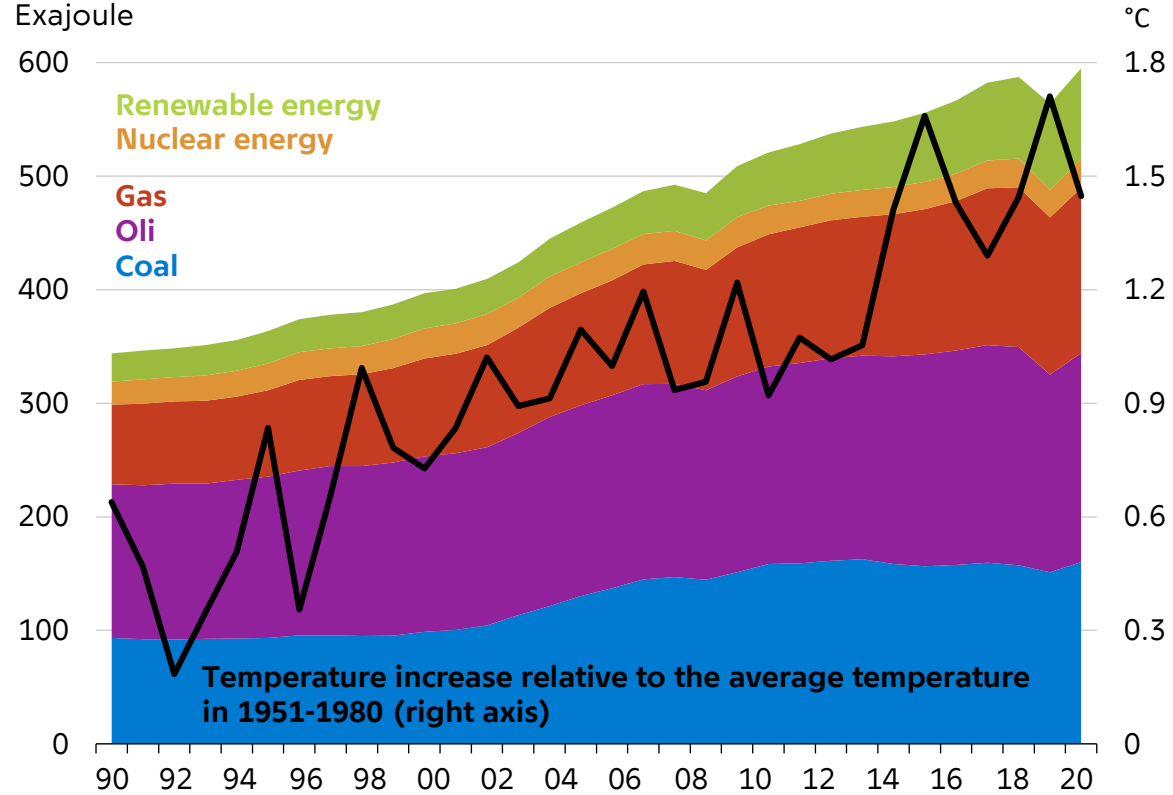


# Status on climate change and financing



# The world's energy supply remains fossil-based, and electrification challenges remain

The world's energy supply remains largely fossil-based, and global temperatures continue to rise



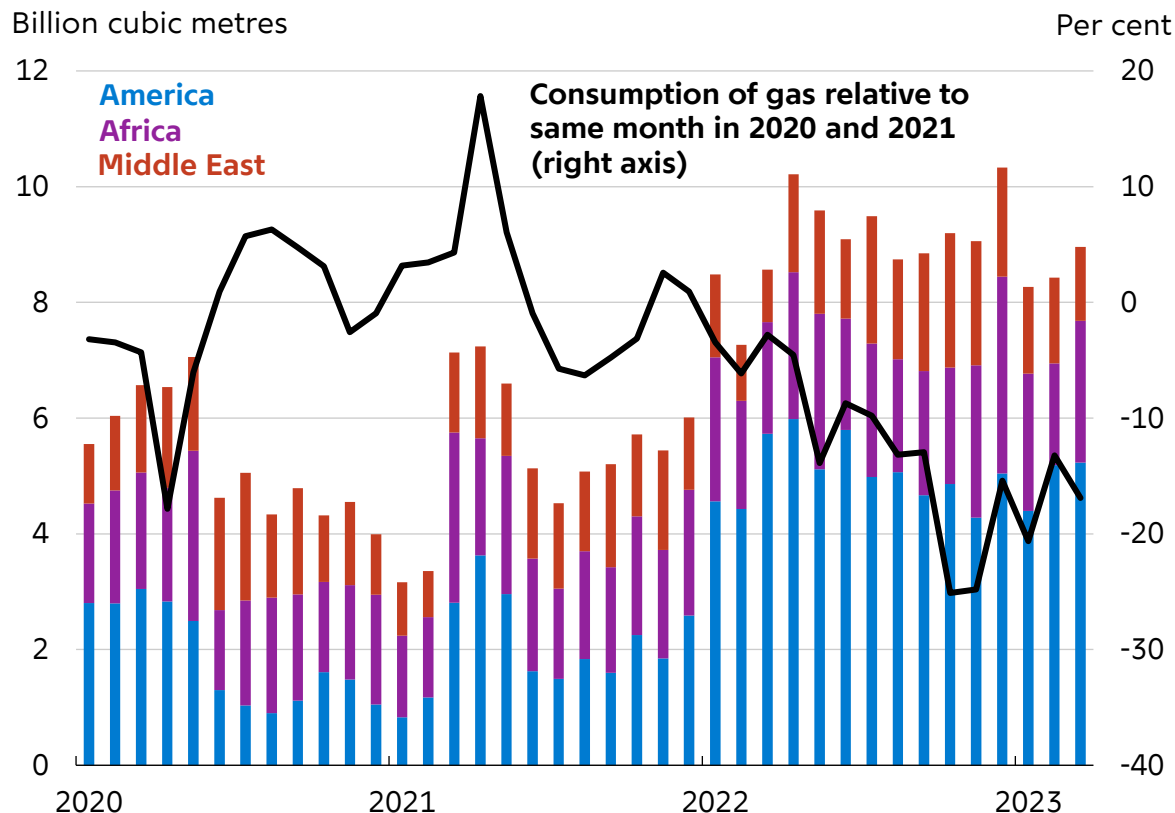
Note: The chart shows the annual global energy consumption by source and temperature increase. Source: Macrobond.

## Challenges to an electrification of the European energy supply

- Stability of supply
- Untested technologies, e.g. Power-to-X
- Access to minerals and rare earths

# Building new energy supply requires financing

Demand for new types of energy can change fast with the right incentives: e.g. gas consumption in the EU fell strongly in 2022



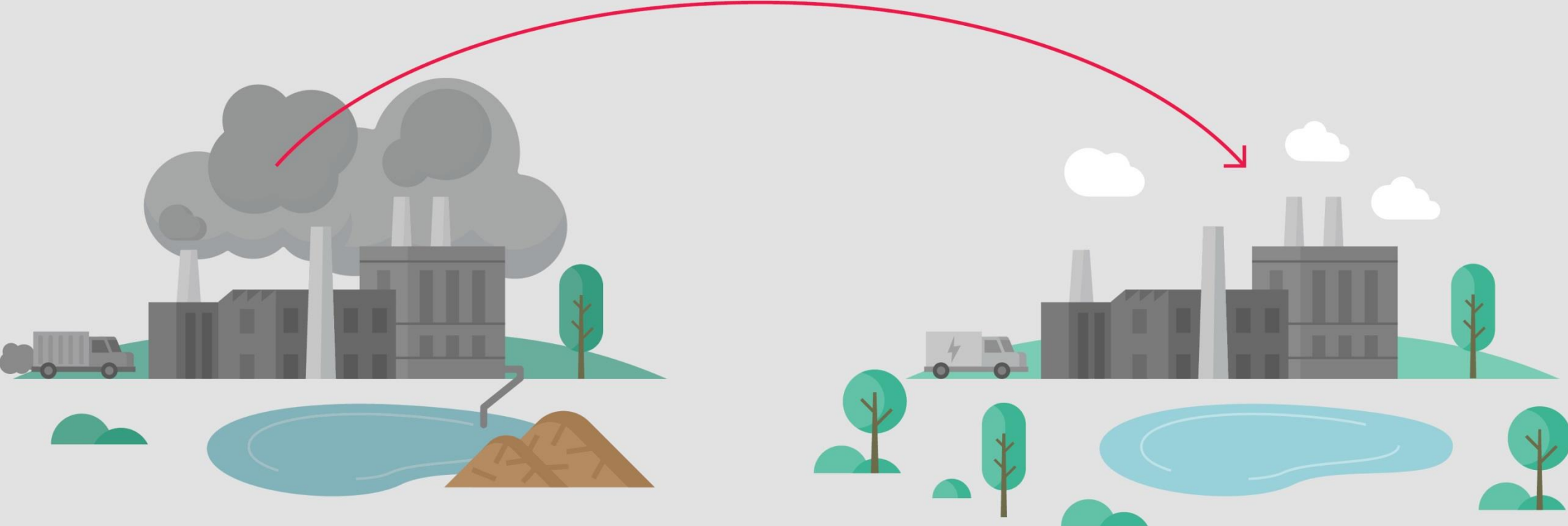
Note: The bars show the import of LNG to EU27.  
Source: Bruegel based on Bloomberg and Eurostat.

Supply of renewable energy requires financing.  
Estimated funding necessary towards 2030:

- **World:** 0.6-1 per cent of GDP annually, according to the IEA (2021) and IMF (2021)
- **World:** 2 per cent of GDP annually, according to the IEA (2023)
- **EU:** 2 per cent of GDP or EUR 470bn annually, according to the European Commission (2020)
- **Denmark:** DKK 500-600bn accumulated, according to Finance Denmark (2022)

# Role of the financial sector in the energy transition

# The financial sector's role – in the transition and otherwise – is to provide capital, supported by sound risk-return analysis



# Climate-related risks are often not well priced

**ANALYSIS**

**DANMARKS NATIONALBANK**

Investors pay a premium for green equities



Investors reward companies with low carbon emissions with higher equity prices

Companies with low carbon emissions have higher equity prices because they are perceived as less risky. However, it is unclear whether investors' pricing of carbon risks reflect the actual risk caused by a green transition.

[Read more](#)



Cheaper financing gives companies a higher incentive to make a green transition

A company can reduce its financing costs by around 3 per cent by reducing its carbon emissions by 1 per cent. The cost reduction is relatively modest, but it does provide an increased incentive for making green investments.

[Read more](#)

**NEWS**

**DANMARKS NATIONALBANK**

9 OCTOBER 2022 — NO. 2

More knowledge is necessary about companies' climate impacts

Corporate climate communication is not associated with fewer emissions

Companies are communicating more and more about efforts aimed at reducing their greenhouse gas (CO<sub>2</sub>e) emissions. However, there is no correlation between how much companies communicate about their CO<sub>2</sub>e emissions and the actual change in their emissions.

This is one of the main findings by Senior Data Scientist Erik F. The study compares companies about CO<sub>2</sub>e emissions with the developments in emissions.

**Companies communicate more about CO<sub>2</sub>e - unchanged level of emissions**



[Read more](#)

**WORKING PAPER**

**DANMARKS NATIONALBANK**

27 SEPTEMBER 2022 — NO. 190

Opportunities and risks in the residential sector during a green transition: House prices, energy renovations and rising energy prices

Alexandros T. Martiakis  
am@danmarksnationalbank.dk  
DANMARKS NATIONALBANK

Wah F. Meier  
wm@danmarksnationalbank.dk  
DANMARKS NATIONALBANK

The Working Papers of Danmarks Nationalbank describe research and discussion, often preliminary, and are a contribution to the professional debate. The views and conclusions stated are the responsibility of the individual contributors, and do not necessarily reflect the views of Danmarks Nationalbank.

**ECONOMIC MEMO**

**DANMARKS NATIONALBANK**

22 OCTOBER 2021 — NO. 7

Flood risk discounts in the Danish housing market

**ECONOMIC MEMO**

**DANMARKS NATIONALBANK**

22 DECEMBER 2021

Do banks manage their flood risk exposures? Evidence from the Danish credit register

Johannes Fensholt  
jf@danmarksnationalbank.dk  
DANMARKS NATIONALBANK

The views and conclusions stated are the responsibility of the individual contributors, and do not necessarily reflect the views of Danmarks Nationalbank. I thank colleagues at Danmarks Nationalbank for comments.

**ANALYSIS**

**DANMARKS NATIONALBANK**

9 NOVEMBER 2020 — NO. 21

A gradual green transition supports financial stability

The financial sector faces both risks associated with the green transition (transition risks) and physical climate risks. Danmarks Nationalbank has performed a climate stress test to highlight transition risks in the banking sector.

[Read more](#)

**ANALYSIS**

**DANMARKS NATIONALBANK**

8 FEBRUARY 2021 — NO. 9

Are climate change risks priced in the US stock market?



Climate change can have an impact on financial stability

The global financial sector faces risks associated with the green transition and physical climate risks. These risks can be a cause for concern, especially if they are not priced by the market.

[Read more](#)



Only very short-term risks are priced in the US stock market

We find that climate change risks are priced only when they reach the domestic political debate; longer-running physical and transition risks do not appear to be priced.

[Read more](#)



We use textual analysis to measure different risks

We measure risks stemming from US climate change legislation, international summits, global warming and natural disasters.

[Read more](#)

# Disclosure standards and a systematic collection of data support risk management



## Climate-related exposures are opaque

- Climate change and the green transition have no historical precedent
- Companies lack data on their supply chains' reliance on greenhouse gas emissions



## Lack of transparency hinders risk management

- Banks and investors need data to assess the impact on corporate profitability of a company's failure to transition

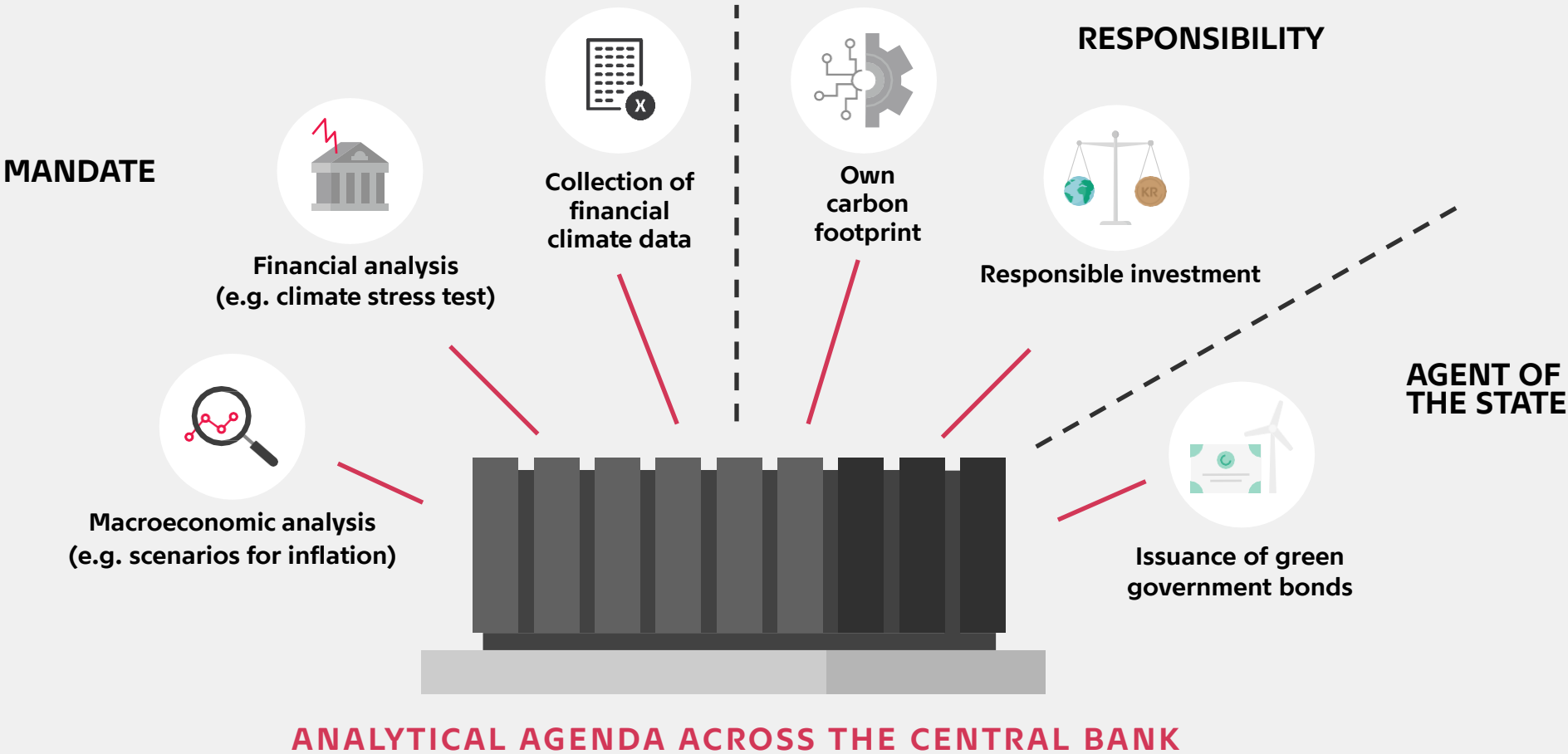


## Disclosures contribute to transparency

- Voluntary standards are expanding these years (e.g. TCFD and IFRS/ISSB)
- EU requirements take effect these years (e.g. CSRD and SFDR)

# Climate-related activities in Danmarks Nationalbank

# Climate-related activities in Danmarks Nationalbank





# Climate change, the green transition and Danmarks Nationalbank's objectives



## CONSEQUENCES OF CLIMATE CHANGE

Shocks to prices and income because of a warmer climate and natural disasters

Financial losses due to natural disasters



## CONSEQUENCES OF GREEN TRANSITION

Effects of climate policies, such as a carbon tax or subsidies

More volatile energy prices

Financial institutions' exposure to 'stranded' assets



## IMPLICATIONS FOR DANMARKS NATIONALBANK

Understanding implications for price and financial stability

Recommendations for other authorities and the financial sector

Pricing analyses

Transparency and systematic collection of data on exposures



# Disclosure of the climate footprint from Denmark's FX reserve

## Disclosure currently covers 10 per cent of the FX reserve

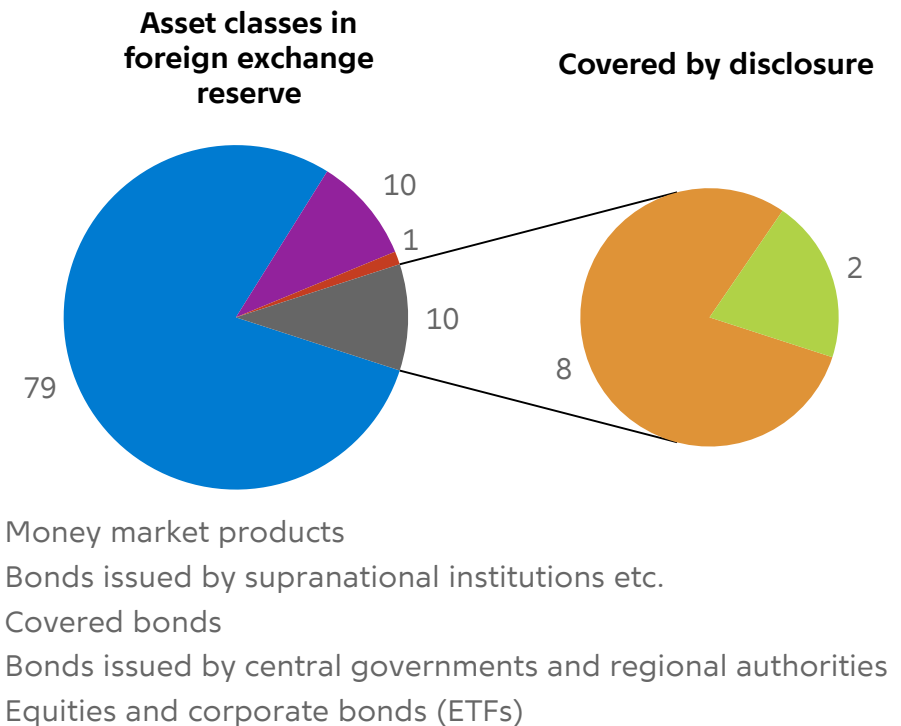
- Disclosure standards do not exist for the remaining asset classes
- We monitor the development in metrics and data to broaden the disclosure in the future

## Disclosure standards are not without problems

- Double-counting and other inconsistencies exist across asset classes
- Disclosed figures do not express the effect on actual emissions of investors owning the assets

## The disclosure covers bonds issued by governments and regional authorities as well as ETFs

Per cent



Note: The holdings are stated at market value as of 30 December 2022, excluding gold and IMF loans.  
Source: Own calculations.

# Climate footprint from the FX reserve

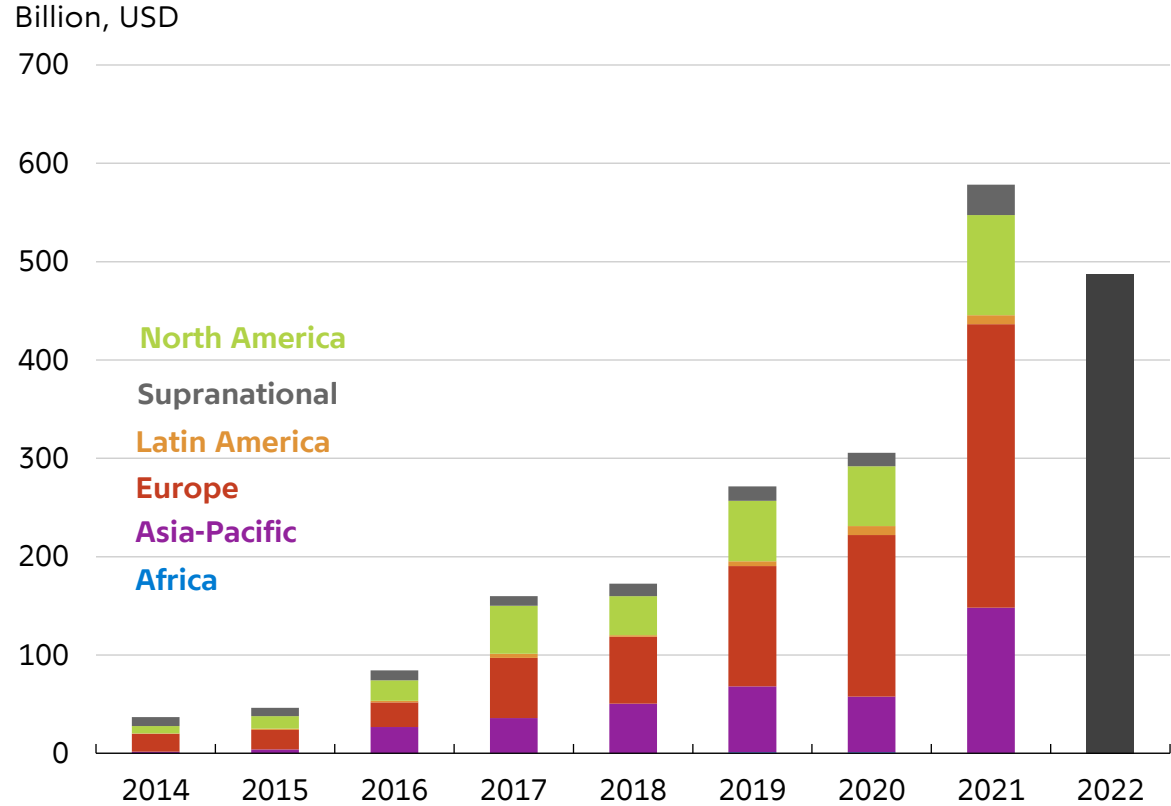
	Bonds issued by central governments and regional authorities		Equities and corporate bonds (ETFs)	
	2022	2021	2022	2021
<b>Allocation of emissions</b>	Production-based		Scopes 1-2	
<b>Weighted average carbon intensity</b> <i>(tonnes of CO<sub>2</sub>e per million euro in GDP or revenue)</i>	198	216	56	106
<b>CO<sub>2</sub>e footprint</b> <i>(tonnes of CO<sub>2</sub>e per million euro invested)</i>	175	248	19	53
<b>Absolute financed emissions</b> <i>(tonnes of CO<sub>2</sub>e)</i>	965,691	2,107,460	26,806	98,176
<b>Share of market value of foreign exchange reserve in 2022</b> <i>(per cent)</i>	7.9		2.0	

Note: The holdings are stated as of 30 December 2021 and 30 December 2022, excluding gold and IMF loans. CO<sub>2</sub>e emissions, GDP, revenue, EVIC as well as total bond issuances by central governments and regional authorities for 2021 have been used in 2022, as data for 2022 were not available at the time of disclosure.

Source: UNFCCC, World Bank, Bloomberg, MSCI and own calculations.

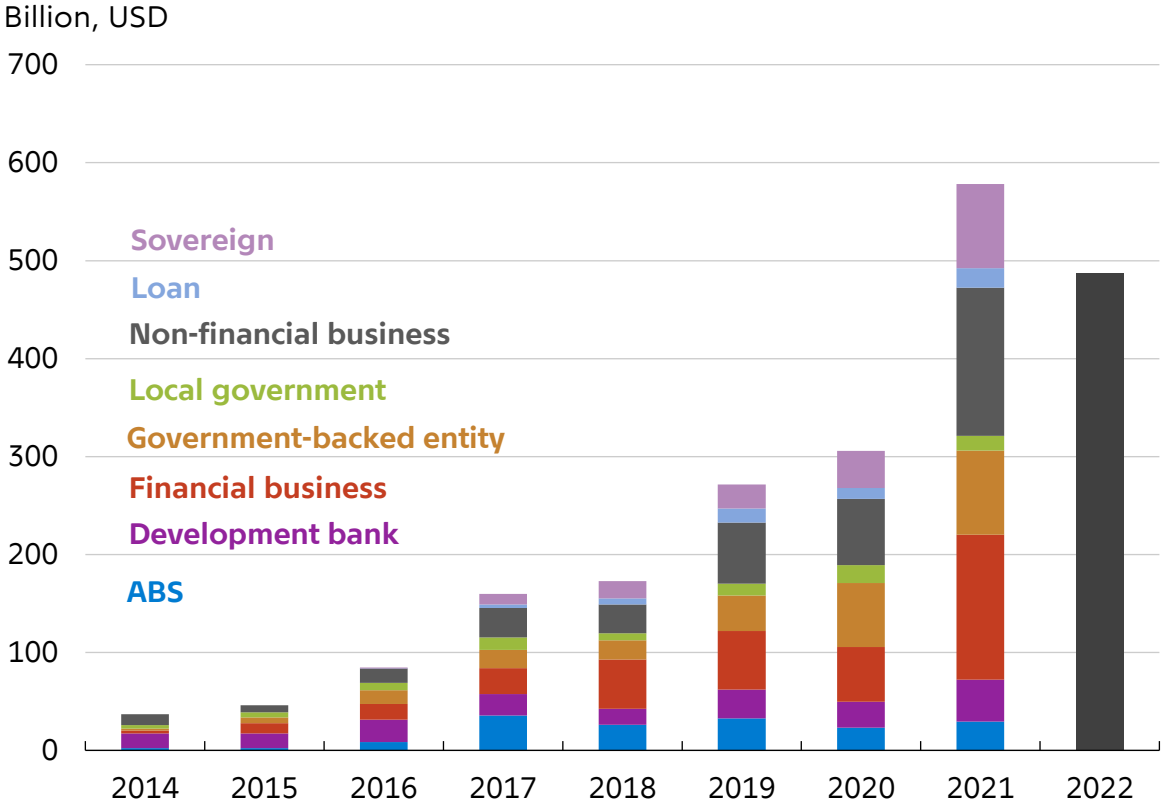
# The market for green bonds has grown significantly, despite a drop in issuances last year

Annual issuance by region



Note: Breakdown by region is not available for 2022.  
Source: Climate Bonds Initiative.

Annual issuance by issuer type



Note: Breakdown by issuer type is not available for 2022.  
Source: Climate Bonds Initiative.

# Danish green government bonds: Aim and design

## Motivation

- Support the **development of green financial markets**
- Maintain a broad and **diversified investor base** in Danish government bonds

## Follows the highest market standards

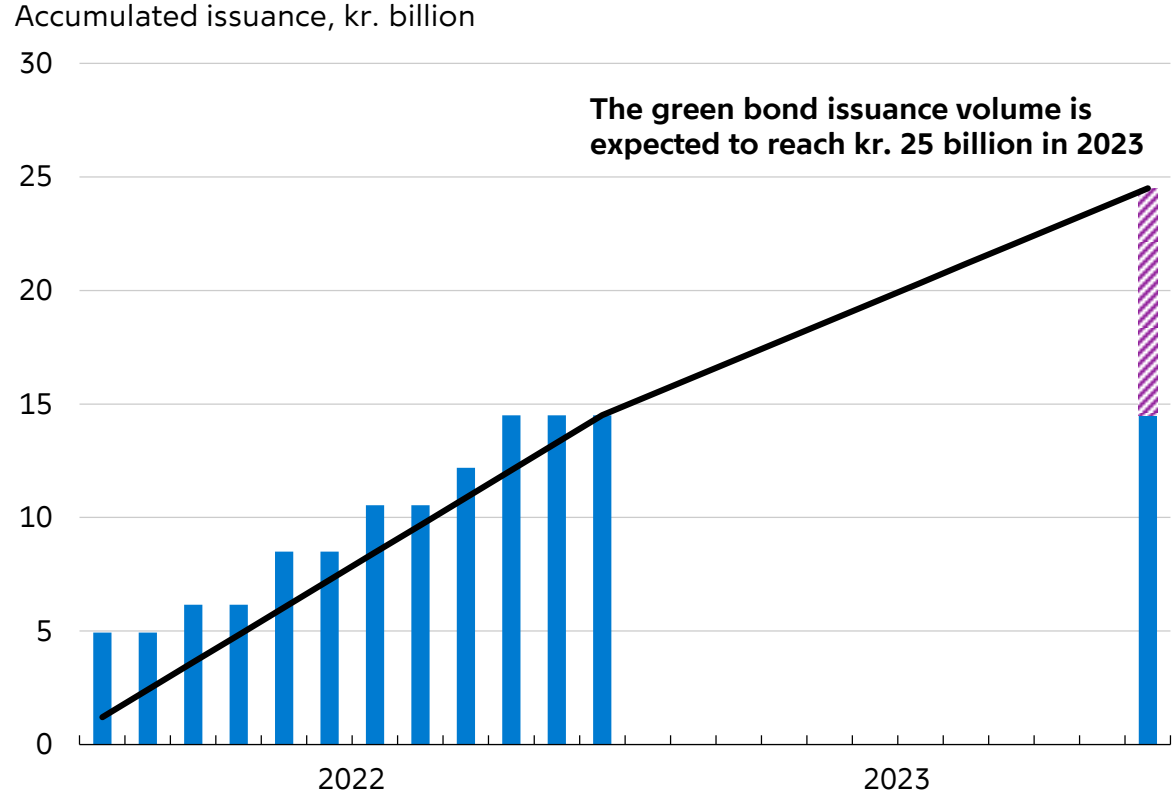
- Largely aligned with the EU Taxonomy
- Dark Green rating

## Issuance by twin bond concept

- Well-known and proven concept
- Supports the liquidity of the green bond

# Green premium levels reflect continued investor demand for green Danish government bonds

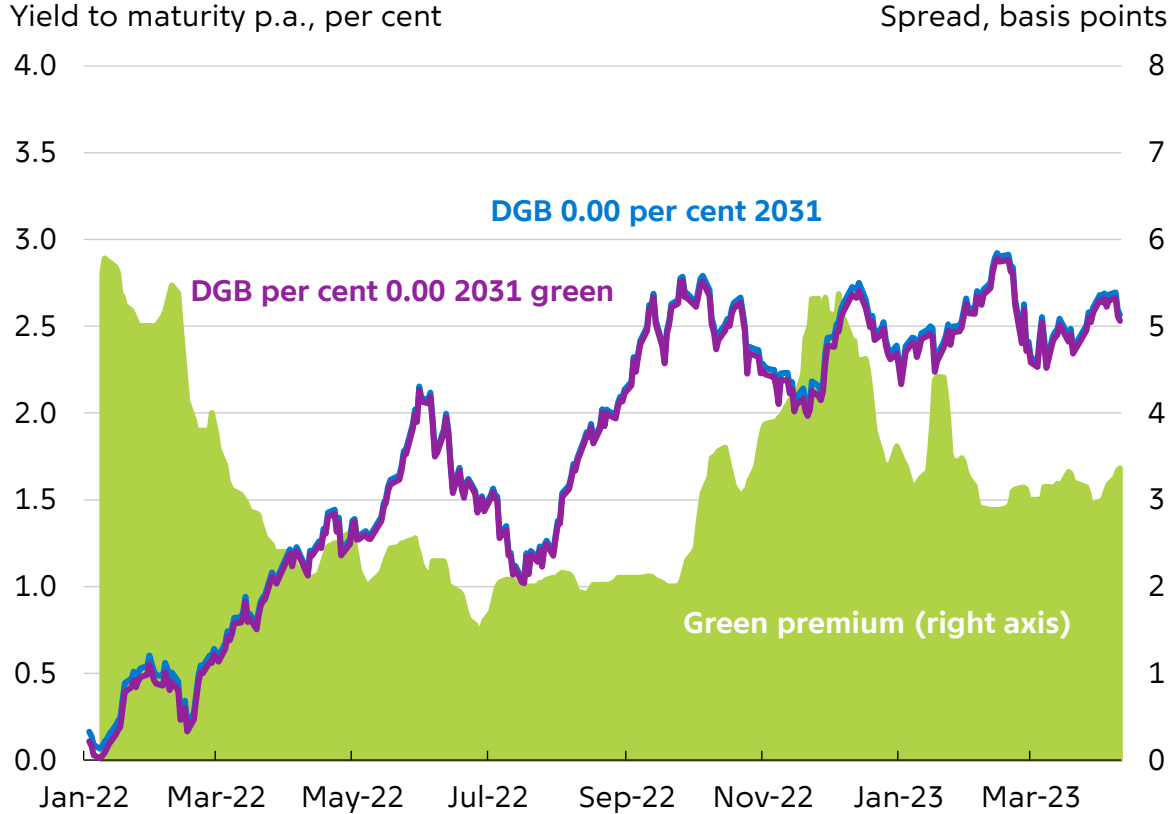
## Planned issuance of additional kr. 10 billion under the government's Green Bond Framework in 2023



Source: Danmarks Nationalbank.

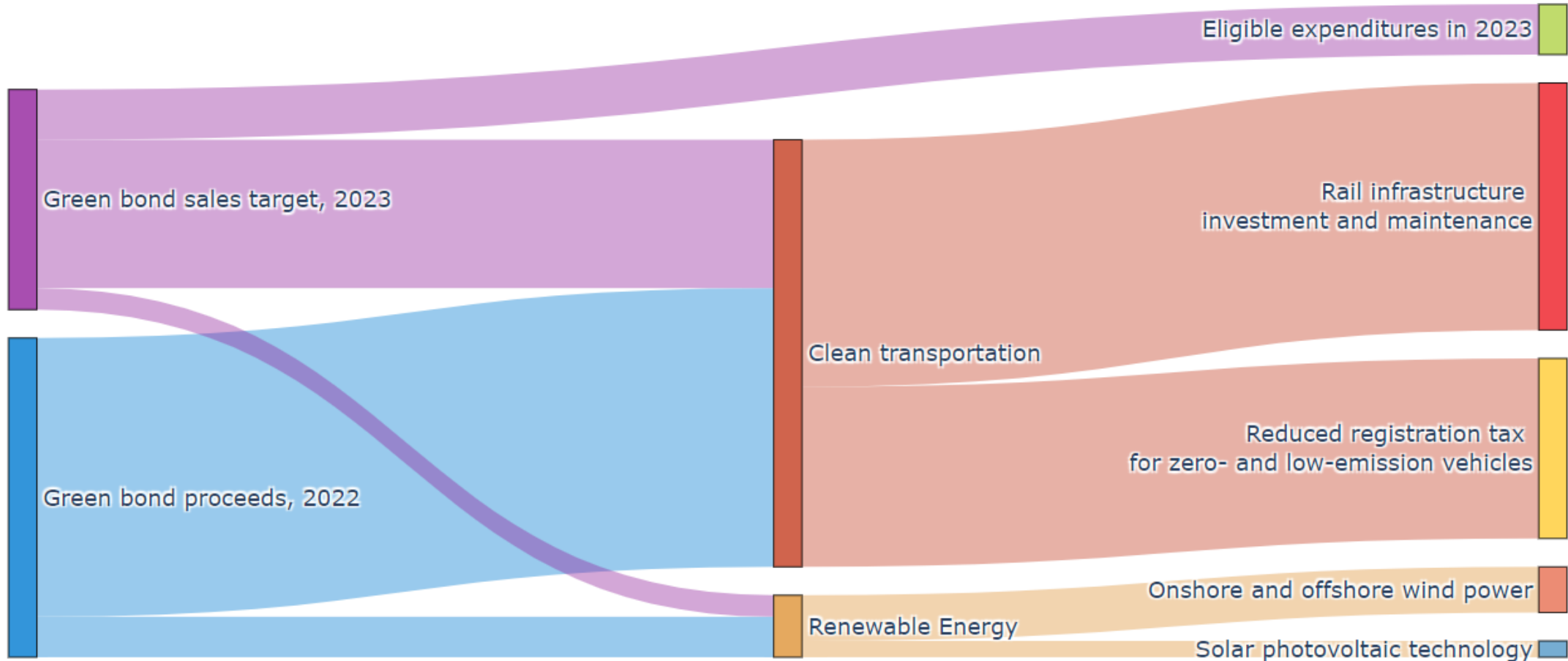


## Investors' willingness to pay a green premium remains, despite market volatility



Source: Nordea Analytics.

# Ensuring transparency of the use of proceeds from green government bonds



Note: The revenue generated from the Danish sovereign green bond issuance in 2022 and 2023 will finance eligible green expenditures in 2021 and 2022. The remaining revenue generated in 2023 will finance prognosed eligible green expenditures in 2023.

Source: Danmarks Nationalbank.

# Concluding remarks



**The green energy transition is behind schedule, and its financing needs are enormous**



**Improving climate-related risk pricing is essential for the financial sector to provide financing for the transition**



**Danmarks Nationalbank supports the transition through economic stability, macro risk analysis and development of green capital markets**

