# THE MAGYAR NEMZETI BANK'S CLIMATE-RELATED FINANCIAL DISCLOSURE


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# Foreword

We live in a period of defining changes with greater impact than ever before. One of the clearest manifestations of this is the change in environmental and climatic conditions and its consequences on ecological, social, and economic processes.

As one of the world's leading green central banks, the Magyar Nemzeti Bank is at the forefront of promoting environmental sustainability. Our conviction and commitment in this regard have been strengthened by the introduction of a green mandate in the Act on the Central Bank in the summer of 2021. Since then, the Magyar Nemzeti Bank - without compromising its primary mandate – has been focussing increasingly on the environmental and sustainability aspects of its activities. It has become clear that there is no time to waste, now is the time to lay the foundations for our future, to take decisive and innovative steps towards a green and sustainable economic and financial transformation.

There may be unique recipes and different solutions for a green transition, but it is beyond dispute that green transformation will not happen without measurement. Measurable and verifiable data are essential for building strategies, setting targets, and evaluating actions. For an accelerated green economic transition, green central banks, green regulators, green loans, and above all green transparency will be required. Creating green transparency in the financial system is one of the cornerstones of the challenges of the green transition.

It is with this goal in mind that the Magyar Nemzeti Bank has prepared its Climate-related Financial Disclosure, joining the world's leading central banks in the fight against climate change. The publication, which is based on international recommendations and best practices, provides a factual account of the internal operations and corporate governance of the central bank in the light of climate challenges and the resulting responsibilities. Furthermore, it provides a glimpse into the climate and other environmental impacts of the various financial instruments on the central bank's balance sheet.

In addition to presenting the Magyar Nemzeti Bank's exposures to climate-related risks, our declared aim is to set an example for local economic actors – both in the private and public sectors – by publishing the Climate-related Financial Disclosure. The financial sector is a priority for the central bank, and although climate change impacts have started to be considered, current practices still show significant room for improvement. The central bank intends to use this report, among others, to provide guidance to financial sector actors to monitor their own carbon footprints.

Preparing a climate-related financial disclosure is a new task for central banks, but the Magyar Nemzeti Bank's disclosure clearly demonstrates that with active engagement, the challenge can be overcome. Everyone must actively contribute to achieving a sustainable economic transition. This requires objective assessment and quantification – measuring and evaluating risks and exposures to draw conclusions.

I invite you to read the Magyar Nemzeti Bank's Climate-Related Financial Disclosure with the above in mind.

*Dr György Matolcsy*
*Governor of the Magyar Nemzeti Bank*

# Executive Summary

**The MNB's statutory objectives include, both directly and indirectly, promoting environmental sustainability and addressing the risks caused by climate change.** While the primary mandates of the central bank provide opportunities to address climate change, since mid-2021 the 'green mandate' has further strengthened this by making the promotion of environmental sustainability an explicit objective.

**The MNB's decision-making bodies and executives are regularly informed about the impact exerted by climate change and other environmental risks on the financial system and the MNB's operations, and they support environmental sustainability through their decisions.** In order to integrate sustainability aspects into their activities, the MNB's various organisational units take wide-ranging steps, which are coordinated at the level of the decision-making bodies and senior management.

**The MNB's strategy for environmental sustainability has been elaborated in line with its mandates laid down in the MNB Act and its organisational structure.** In the Green Monetary Policy Toolkit Strategy, the MNB identifies a number of climate-related risks that may have an impact on price stability. Without compromising its primary objective, the MNB develops its monetary policy toolbox in harmony with long-term environmental sustainability considerations. The MNB's Green Programme sets out the relationship of the supervisory strategy to sustainability objectives, supporting the stability of the financial system through the identification, measurement and management of climate-related and environmental risks. Greening its own operations is also a priority for the central bank, which has set a target of an 80-per cent reduction in direct carbon emissions by 2025 compared to the 2019 level and offsetting emissions that cannot be reduced further.

**The central bank's risk management frameworks consist of different elements, as the MNB has several mandates.** Given the specific characteristics of climate-related risks, traditional risk management frameworks cannot be applied with adequate accuracy, and it is therefore essential to adjust them and introduce new methodologies. The first steps have been taken in terms of resource allocation and task definition, both in monetary policy and in the field of financial supervision. Environmental sustainability is increasingly reflected in the central bank's operational areas and programmes, such as the asset purchase programme, central bank lending, collateral management and foreign exchange reserve management. Climate change has an indirect impact on financial supervision via the financial system and the real economy. The financial risks posed by climate change are also taken into account in the supervisory work through the use of increasingly sophisticated tools for risk identification, measurement and management.

**In addition to examining its own operations, one of the MNB's primary objectives with this report is to provide information on the widest possible range of its financial instruments and related climate risk aspects.** The MNB's long-term objective is to produce a climate risk report that covers its entire asset portfolio. In the short term, mainly due to data availability constraints, the MNB will produce a report that is representative in terms of its total assets, but is not exhaustive. With regard to foreign exchange reserves, the analysis focuses on sovereign exposures, which represent the core component of the reserves. In respect of monetary policy instruments, the analysis also covers mortgage bonds and corporate exposures in addition to sovereigns. Furthermore, the MNB considers it particularly important to provide a brief summary of the climate risk exposure of securities and large corporate loans accepted as collateral.

**The MNB analysed the climate risk exposure of financial asset portfolios according to the two main climate-related risk categories, namely transition risks and physical risks, broken down by portfolios.** The MNB assessed these risks using metrics commonly applied in international practice, supplemented by its own estimates and special analysis for some of the asset categories. In preparing its analysis, the MNB seeks to gain as broad an understanding as possible of the risks and opportunities posed by climate change, and has therefore quantified a number of metrics for different asset portfolios. The analysis of the climate impacts of financial portfolios was based on the preliminary balance sheet data at the end of 2021 and the latest available annual greenhouse gas (GHG) emissions and corresponding GDP data.

**For the foreign exchange reserves, weighted average carbon intensity (WACI), energy mix and physical risk metrics were calculated.** The WACI metric for the sovereign reserve assets is 287 tonnes $CO_2e$ per million euro of GDP, which is

slightly lower than the IMF COFER chosen as the reference portfolio. The energy mix of the sovereign assets in the foreign exchange reserves is the same as the energy mix of the benchmark portfolio, but differs significantly from the 2025 energy mix assumed as necessary in the IEA sustainability scenario. In terms of physical risks, the portfolio is considered relatively risky based on its overall risk score, mainly due to the rise in sea levels.

**For the sovereign bond purchase programme, WACI, energy mix and physical risks are presented similarly as in the case of foreign exchange reserves.** The WACI figure calculated for Hungarian sovereign assets is 495 tonnes $CO_2$e per million euro of GDP, which is lower than the average carbon intensity in the reference region (V3 countries: Czech Republic, Poland and Slovakia). In addition, the transition risk of the government bond purchase programme was also examined through Hungary's energy mix, which shows that Hungary's energy supply has been greening over the past decades. To analyse the physical risks of the programme, it is necessary to assess Hungary's physical risk profile. Hungary's physical risk exposure is relatively low, ranking in the lower third (26$^{th}$ percentile) of the universe examined, with only the heat stress risk category posing a serious challenge.

**Among the corporate exposures, in addition to WACI, the analysis for the Bond Funding for Growth Scheme (BGS) includes the brown share and physical risks.** The WACI figure for the BGS portfolio is 551 tonnes $CO_2$e per million euro of value added, which is higher than the average carbon intensity of the Hungarian corporate sector as a whole, but approximately the same as the average corporate carbon intensity of the V3 countries. Looking at the carbon intensity of the portfolio by sector, it can be concluded that the scheme funds the less carbon intensive industries. The brown share in the BGS portfolio was close to 7.8 per cent at the end of December 2021. Similar to the situation in Hungary, considering most physical risk categories, the BGS portfolio is relatively low risk.

**With regard to the Funding for Growth Scheme (FGS), the analysis only covers transition risks (also using the WACI metric and the brown share), while physical risks are not part of the analysis due to limited data.** The WACI metric for the outstanding stock of FGS loans is 692 tonnes $CO_2$e per million euro of value added, which exceeds both the average corporate carbon intensity of the Hungarian corporate sector as a whole and that of the V3 countries. The sectoral distribution of the carbon intensity of the loans granted under the scheme is heterogeneous, with the largest loan portfolios in the less carbon-intensive sectors, agriculture being the exception. The brown share in the outstanding stock of loans granted under the FGS is relatively low, at only 3.8 per cent of the portfolio.

**In contrast to the other asset portfolios, a unique methodology was developed to estimate the environmental impact of the Mortgage Bond Purchase Programme, due to the specificities of the instrument.** It is estimated that the MNB's Mortgage Bond Purchase Programme will save approximately 19,000-46,000 tonnes of GHG emissions per year, which is roughly equivalent to the carbon footprint of a Hungarian city with 4,000-9,000 inhabitants.

**The MNB has assessed the climate change risks in its collateral management framework and, in addition to the WACI metric for the pledged portfolios, also quantified the brown share of the portfolios and their physical risk score.** The scope of collateral acceptable to the MNB is relatively broad, with eligible holdings including government securities, corporate and bank securities (including mortgage covered bonds) and, from 2020, large corporate receivables. The WACI metric for pledged collateral is 395 tonnes $CO_2$e per million euro of value added for corporate holdings and 495 tonnes $CO_2$e per million euro of GDP for sovereign holdings. The largest holdings of corporate exposures of pledged collateral is typically associated with sectors with a relatively low carbon footprint, and thus the brown share was only 5.6 per cent at the end of 2021. The physical risk of Hungarian government securities, which represent the bulk of the pledged collateral, is in line with the results for the government bond purchase programme, while the physical risk of the pledged corporate portfolio is similar to the physical risk of the overall BGS portfolio.

**The carbon footprint of the MNB's own operations has fallen by 30 per cent over the past 5 years, with the per capita carbon footprint dropping by almost 40 per cent; however, the change in work patterns due to the coronavirus pandemic also played an important role in this decrease.** Between 85 and 90 per cent of the carbon footprint of operational activities is related to energy use, mainly heating and cooling energy consumption for the operation of buildings. In line with its strategic objectives, the MNB aims to reduce its operational carbon footprint by 80 per cent by 2025 (on a 2019 basis), through the installation of a solar PV system and for electricity, through energy consumption from 100 per cent renewable sources.

# Introduction

**In 2015, the G20 Financial Stability Board (FSB) established the Task Force on Climate-related Financial Disclosures (TCFD) with the aim of making recommendations to improve the quality of climate risk related disclosures.** This facilitates more informed investment, lending and insurance decisions and allows market participants to better understand the concentration of GHG-intensive assets in the financial sector and the exposure of the financial system to climate-related and environmental risks. In a more transparent and stable market, these risks are more effectively incorporated into strategic decision-making, thereby supporting capital flows towards sustainable investments.

**The TCFD recommendations play an important role in the G30's proposals for achieving carbon neutrality.**[1] According to this, by 2023 governments should make it mandatory for listed companies in all sectors of the economy to disclose their transition plans to a low-carbon economy and explain how they will align their business activities with the transition to a carbon-neutral economy. In making these plans public, the companies concerned should build on existing TCFD standards.

**The G30 report proposes a number of steps to increase the quantity and quality of these disclosures.** For the MNB, one of the most important and urgent steps is that, although it is not a listed company, 'central banks need to lead by example and publish fully TCFD-compliant disclosures'.

**In June 2017, the TCFD's recommendations on climate-related financial disclosures were published, structured around four areas which represent the core elements of how organisations operate: internal governance, strategy, risk management, and metrics and targets (Chart 1).** Although these recommendations are not sector-specific, a specific addendum for financial institutions has been developed, which mentions additional details as part of the recommendations (e.g. for credit institutions, disclosure is recommended where there is a significant credit concentration in carbon-intensive assets).

**Chart 1**
**TCFD recommendations**


*Source: FSB TCFD*

[1] https://group30.org/images/uploads/publications/G30_Mainstreaming_the_Transition_to_a_Net-Zero_Economy.pdf

**The most important section of the report is the quantification of metrics, in particular direct greenhouse gas (GHG) emissions (Scope 1), indirect GHG emissions related to purchased energy (Scope 2) and GHG emissions of financed activities or further down the supply chain (Scope 3).** The TCFD recommendations also contribute indirectly to improving internal governance, strategy development and risk management in this area.

**The TCFD also monitors market dynamics related to its recommendations, and although the uptake of the recommendations shows a positive trend, the practices of many financial market participants do not even meet the minimum level set by the recommendations.** As the European Central Bank's report[2] points out, 'virtually none of the institutions in the scope of the assessment (significant institutions in the euro area) would meet a minimum level of disclosures set out in … the Task Force on Climate-related Financial Disclosures (TCFD)'.

**Box 1**
**International examples of application by central banks**

For central banks, the disclosure of climate-related financial disclosures is not yet widespread, and the MNB has relied mainly on the report published by the Bank of England. Another example of a partial report is the responsible investment report of the Banque de France, especially in respect of the sections on the portfolios.

In 2020, the Bank of England published for the first time its report 'Climate-related Financial Disclosures' intended to appear annually. The report is structured around the four areas set out in the TCFD Recommendation (governance, strategy, risk management and metrics and targets), with a particular focus on the elaboration of the issues of risk management and metrics.

In the section on internal governance, the report describes the functioning of the Bank of England's climate risk manager and its boards as well as the measures it has taken to mitigate climate risks. The Bank of England's climate change strategy is built around measuring and managing risk on the one hand, and developing a culture of public reporting on the topic on the other. As a third strategic objective, the report sets the identification of the gaps in the transition to a low-carbon economy and promoting exploitation of the opportunities.

The report also follows the TCFD recommendation in that it includes the Bank's Scope 1, 2 and 3 GHG emissions and the Bank's 2030 targets for these indicators. The Bank of England has identified some GHG emissions areas where it cannot significantly reduce future levels of emissions and has therefore not set a target to reduce these. One such area is the process of producing paper money.

The Bank of England's report includes a carbon risk metric for its financial assets compared to a benchmark index compiled from bonds issued by G7 countries. The report also covers different areas of climate risk of assets. For transition risk, it looks at stranded assets behind bonds, and for physical risk, it analyses the exposure of assets to extreme weather events. Due to the Bank of England's specific balance sheet structure, although the portfolio discussed by the report covers 90 per cent of the Bank's balance sheet total, it does not cover foreign exchange reserves, as these represent less than 5 per cent of total assets. As a result, the portfolio under review is largely composed of domestic bonds. In constructing the metrics, the results of external data providers were also relied upon.

Banque de France first published its 'Responsible Investment Report' for 2018, which was repeated for 2019. The report covers a portion of the assets managed by Banque de France, the assets related to the bank's equity and pension fund. It sets out objectives for the responsible investment of these assets and the responsible investment strategy to achieve these objectives, and also provides metrics on the portfolio's climate risk and carbon footprint. The report as a whole is not based on the TCFD recommendations, as it lacks sections on operation and focuses on only part of the asset portfolio, but it does follow the recommendations in terms of investment metrics.

[2] https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.ecbreportinstitutionsclimaterelatedenvironmentalriskdisclosures202011~e8e2ad20f6.en.pdf

The bank publishes a number of established metrics for the portfolio under review, such as average carbon footprint and average carbon intensity, but in addition to these, the consistency of portfolio components with the Paris Agreement 2°C target was also examined. The report also includes the results of the portfolio's climate risk calculations, both for transition and physical risks. For the carbon and climate risk metrics, international benchmarks are also included in the report in addition to the values calculated for the portfolios to help interpret the results. Similarly to the UK central bank report, the French report also draws on the results of external data providers.

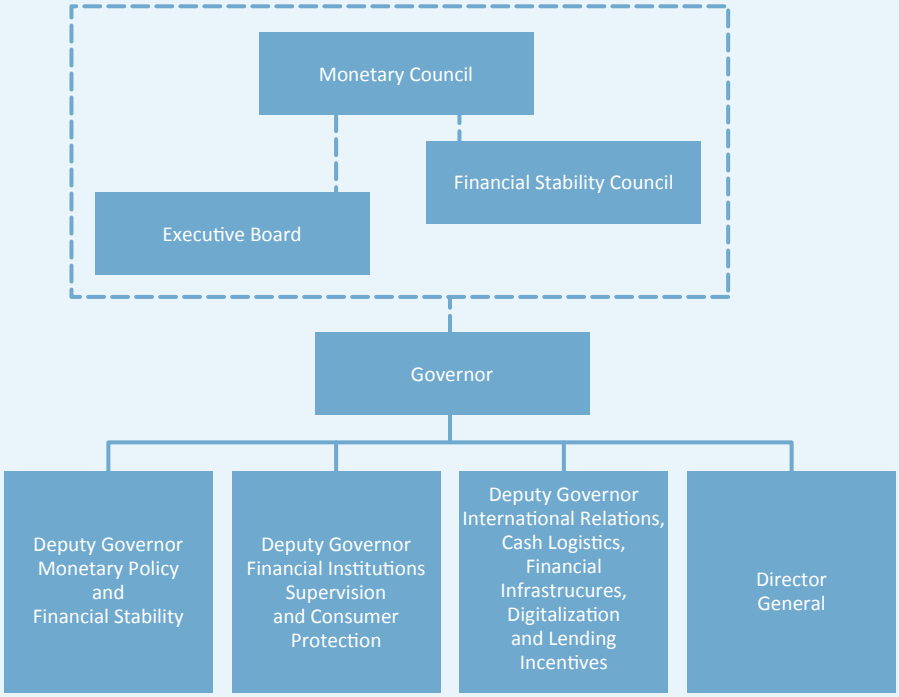
**The structure of this report closely follows the structure of the TCFD recommendations.** This can be seen in the tables presented at the beginning of each section, which contain the recommendations related to the specific topic, with the aim of making the document easier to navigate and the text more transparent.

# 1 Governance

| TCFD RECOMMENDATIONS – GOVERNANCE | |
|---|---|
| G/1 | Describe the board's oversight of climate-related risks and opportunities. |
| G/2 | Describe management's role in assessing and managing climate-related risks and opportunities. |

**Pursuant to Act CXXXIX of 2013 on the Magyar Nemzeti Bank (MNB Act), the MNB supports the stability of the financial intermediary system, enhancing its resilience, ensuring its sustainable contribution to economic growth and, with the tools at its disposal, the Government's policy on economic and, from mid-2021, environmental sustainability, without compromising its primary objective of achieving and maintaining price stability.** The MNB was the first European central bank to be granted this so-called 'green mandate', by which the MNB's statutory objectives now include the promotion of environmental sustainability, following a decision of the National Assembly.

**Chart 2**
**Organisational structure of the MNB**




**The MNB's decision-making bodies are the Monetary Council, the Financial Stability Council and the Executive Board (Chart 2).** The senior management of the MNB are the Governor, the Deputy Governors and the Director General. Decision-making bodies and senior MNB executives are regularly informed of the impact of climate change and other environmental risks on the financial system and the MNB's own operations, and they take measures to promote environmental sustainability. The MNB's Green Programme was launched in 2019 following a decision by the Financial Stability Council and the Executive Board.

**The Monetary Council (MC) is the MNB's supreme decision-making body.** Pursuant to Article 9 (1) of the MNB Act, the powers of the MC include, inter alia, strategic decisions relating to monetary policy, the issuance of legal tender, the accumulation and management of foreign exchange and gold reserves, the management of foreign exchange reserves

and the conduct of foreign exchange operations in the context of the implementation of exchange rate policy, as well as statistical tasks. The MC is also empowered to decide on the strategic framework related to macro-prudential tasks, the oversight of payment and settlement and securities settlement systems, the oversight of the financial intermediary system and the functioning as resolution authority, within which the Financial Stability Council takes decisions. The members of the MC are the Governor, the Deputy Governors and members elected by the National Assembly. The MC monitors the impact of climate change and other ecological risks on the financial system on an ad-hoc basis and supports adaptation to environmental risks through its strategic decisions. Based on the Monetary Council's decision, the MNB was one of the first central banks since 2019 to ensure that sustainability considerations are also reflected in reserve management by creating a dedicated green bond portfolio within the foreign exchange reserves. In July 2021, the MC adopted the Bank's Green Monetary Policy Toolkit Strategy, which aims to ensure the alignment of environmental sustainability and monetary policy.

**Within the strategic framework defined by the MC, the Financial Stability Council (FSC) acts on behalf of the MNB in decision-making related to the oversight of payments and settlement and securities settlement systems, macro-prudential and resolution authority tasks, and the supervision of the financial system.** The members of the FSC are the Governor and Deputy Governors of the MNB, the executives appointed by the Governor and the Director General. The FSC regularly monitors the impact of climate change and other ecological risks on the financial system and financial stability, and takes measures to support the financial system's adaptation to climate change and Hungary's transition to a climate-friendly and ecologically sustainable economy. In January 2019, the FSC adopted the MNB's Green Programme, which sets out the main directions to be followed by the central bank in the context of its financial supervision, stability and sustainable economic growth supporting functions. Since the adoption of the Green Programme, the FSC has supported the objectives set out in the Green Programme through a number of measures (e.g. the introduction of green preferential capital requirement programmes). Following the FSC's decision, in February 2020, the MNB signed the UN Principles for Responsible Banking as a supporter, in order to encourage more domestic credit institutions to make specific, public and accountable commitments to finance a sustainable green economy. In April 2021, the FSC issued MNB Recommendation 5/2021 (IV.15.), which sets out supervisory expectations for credit institutions regarding the identification, measurement, management, control and disclosure of climate-related and environmental risks and the integration of environmental sustainability considerations in the business activities of credit institutions.

**As the MNB's executive body, the Executive Board (EB) is responsible for implementing the decisions of the MC and the FSC, as defined in Article 12 (1) of the MNB Act, and for managing the MNB's operations.** The members of the EB are the Governor and the Deputy Governors of the MNB. The EB is regularly informed about the impact of climate change and environmental risks on the financial system and the MNB's operations, and through its actions it contributes to the implementation of the decisions of the MC and the FSC in support of environmental sustainability. The EB prepares a medium-term Environmental Strategy every 3 years. The targets set out in the Environmental Strategy are backtested in the Annual Environmental Statement adopted by the EB and updated annually. The Statute adopted by the EB in 2014 and the Corporate Social Responsibility Strategy adopted in the same year set out the framework for the Bank's operations in the area of environmental policy and protection. The EB, responsible for managing the MNB's operations, is empowered to decide on the identification, management and measurement of the MNB's major environmental risks and on the implementation of its investments in support of environmental sustainability.

**The Governor is the top executive of the EB heading the MNB.** As the Chair of the MC, the FSC and the EB, the Governor is regularly informed about the impact of climate change and other environmental risks on the financial system and the MNB's operations. The departments under the Governor's direct management are responsible for the MNB's academic and other educational activities related to sustainable finance.

**As a member of the MC, the FSC and the EB, the Deputy Governor responsible for monetary policy and financial stability is regularly informed about matters falling within the competence of the decision-making bodies and participates in taking measures.** The departments under the Deputy Governor's direction are responsible for formulating the central bank's proposals for structural reforms to ensure sustainable growth in Hungary; conducting research on sustainable economic growth; monitoring Hungarian and international macroeconomic topics and economic policies that support sustainable growth; and assessing the function of the financial system to support sustainable economic growth. The area is responsible for the development and ongoing revision of the Green Monetary Policy Toolkit Strategy and for formulating

specific proposals for each of the instruments in the implementation of the strategy and, once decisions have been taken, for the operational implementation of the strategy (e.g. green mortgage bond purchases, green portfolio construction).

**As a member of the MC, the FSC and the EB, the Deputy Governor responsible for Supervision of Financial Institutions and Consumer Protection is regularly informed about the matters falling within the competence of the decision-making bodies and participates in taking measures.** The departments under the Deputy Governor's responsibility are responsible for conducting analyses and research on financial services and products that support environmental and social sustainability; identifying the prudential implications and risks of climate change and other ecological anomalies and conducting on-site and off-site investigations and supervision activities related to these and to sustainable financial regulation; developing the MNB's position and regulatory proposals on sustainable finance; and contributing to the MNB's academic and other educational, training, awareness-raising, research and international relations-related tasks in the field of sustainable finance. Since 2019, the activities of the Deputy Governor responsible for Supervision of Financial Institutions and Consumer Protection regarding climate-related and other environmental risks and sustainability have been supported by a dedicated unit, the Sustainable Finance Department.

**As a member of the MC, the FSC and the EB, the Deputy Governor responsible for international relations, cash logistics, financial infrastructure, digitalisation and lending incentives is regularly informed about matters falling within the competence of the decision-making bodies and participates in taking measures.** The departments under the Deputy Governor's responsibility are responsible for exploring, identifying and implementing opportunities for the development and promotion of the domestic green credit and bond market by the central bank; and for supporting and coordinating the MNB's sustainability-related international tasks.

**The Director General, as a member of the FSC, is regularly informed about matters falling within the FSC's competence and participates in taking measures.** The departments under the Director General's direction are responsible for reducing the MNB's carbon footprint, in particular with regard to building operations and the vehicle fleet; for the management, support and implementation of the MNB's environmental activities; and for the operation of the MNB's Environmental Management and Verification System; monitoring the MNB's waste management activities; developing and implementing the MNB's Corporate Social Responsibility Strategy; and disseminating an environmentally sustainable financial culture and awareness among large sections of society.

In addition to ad-hoc cooperation and multi-disciplinary projects, the MNB's sustainability and environmental risk departments also report on their activities to one another at the three weekly Green Workshop meetings at the middle management and expert level.

# 2 Strategy

| TCFD RECOMMENDATIONS – STRATEGY | |
|---|---|
| S/1 | Describe the climate-related risks and opportunities the organisation has identified over the short, medium, and long term. |
| S/2 | Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning. |
| S/3 | Describe the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario. |

**The primary objective of the MNB is to achieve and maintain price stability and, without compromising its primary objective, to support the maintenance of stability and improvement of the resilience of the financial system, its sustainable contribution to economic growth and to support the economic policies of the Government using the instruments at its disposal.** The core tasks of the central bank are defined in Article 4 (1) to (7) of the MNB Act, such as the elaboration and implementation of monetary policy, maintaining price stability, managing foreign exchange reserves, issuing banknotes and coins, and ensuring the stability of the financial intermediary system through the identification and management of micro– and macro-prudential risks.

**The amendment to the legislation, which entered into force on 2 August 2021, extends the MNB's mandate to support government policy on environmental sustainability.** With the amendment, the MNB is legally obliged to integrate environmental sustainability considerations in its activities without compromising its primary objective of achieving and maintaining price stability.

## 2.1 GREEN MONETARY POLICY TOOLKIT STRATEGY

**In July 2021, the document 'Sustainability and central bank policy – Green aspects in the MNB's monetary policy toolkit' was published, which sets out the strategic orientations for mainstreaming long-term environmental sustainability considerations through central bank instruments.** The MNB identifies a number of risks stemming from climate change, including both transition and physical risks, which may have implications for price stability and financial stability. The design of central bank instruments should therefore take into account that environmental sustainability is a prerequisite for the fulfilment of the primary mandate.

**The Magyar Nemzeti Bank considers it its mission to develop its monetary policy instruments in line with its tasks and mandate as laid down in the MNB Act, without compromising its primary objective, while ensuring that long-term environmental sustainability is taken into account.** It also wants to play an active role in supporting the transition to a low-carbon economy, and in developing and implementing international best practice.

**To achieve this mission, the Bank has identified the following strategic objectives:**

- Contributing to a sustainable economic transition;
- Supporting the achievement of climate targets;
- Increasing the climate-awareness of the financial system;
- Shaping consumer and social attitudes;
- Adopting international best practices;
- Assessing the climate exposure of monetary policy instruments.

**The MNB has identified a number of factors that can help achieve the strategic objectives.** These include a supportive attitude towards sustainability issues in the domestic and international environment, flexible market participants, an evolving green bond market, and a green central bank approach and innovative attitude. The Bank also identified as constraints the level of development of domestic financial markets, the immature international practices and limited number of international examples, the short-term business approach prevailing in the financial sector and the need for cooperation between different stakeholders.

**Possible directions for the greening of monetary policy (Chart 3):**

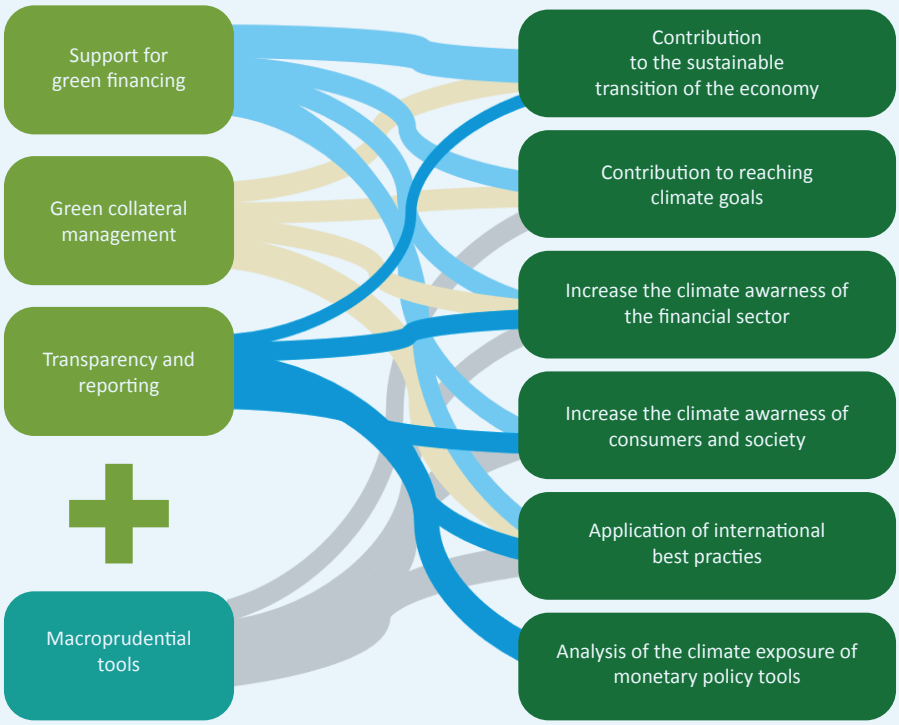
- **Transparency and reporting:**
  The MNB's TCFD report falls under this heading, through which the Bank demonstrates the emergence of sustainability considerations in the Bank's governance, strategy and risk management practices, and provides an example for domestic financial sector actors.

- **Central bank incentives for green lending:**
  One area identified by the MNB where it can make a significant impact facilitating sustainability is the residential housing stock, which is responsible for nearly one quarter of Hungary's primary energy consumption. In response to this challenge, the MNB has launched the Green Mortgage Bond Purchase Programme, the first asset purchase programme to focus on sustainability. The aim of the programme is to foster green lending through the creation of a domestic green mortgage bond market, to promote best practices and thus build an energy-efficient real estate stock.

- **Green collateral management:**
  In its monetary policy-related collateral management activities, the MNB assumes significant green risks via the assets it accepts as collateral. For this reason, the Bank is exploring opportunities for green collateral management, which can have a significant impact on greening bank exposures and influencing risk management practices through liquidity management at commercial banks.

- **Fitting macroprudential measures into a green monetary policy toolbox:**
  In addition to the elements related to the monetary policy toolbox, the MNB is also looking at greening the macroprudential toolbox. In addition, the Bank is considering the integration of green risk monitoring elements into its risk assessment and decision-making framework.

**Chart 3**
**Possible directions for the greening of monetary policy**



## 2.2 FOREIGN EXCHANGE RESERVES STRATEGY

**One of the MNB's fundamental statutory tasks is the management of the country's foreign exchange reserves, which is defined by the primary central bank objectives.** The maintenance of foreign exchange reserves is justified to support monetary and exchange rate policy; to provide the necessary foreign exchange liquidity; to meet the expectations of market participants; and to secure the transactional foreign exchange needs of the State. When investing foreign exchange reserves, the central bank follows a tripartite regime of safety-liquidity-return, in line with international best practice, i.e. it aims to achieve the highest possible level of returns while keeping risks low and providing the necessary liquidity.

**In 2021, the MNB managed foreign exchange reserves in eight main currencies (EUR, USD, JPY, GBP, AUD, RMB, CZK, PLN) in different portfolios.** In line with conservative reserve portfolio management, a significant proportion of the foreign exchange reserves consist of highly rated government securities, considered to be credit risk-free. In addition to sovereign issues, foreign exchange reserves also include (supranational) issues by international institutions, highly rated corporate and bank issues and covered bonds. In order to achieve geographical diversification, the foreign exchange reserves include exposures to different countries, but the majority of the issues are from developed countries with good credit ratings.

**In recent years, the wider application of environmental sustainability considerations has also become a priority for central banks.** In addition to meeting the primary objectives of reserve maintenance, central banks have a key role to play in developing green bond markets and successfully implementing the green transition of economies ('supportive approach'). In addition, the value of foreign exchange reserves may be strongly affected by the realisation of the transition and physical risks associated with purchased issues ('defensive approach'). Although the likelihood of risks materialising appears to be significant in the longer term, in the short term it is still unavoidable to explore the issue, take the necessary steps and assess the investment strategy from a climate risk perspective.

**The MNB has taken a number of steps to integrate environmental considerations into its operational framework, in line with its responsibilities under the MNB Act.** In 2019, the MNB was among the first central banks to decide to construct a portfolio of green bonds within its foreign exchange reserves. Construction of the dedicated green bond portfolio was completed in 2020 and is consistent with the central bank's corporate social responsibility and environmental strategy objectives. By preparing the TCFD report, the MNB is among the first to assess the climate risks inherent in foreign exchange reserve portfolios.

**However, achieving climate targets and managing climate risks is a long-term process, which may require further actions by central banks in the future, including in the area of foreign exchange reserve management.** One of the key roles of central banks in addressing the challenges of climate change is to develop and support international practice and to be a role model for actors in the world of business. In this context, foreign exchange reserves can help to develop the green investment market, for example by holding and further purchasing green bond portfolios. In addition, an important challenge is to integrate climate risks and green considerations into the traditional risk management and investment framework in the medium to long term.

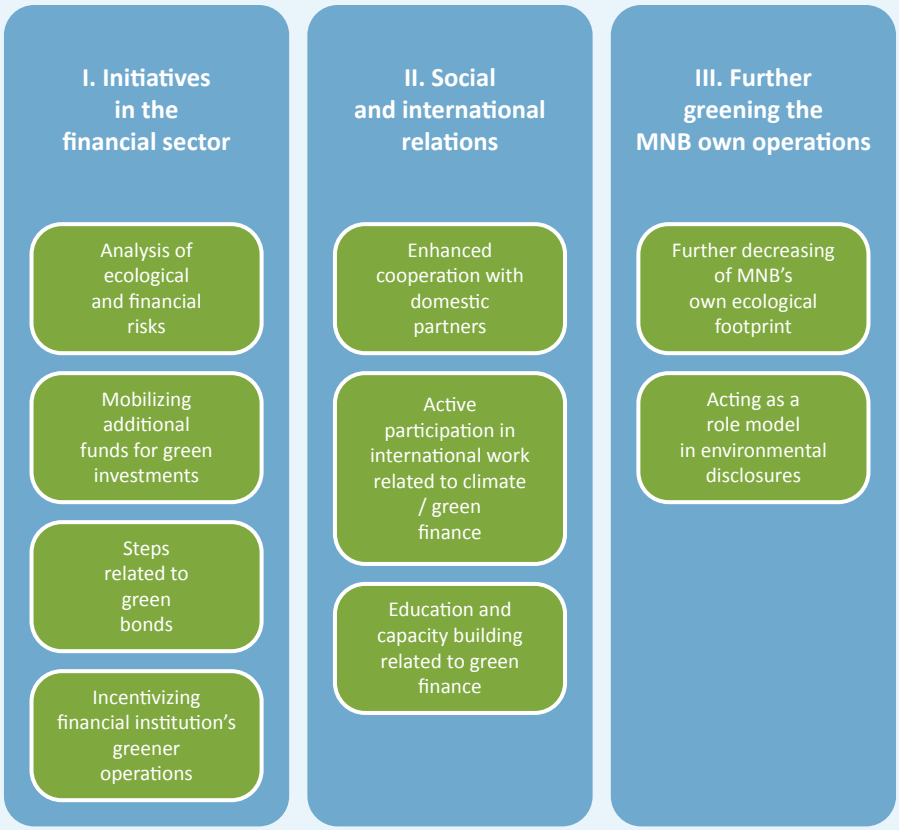
## 2.3 SUPERVISORY STRATEGY

**Several elements of Stability and Confidence 2.0 – the MNB's supervisory strategy for 2020-2025 – are closely linked to environmental sustainability efforts.** The MNB's mission is to support and deepen the stability of the financial system, with a particular focus on sustainability, consumer protection and digitalisation. In its strategy, the Bank has set as a market objective that the activities and services of financial institutions should support environmental sustainability as much as possible and it has also set a number of related organisational objectives. Examples include the development of consumer protection principles for green products, the provision of a supportive environment for financial and capital market services for sustainability, and financial education on products designed for sustainability. The MNB has also set as an organisational objective the promotion of financial and capital market services that support social sustainability in the future. The MNB has also launched a dedicated action plan, the Green Programme, to implement the environmental sustainability aspects of its supervisory strategy as effectively as possible.

## 2.3.1 Green Programme

**As noted above, the MNB launched its Green Programme in the first half of 2019, with the dedicated objective of mitigating the ecological, economic and financial risks of climate change in Hungary.** The programme is divided into three pillars: financial system, social and international relations, and the sustainability of the MNB's own operations (Chart 4).

**Chart 4**
**Pillars of the MNB Green Programme**




*Source: MNB*

**The first element of the financial sector pillar is the financial analysis of climate-related and other environmental risks.** Financial risks stemming from environmental degradation are of particular importance, as the MNB supervises financial institutions. In this area, the Bank has carried out a number of studies in recent years. A metric measuring the carbon risk of banks has been developed and is used by the MNB to monitor the evolution of the transition risks of the banking system as a whole (and of individual institutions) on a quarter-by-quarter basis. In 2021, the Bank assessed the resilience of the banking system to climate change transition risk through a climate stress test.

**Given the central role of the financial system in allocating capital, the greening and mobilisation of financial services towards financing sustainable economic activities is a crucial element of the MNB's Green Programme.** In this context, the MNB has launched green preferential capital requirement programmes for banks in the retail, corporate and municipal lending segments. In case of corporate and municipal loans, the preferential requirement scheme now covers not only financing renewable energy production and green bond purchases, but also electromobility, sustainable agriculture development and other financing serving environmental sustainability without any industry-specific restrictions. In the case of retail loans, the preferential requirement scheme applies to financing the energy renovation of residential buildings, condominiums and housing cooperatives, specific modernisation measures, the construction or purchase of new housing with a high energy performance certificate, or the purchase of used property.

**Supporting the take-up of green bonds is also part of the Green Programme, and the MNB explored this issue in its publication 'Opportunities for launching a green bond market in Hungary'.** In addition, several MNB measures which have already been mentioned, such as the Corporate Green Capital Requirement Scheme and the construction of the Green Bond Portfolio, as well as the development of the Sustainable Capital Market Strategy and the recent Green Bond Issuance Guidelines, also facilitate the development of the green bond market.

**The MNB also considers it important to support the greening of the operations of the Hungarian financial system, and this is also one of the items of the Green Programme.** To promote this, in 2019 the Bank established an award to recognise the best environmental performance in the financial sector and to encourage the sustainable operations of financial institutions through its reputational value. The greening of the MNB's own operational activities is also explained in more detail in Section 2.4.

**In addition to the programmes for financial institutions, the second pillar of the MNB's Green Programme concerns the fostering and expansion of social and international relations.** The Bank intends to work in partnership with domestic government, market and social actors with knowledge and capacity relevant to climate change and green finance to implement the Green Programme, taking advantage of synergies arising from the cooperation.

**In addition to domestic actors, the MNB is also seeking to build international relationships in the field of climate risk and green finance initiatives to implement the Programme.** To this end, the Bank has been a member of the Network for Greening the Financial System (NGFS) since 2019, and has joined all three working groups of the NGFS. In the same year, the MNB joined the Advisory Council of the Energy Efficient Mortgages Initiative (EEMI), which aims to promote preferential loans for energy efficiency investments. The MNB is also actively involved in the development of related regulations by the European Supervisory Authorities (EBA, ESMA, EIOPA).

**Through its social contacts, the Bank intends to support awareness-raising and educational activities on green finance under the Green Programme.** The MNB promotes the development of the knowledge base on green finance for both market participants and students through the Budapest Institute of Banking and through its university courses in economics and finance. In addition, the Bank has developed a dedicated website called Family Green Finance to raise the ecological awareness of the population.

## 2.4 SUSTAINABILITY STRATEGY FOR THE MNB'S OWN OPERATIONS

**The third pillar of the MNB's Green Programme aims to further green the Bank's operations. In order to reduce the environmental footprint of MNB's operations, the Bank operates an Environmental Management System (EMS).** The introduction of the EMS in 2011 was preceded by an environmental risk assessment, involving the identification of significant environmental factors. On the basis of these factors, the MNB's senior management defined the two main directions of the Bank's long-term environmental strategy: reducing the environmental footprint of the buildings needed for its operation and reducing the carbon footprint of the cash supply chain.

**The increasing 'application' of renewable energy is seen as an opportunity to make buildings more environmentally friendly, both by installing solar panels and by purchasing such energy from the market.** It is important to note that there are already limits to leverage either of these options, and the margins for future renewable energy from the energy market are likely to increase. In the context of climate change, there has been a steady increase in energy demand in recent years, affecting mainly energy consumption for heating, but it is also becoming a regular occurrence that century-old summer heat records are repeatedly broken, leading to increasing energy demand for the operation of cooling systems. Increasing energy demand is expected to continue in the future.

**The main ways to reduce the carbon footprint of the cash supply chain are to increase local banknote and coin recycling by credit institutions and to reduce the transport tasks within the supply chain on the cash processing side.** It is important to note that, almost without exception, the measures to reduce the environmental footprint on the cash supply chain affect the internal processes of market-based companies, so the central bank can play a consultative role in orienting participants towards environmentally conscious behaviour by presenting the possibilities for reducing the carbon footprint of cash processing and credit institutions and outlining the long-term benefits.

## 2.4.1. The MNB's Environmental Strategy

**The Environmental Management System operates in 3-year cycles, with the current cycle covering the period 2020-2022.** Medium-term strategic objectives are set for each cycle and the implementation of these objectives is supported by the Environmental Programme.

**Based on the medium-term environmental strategy announced by the Magyar Nemzeti Bank in 2020, the Bank will shift to carbon-neutral operation starting from 2021; In implementing this strategy (Chart 5), the Bank will**

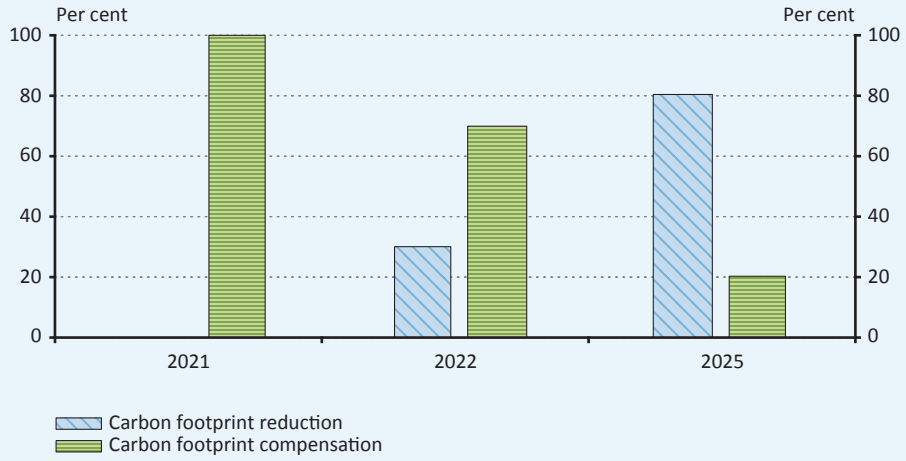
- Fully neutralise its 2020 carbon emissions related to its operational activities by offsetting them in 2021 through its participation in a domestic habitat restoration project;

- Reduce the carbon footprint associated with its operational activities by at least 30 per cent by the end of 2022:
  – Install a solar PV system in the Logistics Centre;
  – Ensure that 50 per cent of the electricity used in the office buildings serving the MNB's operations comes from renewable sources;

- Achieve carbon-neutral operations within 5 years, with an 80 per cent carbon footprint reduction and a 20 per cent offset
  – Ensure that 100 per cent of the electricity used in the office buildings serving the MNB's operations comes from renewable sources.

- The MNB intends to offset its remaining emissions by financing habitat restoration projects, such as the planting of a 27-hectare forest in the Körös-Maros National Park.

**Chart 5**
**Timetable for the transition to carbon neutrality**




*Source: MNB*

# 3 Risk management

| TCFD RECOMMENDATIONS – RISK MANAGEMENT | |
|---|---|
| RM/1 | Describe the organisation's processes for identifying and assessing climate-related risks. |
| RM/2 | Describe the organisation's processes for managing climate-related risks. |
| RM/3 | Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organisation's overall risk management. |

**Central bank risk management frameworks consist of different parts, as central banks often have several mandates, as is the case with the MNB.** Since central bank responsibilities are also diverse, the risks they face and the processes for managing these risks can differ greatly, and the organisational and asset structures of the institutions can vary substantially. The risk management framework and its processes include the identification, assessment, management and monitoring of risks.

## 3.1 TRANSITION AND PHYSICAL RISKS

**For climate-related and environmental risks, the defining criterion is 'dual materiality', which covers environmental materiality, in addition to financial materiality.** In other words, the consequences of climate change can affect an institution from a financial point of view, and the institution can also have an impact on the environment through its activities and investments. These impacts may be partly overlapping, and are therefore rarely separable, for example, high GHG emissions may have an impact on the environment, but may also have a negative financial impact on the issuer itself. This is of course also a relevant concept for central banks.

**When detailing the climate risks impacting central banks, as with other institutions, a distinction is made between the transition and physical risk channels.**

- Transition risks arise from the transition to a low-carbon and climate resilient economy. Changes in policy or technology, or rapid shifts in consumer attitudes, can all cause a sudden revaluation in the price of financial instruments. As a consequence, credit and market risks may increase and, in certain scenarios, the resulting losses could even threaten financial stability.

- Physical risks arise from the physical effects of climate change, i.e. changes in the long-term climate and an increase in the severity and frequency of extreme weather events. With physical risks, it is not only the risk of losses due to the destruction of physical assets and infrastructure that is considered, but also the breakdown of value chains, loss of biodiversity, negative impacts on human health and well-being, which in extreme cases could lead to migration and conflict. Understandably, this has an impact on the productivity of companies or the value of physical and financial assets. It can also affect financial stability, in addition to long-term macroeconomic opportunities and equilibrium.

## 3.2 CHARACTERISTICS OF CLIMATE RISKS

**Given the specific characteristics of climate risks, traditional risk management frameworks and methodologies cannot be applied with sufficient accuracy.** Traditional risk assessment builds on historical data, analyses widely accepted metrics and uses methodologies that are reliable and robust.

**By contrast, climate change leads to changes that are characterised by a high degree of uncertainty, i.e. determined not only by the interaction of economic and financial impacts, but also inter alia by environmental, technological and cultural forces.** Furthermore, these processes interact with each other to generate unpredictable impacts that are wide-ranging and potentially very severe. These risks are therefore non-linear, irreversible and characterised by a fat tail distribution.

**Moreover, the 'tragedy of the horizons', as promoted by former Bank of England Governor Mark Carney, expresses the fact that many of the impacts of climate change will materialise and be reflected in financial risks over longer time horizons, but that they can only be mitigated by actions taken today.** Long horizons, on the other hand, are not compatible with traditional business planning and risk taking. In addition, the lack of necessary data is also major problem. High quality, abundant data are essential to understand and assess risks accurately and to develop reliable models. Since models based on historical data are not sufficient, forward-looking estimates are also required, for example through scenario analysis or climate stress tests.

**Although the details of how climate-related and environmental risks will materialise are unknown, it can be stated with absolute certainty that the materialisation – of some combination – of the transition and physical risks is inevitable.** Their timing, severity and subsequent manageability will depend on how we respond to them: if the targets of the Paris Climate Agreement are met globally, we will face higher transition risks, but if we continue with ineffective climate policies, the future will be determined by the occurrence of physical risks.

## 3.3 MONETARY POLICY

### 3.3.1 Risk management

**In relation to its monetary policy and reserve management tools, the MNB includes Hungarian and foreign exposures, typically bonds or loans, in its balance sheet.** The Bank monitors the risk of these exposures on an ongoing basis and takes into account not only monetary policy but also risk management considerations in its relevant decisions. At the MNB, the tasks of identifying, measuring and managing risks to the central bank's balance sheet, preparing decisions and monitoring risks are performed by a single unit for the various central bank functions. The management of climate risks should also be integrated into this framework. The first steps have been taken in terms of resource allocation and task definition. The MNB has also identified its strategic objectives in relation to the different central bank functions and climate risks, but further steps need to be taken in the coming years to achieve the long-term plans.

Each central bank function has different risk characteristics, taking into account their objectives, and a different risk management approach should be applied, and thus it is worth outlining the MNB's traditional and climate risk approaches by central bank functions.

### 3.3.2 Monetary policy – asset purchases

**Following the global economic crisis in 2008, asset purchase programmes have become a central element of the central bank's toolbox.** The MNB also launched programmes to buy government bonds, mortgage bonds and corporate bonds. The primary objectives of these instruments include ensuring the achievement of the inflation target, monetary easing, supporting companies' access to long-term, low cost funding and developing certain markets. The introduction of these instruments has increased the MNB's balance sheet and risk exposure. Before launching the programmes, the MNB considered the key parameters (e.g. amount, maturity) and their impact and risks on its balance sheet.

- Credit risk: In terms of credit risk exposure, credit quality (credit rating) and maturity are the main factors in asset purchase programmes. Compared to Hungarian government bonds or covered mortgage bonds, in terms of credit risk, the MNB takes the higher risk on corporate bonds, which are typically rated low, but in line with the Hungarian market average. Given the remaining maturities of over 10 years in some cases, the MNB expects these exposures to remain in its balance sheet for a long period of time. The Bank monitors the bonds and issuers on an ongoing

basis to control excessive risk-taking. In addition, the MNB manages the risks associated with the exposures in its books by applying impairment charges.

- Market risk: The fixed interest rates and long maturity of the bonds purchased represent an interest rate risk for the MNB. The primary purpose of the asset purchase programmes justifies this risk exposure.

**If the central bank does not place sufficient emphasis on mainstreaming climate risk considerations in its asset purchase programme, it may not be able to fulfil its mandate adequately, to support the green transition of the economy and to meet the government's economic policy objectives.** The green transition of the Hungarian economy could also improve the MNB's bond exposures from a climate risk perspective. The bond positions purchased by the MNB are concentrated due to geography and the small number of issuing entities, and Hungary is exposed to climate risks, making it particularly important to manage the associated risks appropriately. Due to the long remaining maturities, the MNB may hold the bonds for several decades as planned, over which time horizon the probability of realisation of climate risks is significant.

**Against this background, the MNB formulated its Green Monetary Policy Toolkit Strategy in 2021.** In line with this, the MNB has already taken steps to address climate risks in the short term by launching the Green Mortgage Bond Purchase Programme. In the medium to longer term, however, it is important to assess how to move in a green direction for other programmes as well. In the medium term, the MNB's priority is to quantify the climate risk impacts of the programmes, including through data acquisition and taking methodological decisions.

**The positions taken in the asset purchase programmes are regularly presented to the MNB's decision-making fora.** In the medium term, the MNB aims to include climate risk data and analysis in these reports.

### 3.3.3 Monetary policy – loans/collateral management

**Central bank lending serves several purposes.** Traditional central bank lending is a short-term (e.g. overnight, one-week) commitment, which plays a key role in the liquidity of the banking system. In recent years, central banks have also sought to help the market to run smoothly using longer-term, focused programmes. By offering banks long-term funding on attractive terms, they maintain favourable borrowing conditions for banks and encourage lending to the real economy. Such programmes include the European Central Bank's TLTRO (Targeted Longer-term Refinancing Operations), a long-term refinancing programme, and the MTLF (Medium Term Lending Facility) initiative adopted by the People's Bank of China in 2018. The MNB also has short-term liquidity loan products and longer-term credit facilities.

**These extended loans represent the most significant items on central banks' asset side, and thus central banks are also exposed to significant risks through this activity.**

- Credit risk: In accordance with the provisions of the Central Bank Act, the MNB does not assume credit risk in its lending activities. The MNB achieves this by extending credit to money market clients only in secured form. The MNB specifies the minimum credit rating, conflict of interest and other eligibility requirements for collateral. The Bank manages the risks arising from changes in market prices, spreads and foreign exchange rates by applying haircuts.

- Market risk: Long-term fixed-rate lending poses an interest rate risk for the MNB. The primary purpose of the loan programmes justifies this risk-taking.

**The MNB also evaluates the issue of climate risk in the context of lending and collateral management.** Climate risk can be taken into account in the targeted lending activities of central banks, and climate risk considerations are consistent with their primary objectives. By shaping these programmes in a targeted way, central banks can encourage the green transition in the economy and green lending in the banking system. Failure to take these steps could jeopardise the fulfilment of the central bank mandate. In this context, the MNB has decided, for example, to launch the FGS Green Home Programme.

**Similar considerations are also relevant in collateral management.** Central banks can effectively influence market participants through the collateral management framework, via their exposure to bank funding and liquidity management, for example by giving preferential treatment to certain asset classes in order to influence the spreads of relevant issues. Therefore, from a climate risk perspective, collateral management can also be an effective tool for developing the Hungarian green bond market, improving the financial stability of the banking system and supporting the government's economic policies. A green shift in the banking system will improve banks' stress resilience and reduce the risk of lending activities.

**In addition to policy considerations, the central bank also takes into account the financial risks of climate exposures associated with collateral.** By modifying the framework, climate risk exposures can also be reduced for collateral accepted in collateral management. (It should be noted, however, that the exposure of central banks to collateral management is only indirect, as the primary obligor of lending activity is the lending bank, and collateral is included in the central bank balance sheet only in the event of a bank default.) Overall, a greener collateral pool may be preferable for the central bank due to potentially lower default risk or higher returns and lower price volatility.

- **Short-term measures:** Taking into account the above considerations, the MNB has decided to apply a preferential haircut for green bonds in 2021 as a short-term element of its collateral management strategy. (Green bonds were previously already eligible collateral.)

- **Long-term review of the framework:** A key objective at the MNB is to understand and manage green risks. In a long-term project, the MNB is exploring how climate risks can/should be integrated into the collateral management framework (e.g. climate risk assessment of collateral pools, formulation of requirements; greening of mortgage bond reporting requirements; positive/negative differentiation; exclusion; development of internal rating methodology; issue of reflecting climate risks in bond prices).

- **Data:** The transparency of the international and Hungarian green bond market and the related reporting need to improve substantially. On the one hand, the MNB wants to give guidance to banks by setting a good example. On the other hand, it is also important for the MNB to have the right data on which to build the right models and make the right regulations. In this context, it is essential to carry out appropriate data acquisitions and review the relevant methodologies.

- **International practice:** There is a consensus in the international community of central bankers on the need for a green shift in collateral management, but the modalities of how this should be achieved remain a matter of debate. MNB actively monitors and participates in the development of central bank best practices (e.g. NGFS).

**The MNB has regularly reviewed the collateral management framework.** In the future, the MNB intends to place more emphasis on the presentation of climate risk considerations in these reports. In addition, the MNB intends to pay more attention to green considerations in its publications (e.g. TCFD report).

### 3.3.4 Foreign exchange reserve management

**The MNB determines its investment policy and limit system with respect to foreign exchange reserves, taking into account the central bank's objectives, by considering the risk-liquidity-return framework.**

**The MNB aims to minimise the level of risks it assumes in relation to risks associated with transactions.** Delivery risk is minimised by using the available market infrastructures (e.g. CLS or DvP settlement methods), and the level of credit risk associated with transactions can be kept low with GMRA or ISDA/CSA contracts. Above and beyond this, the MNB applies various risk mitigation procedures in line with international best practice (e.g. counterparty limits, concentration limits).

**In relation to its investment-type exposures, the MNB must bear material risk to transaction exposures.**

- **Credit risk:** In line with international central banking practice, the MNB is fundamentally considered to be a conservative investor. The Bank holds low credit risk assets in its portfolios, and the probability of a credit risk event occurring in the reserves is minimised by applying various risk management procedures (e.g. issuer limits, country limits, diversification requirements, credit rating standards, rules on credit risk-free assets.)

- **Market risk:** The MNB is exposed to market movements through exchange rate, interest rate or spread risk. Foreign exchange risk is hedged by the MNB against the euro. However, the volatility of the gold price cannot be ignored from a market risk perspective. Also with regard to interest rate risk, the Bank maintains basically a short position, limiting the associated risks to a low level.

- **Liquidity:** One of the main objectives of reserve maintenance is to ensure the availability of adequate liquidity, which the MNB guarantees by setting various limits. A significant part of the reserves consist of liquid securities, but the MNB also maintains substantial liquid cash reserves.

- **Return:** In addition to meeting its core objectives, the MNB seeks to maximise the return on the reserves. The MNB's reserves include portfolios of credit risk-free, money market and investment portfolios. Return considerations can be applied more strongly to the latter.

**The Bank analyses climate risk exposure with respect to the reserves in terms of (i) policy risk and (ii) financial risk.** The MNB supports green bond markets and issuers' access to the market by creating demand, while giving priority to reserve maintenance objectives. In addition, the MNB still has much to learn about the functioning of green assets and markets, and its internal procedures need to be continuously improved. With these considerations in mind, the MNB was among the first central banks to construct a green bond portfolio (see Box 4-2 for more details), with a small initial size compared to other reserve assets, in line with the central bank's prudent approach. In this context, the MNB is continuously examining the options for moving forward in terms of currencies, markets and issuers.

**The financial risk aspects of climate risks are also of particular importance in reserve management.** Physical or transition risks represent a market and credit risk for the reserve assets via an increase in spreads or a deterioration in the probability of default. These risks need to be identified, measured and managed, for which the MNB has taken the necessary steps. In this context, it is worth distinguishing between a short-term and a long-term approach.

- **Short term:** The MNB's investment horizon is essentially short. The MNB's reserves are largely protected against climate risks over this short time horizon. One reason for this is that climate risks will have an increasing impact over a time horizon of several decades. On the other hand, the MNB mainly holds sovereign exposures of developed countries with high credit quality thresholds, where exposures are well diversified. On the one hand, this means that the risk of default is low and, on the other hand, the risk of repricing is also low because of the short exposures.

- **Long term:** The current structure of the reserves allows the MNB to develop and implement its long-term strategy without a rapid and drastic reallocation of reserves. As time passes, it will become increasingly important to make appropriate, gradual steps in the MNB's reserves.

**The MNB has recognised the challenges related to climate risks, started to prepare and is looking at several areas:**

- **Market development:** The green bond market is a small part of the overall bond universe, but it is steadily evolving; the investor and issuer base is expanding and, in this context, the quality and comparability of issuer reporting is improving. It is important to monitor changes in these areas and actively contribute to developments.

- **International best practice:** There is a consensus among central banks to promote green considerations. However, there is still no uniform best practice as regards specific procedures and steps. The MNB should actively monitor these developments as well and can be a driving force for promoting changes and defining best practices in international fora (e.g. NGFS).

- **Methodologies:** Climate risk methodologies are constantly evolving around the world, with a growing number of analyses exploring the correlation between climate risk and financial risk. For example, one question is how credit rating agencies incorporate climate risk considerations into their methodologies. The green bond market is still a small, concentrated market with low liquidity and relatively long average maturity, and thus the optimal way of integrating large volumes of green bonds into the reserve strategy under these boundary conditions needs to be examined.

- **Risk management:** Climate risk exposure can be managed with simpler limits (e.g. concentration limits, exclusions), but more complex models may also need to be implemented (climate risk cost framework, VaR, green benchmark).

- **Data acquisition:** The MNB's climate risk data access needs to be substantially improved. The optimal set of metrics and suppliers and the optimal use of data should be defined.

**In the traditional reserve management limit system, daily limit monitoring is in place and monthly, quarterly and semi-annual reporting supports the work of the decision-making fora.** Climate risk reporting in the MNB is still evolving, and the MNB is currently analysing the climate impact of its green bond portfolio in an annual report. With the implementation of climate risk limits and the development of data reporting, the MNB would like to move towards a framework of traditional limit monitoring and reporting in the medium term, and it is envisaged that climate risk monitoring will be mainstreamed into traditional risk management in an integrated fashion.

## 3.4 FINANCIAL STABILITY

**Climate risks affect the MNB not only directly, but also indirectly. They spill over into the financial system via the real economy, causing losses first to economic actors and then to investors and creditors.** Therefore, climate change has an indirect impact on the financial system and a double cascading effect on the central bank – the losses of credit institutions, whether concentrated in one institution or affecting the whole banking system at once, can have serious consequences. The MNB, as the authority responsible for the stability of the financial system, monitors these developments.

**The process of risk management can be divided into distinct, successive phases.** The identification and detection of risks is considered to be the first essential step, with the aim of determining the risks that threaten the institution's operations and business. The assessment of the identified risks provides an opportunity to determine their materiality and then assess their size. The active management of risks itself can only be undertaken after these steps. From the perspective of the central bank, there are some risks that it only monitors, while it consciously seeks to mitigate others.

### 3.4.1 Identification

**The identification of climate risks in the course of micro-prudential supervision is still ad-hoc and not part of the supervisory framework.** The main reason for this is that the issue is relatively new among central bank tasks and the legislative process has not reached a certain level of maturity, neither at national nor at European level.

**Nevertheless, the MNB has taken a number of steps to map the climate risks affecting the domestic financial system, for example by conducting annual surveys to assess the preparedness and attitudes of domestic credit institutions with regard to environmental sustainability considerations.** However, the end of this practice could be the point at which ESG risks are integrated into the banking supervision framework. The first step is the submission and assessment of bank self-assessments under the MNB Green Recommendation. The report prepared by the European Banking Authority[3]

[3] https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Reports/2021/1015656/EBA%20Report%20on%20ESG%20risks%20management%20and%20supervision.pdf

envisages how the monitoring of these risks by the MNB will be integrated into the supervisory review and evaluation process (SREP) in the coming years.

### 3.4.2 Measurement

**Similarly to other central banks and supervisors, the MNB is still at an early stage in this process, and accordingly the assessment of risks takes different forms.** The Carbon Concentration Analysis, conducted by the MNB in 2019, looked at the proportion of corporate loans provided by the domestic banking sector to finance companies in GHG-intensive sectors, thereby estimating the magnitude of transition risks.

**Given the limited data availability, it was necessary to further develop the analysis.** The Banking Carbon Risk Index is a more detailed analysis that combined transaction-level data with sub-sector-level GHG-intensity data, and as a result, more accurate data quantifying transition risks for the sector as a whole as well as for individual institutions became available.

**In 2021, the MNB assessed the climate risk resilience of the Hungarian banking system for the first time using long– and medium-term climate risk stress tests.** The long-term stress test was conducted on the basis of three scenarios. An orderly transition trajectory, where the transition to a low-carbon economy is successful; a disorderly transition trajectory, where the transition is sudden and faster due to a delay in action; and an unsuccessful transition trajectory, where the Paris Agreement targets are not met. The Bank also performed medium-term climate risk stress tests to assess the resilience of the banking system in the event of certain physical and transition risk shocks.

### 3.4.3 Management

**The next step after risk assessment is risk management.** For a company, managing climate risks can be done, for example, by changing the business model, changing suppliers or even investing in green projects, but from a credit institution's perspective it is achieved indirectly. For a bank, climate risks can be reduced via climate risk limits or, for example, via exposure reduction strategies. From a financial supervision perspective, this is therefore a double cascading effect, as the MNB's objective in this context is to preserve the financial stability of individual credit institutions, and it can achieve its risk management objectives by making proposals, recommendations and developing regulations.

**The publication of the MNB guide on climate-related and environmental risks is an important milestone in the management of these risks.** Taking into account international and EU regulatory developments, the MNB has formulated expectations and best practices for credit institutions, helping prepare for new regulations in the coming years and recommending specific steps to be taken. It covers wide range of banking activities, from the definition of business models and strategies, through internal governance and risk management, to disclosures, with a particular emphasis on the application of the UN Principles for Responsible Banking, which are considered international best practice (See Box 3-1). If the level of compliance with these recommendations improves in the Hungarian banking sector, the level of climate risk to the financial system may also be reduced, and the likelihood of a shock-like response to new, stricter regulations may also be reduced.

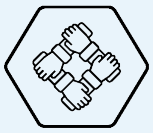
**The retail, corporate and municipal green preferential capital requirement programmes launched by the MNB are also designed to indirectly reduce transition risk for banks.** If utilisation of these programmes increases, it will contribute to an increase in the share of environmentally sustainable exposures in the bank loan portfolio, up to a certain limit, and thus make the banking system less vulnerable to climate policy or technological shocks.

**Box 3-1**
**Principles for Responsible Banking**

The Principles for Responsible Banking were developed by the United Nations Environment Programme Finance Initiative (UNEP FI) with the aim of providing a framework for banks to align their strategies and business practices with the vision of the society expressed in the Sustainable Development Goals (SDGs) and the Paris Climate Agreement.

Six principles have been developed, of which the 'Transparency and Accountability' principle is an integral part of the recommendations set out by the TCFD (Chart 6).

**Chart 6**
**UN Principles for Responsible Banking**

| | | |
|---|---|---|
|  | **Principle 1**<br>**Alignment** | We will align our business strategy to be consistent with and contribute to individuals' needs and society's goals, as expressed in the Sustainable Development Goals, the Paris Climate Agreement and relevant national and regional frameworks. |
|  | **Principle 2**<br>**Impact & Target Setting** | We will continuously increase our positive impacts while reducing the negative impacts on, and managing the risks to, people and environment resulting from our activities, products and services. To this end, we will set and publish targets where we can have the most significant impacts. |
|  | **Principle 3**<br>**Clients & Customers** | We will work responsibly with our clients and our customers to encourage sustainable practices and enable economic activities that create shared prosperity for current and future generations. |
|  | **Principle 4**<br>**Stakeholders** | We will proactively and responsibly consult, engage and partner with relevant stakeholders to achieve society's goals. |
|  | **Principle 5**<br>**Governance & Culture** | We will implement our commitment to these Principles through effective governance and a culture of responsible banking. |
|  | **Principle 6**<br>**Transparency & Accountability** | We will periodically review our individual and collective implementation of these Principles and be transparent about and accountable for our positive and negative impacts and our contribution to society's goals. |

*Source: FSB TCFD*

*The MNB itself became a signatory to the Principles in 2019, and in the 2021 MNB Guide on climate-related and environmental risks it encourages Hungarian credit institutions to do the same.*

## 3.5 OPERATIONAL RISKS

**The principle of dual materiality is also essential for the physical operations of the central bank.** The operations of the central bank can be affected by both transition and physical risks and at the same time the bank's operation also has an impact on the environment.

- For example, transition risks have an impact on changes in the price of energy used or business travel, which can lead to higher operating costs.
- Physical risks can have a negative impact on the MNB's buildings, for example high summer temperatures can damage infrastructure, making business continuity difficult.
- The MNB's operations generate GHG emissions and other environmental footprints, which have a negative impact on the environment and thus pose a reputational risk to the MNB.

**The MNB manages its transition risks and impact on the environment by measuring and reducing its carbon footprint.**

**In respect of physical risks, operational risk management activities are carried out in accordance with the rules developed on the basis of the European Central Bank's methodology, as set out in the MNB's Operational Risk Management Manual.** Achieving the MNB's objectives is a strategic task, and preserving its reputation and assets is a key value. An efficient operational risk management system plays an important role in the protection of these objectives and values.

**As chance, certain undetected errors and unforeseeable external circumstances also play a role in the occurrence of risk events, this creates uncertainty in the MNB's operations.** The objective of operational risk management is to manage this uncertainty effectively and to provide the decision-making processes with as comprehensive information as possible. Direct risks arising from the MNB's operations may also be affected by the impacts of climate change and environmental degradation.

**Activities related to operational risk management and business continuity management are decentralised within the MNB.** Accordingly, the Directorate for Banking Security plays a coordinating role, with the actual activities being carried out by the business lines. The business areas are required to prepare their risk maps, in which they collect operational risks related to their processes and activities, and to maintain an event register, in which they keep a record of operational risk events that have occurred.

**Once a year, Banking Security (BS), in cooperation with the business areas, assesses and evaluates the operational risks of the MNB.** The assessment is based on a self-assessment by the departments concerned, in the course of which the departments assess the risk exposure to potential risk events of the work processes they carry out or plan to carry out in their objectives, or of the projects they supervise, which is summarised by BS at the MNB level. The assessment represents the departments' perception of themselves in relation to the risks, but its results are also reconciled between departments where necessary.

**The assessment focuses on the potential frequency and impact (both financial and non-financial) associated with a given risk event or process.** Based on the results of the assessment, the impact of risk events (business, property, reputational) and their probability of occurrence are classified according to the risk tolerance matrix on the risk map.

**The assessment data is part of the MNB's operational risk database and is analysed by BS.** In consultation with the business areas, BS prepares an annual report on the evaluation of the risk assessment for the Governor, as a member of the EB, in which it reports on the overall operational risk situation of the Bank, with a particular focus on residual risk. In the context of the identification and management of residual risks, the business areas must consider whether or not it is worth proposing action on a cost/benefit basis. The Governor decides on the MNB's risk appetite, the acceptable level of residual risk, the adoption of additional risk mitigation measures and the approval of the annual operational risk report.

# 4 Metrics and targets

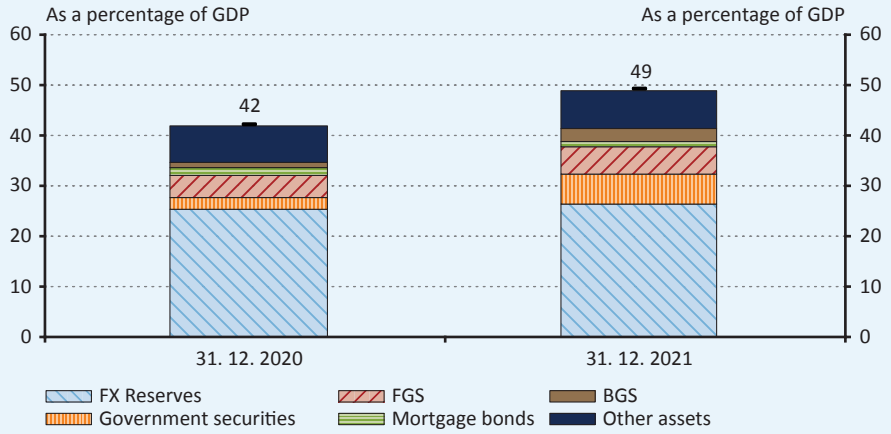
| TCFD RECOMMENDATIONS – METRICS AND TARGETS | |
|---|---|
| M/1 | Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process. |
| M/2 | Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 greenhouse gas (GHG) emissions and the related risks. |
| M/3 | Describe the targets used by the organisation to manage climate-related risk and opportunities and performance against targets. |

**This year, for the first time, the MNB conducted and published a comprehensive climate risk analysis of the central bank's financial assets**. The methodology and the choice of metrics used were based on the recommendations developed by the G20 Financial Stability Board's TCFD and based on existing central bank reports (Bank of England,[4] Banque de France[5]). As there is not yet any standard practice for the preparation of TCFD reports, the MNB prepared its first TCFD report taking into account existing international practices and the specific characteristics of its financial portfolios. The report may evolve in the future in line with developments in international practice and methodology.

## 4.1 SCOPE OF FINANCIAL INSTRUMENTS EXAMINED

**In response to the crisis caused by the coronavirus epidemic, the MNB took a number of measures in 2020 to ensure the necessary liquidity and appropriate monetary conditions, some of which were maintained throughout 2021.** 3-year and 5-year secured forint loans were introduced, the sovereign bond purchase programme was launched, and the new Funding for Growth Scheme 'Go!' was launched. The central bank also relaunched its mortgage bond purchase programme, expanded the programme's size of the Bond Funding for Growth Scheme (BGS) and increased its international reserves. The central bank decided to discontinue its crisis management programmes in 2021. The targeted measures taken by the MNB over the past two years have also had a significant impact on the composition and size of the central bank's balance sheet. As a result of these measures, according to preliminary data, the MNB's balance sheet total expanded to HUF 26,300 billion (EUR 71 billion) in 2021 and to almost 50 per cent as a share of GDP, and the composition of the asset side was significantly restructured. The share of international reserves in the MNB's balance sheet remains high, which is a feature of emerging market central bank balance sheets (Chart 7).

**Chart 7**
**Asset side of the balance sheet of MNB**




*Note: The forecast of the balance sheet composition in 2021 is based on preliminary data and December GDP forecast.*
*Source: HCSO and MNB*

[4] Bank of England (2021): The Bank of England's climate-related financial disclosure 2021.
[5] Banque de France (2020): Responsible Investment Report 2020

**The MNB aims to be able to provide information on the widest possible range of its instruments and related climate risk considerations.** The MNB's long-term objective is to produce a climate risk report on its entire asset portfolio. In the short term, mainly due to data availability constraints, the MNB will produce report which is representative from the perspective of its total assets, but is not exhaustive. As regards the foreign exchange reserves, the focus of the analysis is on sovereign exposures, representing the core of the reserves. For monetary policy instruments, the analysis also covers mortgage bonds and corporate exposures in addition to sovereigns. In addition, the MNB considers it of particular importance to provide a brief summary of the climate risk exposure of securities and large corporate loans accepted as collateral.

## 4.2 METHODOLOGY AND DATA SOURCES

**The MNB analysed the climate risk exposure of its financial asset portfolios based on the two main climate change risk categories of transition risks and physical risks.**

- **Transition risks** are the risks associated with the transition to a carbon-neutral economy that arise from changes in the structure of the economy. To measure the transition risk of portfolios, the MNB primarily used the Weighted Average Carbon Intensity (WACI), which is the proposed metric for the climate impact of financial asset portfolios based on the TCFD recommendations. The WACI figure was calculated by the MNB for all asset classes under review, with the exception of the Mortgage Bond Purchase Programme (MBP). In addition to the WACI, the other metrics used in the report to analyse the transition risks are the proportion of carbon-intensive assets (brown share) in corporate portfolios and the energy mix of sovereign portfolios.

- **Physical risks** can be divided into two categories: acute risks are event-driven (e.g. increased severity of extreme weather events), and chronic physical risks that refer to long-term shifts in climate patterns (e.g. sea level rise). Assessing physical climate risks involves significant technical challenges, including the need for detailed geographical data to determine the severity of potential weather events occurring at different locations. The MNB uses data and models from Four Twenty Seven (427, Moody's Analytics) to analyse physical risks. In the current report, the analysis of physical risks covers a narrower range of financial assets included in the MNB's balance sheet, i.e. sovereign exposures and Hungarian large corporate bonds and loans, but in the future, as the methodology evolves, it is expected that both the range of metrics and the coverage of asset portfolios will be extended in terms of physical risks.

In addition to metrics widely used in international practice, the report also includes some special analyses, which are presented in boxes.

**The analysis of the climate impacts of financial portfolios was based on the preliminary balance sheet data at the end of 2021 and the latest available GHG emission data and corresponding GDP data.** The latest GHG data available for the assets were used to prepare the report, which for the foreign exchange reserves portfolio means 2019 GHG data and for the Hungarian assets 2020 GHG data. For most portfolios, data are taken from Eurostat databases, with the exception of the foreign exchange reserves portfolios due to the different issuer universe (including non-European entities).

- For the analysis of the government bond purchase programme and corporate exposures (FGS, BGS, large corporate loan stock), data from Eurostat's Air Emissions Accounts databases, also available by sector (NACE Rev. 2 codes), were used.

- The carbon intensity of foreign exchange reserves was calculated using the UNFCCC National Inventory of Greenhouse Gas Emissions and GDP data available from the OECD and World Bank databases.

The GHG Inventory (UNFCCC) and Air Emissions Accounts (Eurostat) data tables adopt a methodologically different approach: while the National Emissions Inventory (UNFCCC) data consider countries' GHG emissions using a territorial approach, the Air Emissions Accounts data use a resident rather than territorial approach to quantify GHG emissions of economic operators.

The MNB has quantified even more than one metric for each asset category, based on a methodology in line with TCFD recommendations and international best practice, in an effort to gain a broader understanding of the risks and opportunities of climate change (Table 1).

**Table 1**
**Asset categories covered in the TCFD report and the set of metrics used for their analysis**

| Asset category | Size (EUR billion) | Coverage of the Report | Metrics applied |
|---|---|---|---|
| **Gold and foreign exchange reserves** | 38.32 | Sovereign issues | WACI, energy mix, physical risk |
| **Government Securities Purchase Programme** | 8.85 | Hungarian government securities | WACI, energy mix, physical risk |
| **Mortgage Bond Purchase Programme** | 1.78 | Hungarian mortgage bonds | Avoided GHG-emissions |
| **Bond Funding for Growth Scheme (BGS)** | 3.55 | Hungarian corporate bonds | WACI, brown share, physical risk |
| **Funding for Growth Scheme (FGS)** | 6.87 | Hungarian SME-loans | WACI, brown share |
| **Collateral Management** | 17.43 | Hungarian government and corporate bonds, corporate loans | WACI, brown share, physical risk |

*Source: MNB, preliminary stocks as at end of 2021*

**Box 4-1**
**Metrics used to analyse climate risks – methodology and limitations**

**Weighted Average Carbon Intensity (WACI):** A metric quantifying the GHG emissions per unit of GDP or value added generated by portfolios. The benefit of an intensity-based metric is that it allows the environmental performance of the entity issuing the security to be back tested, enabling the investor to mitigate climate risk by identifying and managing the most carbon-intensive entities. Calculation of the metric is simple, can be easily applied to different asset classes and allows for comparison across portfolios. Nevertheless, the outliers and the nominal metrics used for normalisation can introduce bias in the value of the carbon intensity index. A detailed description of the metric can be found in Annex 1 to this report. Whilst consistency is a primary consideration in the analysis, there may be differences in the calculation of the carbon intensity metric for different asset categories due to methodological specificities and the available data set. Methodological differences make it difficult to compare the results of portfolios and do not allow for the calculation of a carbon intensity metric aggregated at the balance sheet level. Accordingly, the carbon intensity of each asset category is not always compared with the same reference portfolio. The WACI metric measures carbon intensity at the portfolio level and thus indirectly captures the GHG emissions of financial portfolios, rather than showing the direct carbon emissions associated with the MNB's own operations.

**Brown share:** The analysis of brown corporate exposures is important for investors because the transition to a carbon-neutral economic structure will be most challenging for companies with high carbon intensity, as these are the most exposed to risks, both from a technological and regulatory perspective. To identify carbon-intensive industries, the TCFD Working Group recommends using the Global Industry Classification Standard (GICS) sector classification. According to the TCFD assessment, the energy and utilities industries (excluding water utilities and renewable energy companies) are the most carbon-intensive sectors and therefore the financial exposure to companies operating in these sectors should be assessed. The MNB has used the NACE Rev. 2 sector classification instead of the GICS classification, within which the GICS carbon-intensive sectors can be matched with a high degree of overlap. The metric provides a snapshot of the proportion of brown assets and can therefore change dynamically as the asset portfolio changes. In addition, the metric does not assess exposure based on the direct carbon intensity of issuers,

but rather on sector classification, thus providing an indirect picture of brown assets. For more information on the methodological limitations of sector-based analyses, see Methodological aspects and data sources.

**Energy mix:** A substantial shift in the world's energy mix from burning fossil fuels to using renewable energy sources is needed to meet the Paris Agreement. One way of measuring the risks arising from this transition could be to study the energy mix of the countries issuing securities. The methodology will help investors to better assess the exposure of the countries in their portfolio to the risks associated with the development of a carbon-neutral energy system. Countries where major structural change is required due to the high share of fossil fuel use are obviously more exposed to the risks associated with transition. The energy mix is a good starting point for examining the transition risks arising from the structural characteristics of the energy supply, but it does not provide information on the level of energy supply, the capacity required for transition and the strategic plans and measures of the country to address climate risk, for which further forward-looking analysis is required.

**Physical risk:** For the analysis of physical risks, the model of the external data provider (427, Moody's Analytics) takes into account the results of six risk categories: flood, heat stress, hurricanes and typhoons, sea level rise, water scarcity (water stress), and risks from forest fires and wildfires. Within the risk categories, a number of indicators are quantified that capture the change in the exposure of the entity (country or company) to physical risks over the forecast horizon (the 2030s). The scenario used to predict physical risk is based on the GHG trajectory RCP8.5 adopted by the IPCC. The scores for the risk categories correspond to a percentile rank order, i.e. from 0 to 100, where 0 represents the lowest risk level and 100 the highest risk exposure. Accordingly, physical risk scores show the relative riskiness of entities within the universe of analysis and risks are not quantified. The current phase of physical risk analysis is suitable to draw attention to the riskiest areas and entities. However, the analysis is not suitable for comparing the results of different asset classes (different universes).

**As regards the climate risk analysis as a whole, it is worth noting that the values of the transition and physical risk metrics are also influenced by country– and central bank-specific factors.** For the MNB, the focus is on monetary policy objectives and considerations, which are fundamental to both the composition of the central bank balance sheet and the operation of the central bank. Therefore, the portfolios analysed (and their climate risk characteristics) are shaped by the MNB's statutory obligations and monetary policy programmes, on the one hand, and by national economic characteristics, on the other.

**For the time being, the analysis of climate risks of financial instruments is still subject to a number of general challenges stemming from the evolving methodology and the quantitative and qualitative shortcomings of the available data.** The most relevant of these are the following.

- **GHG emission data are available with significant delays** for both sovereign and corporate asset categories; thus in some cases only data for earlier periods than the date of analysis were available.
- **In the area of climate-related risks, consistent data reporting practices across all asset categories have not yet been established**, making it difficult to carry out an analysis across different asset portfolios.
- **There are considerable differences in the methodology used to measure climate risk on a geographical basis.** Generally speaking, reporting practices are more advanced in developed countries and large companies operating in developed countries, partly due to a more stringent regulatory environment. In Hungary, the reporting of companies' environmental impacts is at a less advanced stage, mainly due to the size and resource constraints of companies, which has made the analysis more difficult to perform and has most likely reduced its accuracy. Companies providing climate risk data and analysis focus on global enterprises in line with market needs and data availability, making analysis of smaller firms a significant challenge even when outsourcing the analysis.

- **The lack of company-specific data distorts the results to some extent.** In the absence of micro-level data, for companies the analyses used sectoral average metrics, which can lead to biases in GHG emissions (e.g. the sector classification of a green bond of an issuer is the same as that of a traditional bond, while the amount of carbon dioxide emitted is significantly different). This is also the case for the biased classification of companies producing green energy. Overall, their impact on the value of the metrics is small, and therefore, bearing in mind robustness, international best practice and comparability, corrections are only applied in case of clear errors. A disadvantage of the sectoral approach to corporate exposures is that the most carbon-intensive sectors may also include companies that are trying to achieve carbon neutrality through new, innovative technologies, while sectors classified as non-carbon intensive may also include companies with particularly high carbon intensity. In the future, this can be addressed by measuring and communicating corporate GHG emissions as widely as possible, i.e. by individual company-level data.

- **The WACI metric for the reserve portfolios is calculated using data from the National Greenhouse Gas Inventory (GHG Inventory)**, which quantifies the amount of GHG emissions produced in a country's territory in accordance with international guidelines, for the seven main GHGs, expressed in carbon dioxide equivalents ($CO_2e$).[6] Due to the production approach, national emission inventories do not include GHG emissions generated in other countries but associated with imported products, which can introduce a significant bias in the metric.

**The measurement and reporting of climate risks is at an early stage, for which no international standard practice has yet been developed**, and the analyses presented in this report are based on available data and are subject to methodological constraints. The dynamic evolution of the methodology and the regulatory environment could play an important role in addressing these challenges in the future.

## 4.3 CLIMATE RISK ANALYSIS OF THE MNB'S FINANCIAL INSTRUMENTS

The results of the indicators used by the MNB in line with the TCFD Recommendation are presented and analysed according to the asset categories mentioned above, thus quantifying the exposure of each portfolio to climate risks. In addition to the metrics recommended by the TCFD, special analyses related to different financial instruments also add value to the report.

### 4.3.1 Climate risk analysis of foreign exchange reserves

**One of the MNB's core tasks is to manage foreign exchange reserves optimised on a risk-return-liquidity basis in line with international practice.** The MNB basically manages foreign exchange reserves in eight currencies (EUR, USD, JPY, GBP, AUD, RMB, CZK, PLN) in different portfolios. In line with conservative reserve portfolio management, a significant proportion of the foreign exchange reserves are made up of highly rated government securities, considered to be credit risk-free. In addition to sovereign issues, foreign exchange reserves also include (supranational) issues by international institutions, highly rated corporate and bank issues and covered bonds. In order to achieve geographical diversification, the foreign exchange reserves include exposures to different countries, but the majority of the issues are from developed countries with good credit ratings.

**In recent periods, there has also been an increase in the use of 'green factors' by central banks, with a focus on the widest possible application of sustainability considerations.** In this context, the MNB was one of the first central banks to integrate sustainability considerations in its reserve management, by setting up a dedicated green bond portfolio of EUR 250 million.

#### 4.3.1.1 Transition risk: carbon intensity (WACI)

**For the purpose of comparing/measuring the environmental performance of sovereign reserve assets, a portfolio representing the currency composition of the IMF's official foreign exchange reserves has been identified as the**

[6] Signatory countries to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) have committed to preparing an annual national GHG emissions inventory, for which the Intergovernmental Panel on Climate Change (IPCC) guidelines provide the guiding standards (2006 IPCC Guidelines for National Greenhouse Gas Inventories).

**reference portfolio.** To manage the foreign exchange reserves portfolios, the MNB uses market bond indices, which are tailored to the needs and constraints of the central bank. The MNB did not use the portfolio management benchmarks as a reference for the calculation of the WACI metric, as they were designed without taking into account climate risk considerations; instead, a neutral external benchmark, the IMF COFER composition, was used. In the calculation of the carbon intensity of the reference portfolio, the GHG intensity of countries was weighted by the share of the emitting country's currency in the IMF COFER (Table 2).

**Table 2**
**Main issuers in the sovereign exposures of MNB and in the IMF COFER**

| MNB sovereign exposures | | IMF COFER | |
|---|---|---|---|
| • Australia | • China | • Australia | • China |
| • United Kingdom | • USA | • United Kingdom | • Switzerland |
| • Euro Area | • Other | • Euro Area | • USA |
| • Israel | | • Japan | • Other |
| • Japan | | • Canada | |

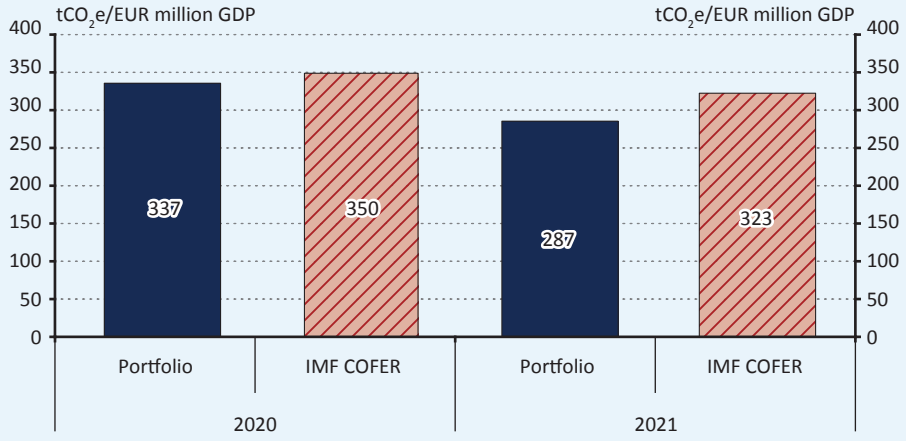
*Note: In the IMF's COFER statistics, the share of Other currencies is 2.9 per cent based on 2021 Q3 data, which was omitted in the compilation of the benchmark.*

*Source: MNB, IMF*

**In the TCFD report, the MNB focused on sovereign exposures when analysing the foreign exchange reserves in terms of climate risk.** Sovereign assets cover the vast majority of the reserve portfolios, and thus the environmental impact of foreign exchange reserves can be effectively assessed even without regard to other asset classes. Moreover, given the data available and the methodological specificities, the analysis was feasible for the sovereign asset category.

**The WACI metric for the sovereign exposure of the reserve portfolios was 287 tonnes $CO_2e$ per million euro of GDP, 15 per cent lower than the previous year and 11 per cent lower than the reference portfolio (Chart 8).** The decrease in the WACI metric was caused by changes in several factors. The most significant impact stemmed from changes and reallocations in the reserve structure. In addition, the annual GHG emissions of the countries under review also fell slightly, which contributed to the decline in carbon intensity with an average increase in GDP of around 5 per cent in the issuing countries. One specific WACI feature is that even with unchanged levels of GHG emissions, the WACI can show a decrease if countries' GDP increases, thus limiting the ability of carbon intensity to capture the actual evolution of climate risks.

**Chart 8**
**WACI metric for the sovereign exposure of foreign exchange reserves and the IMF COFER, 2020-2021**



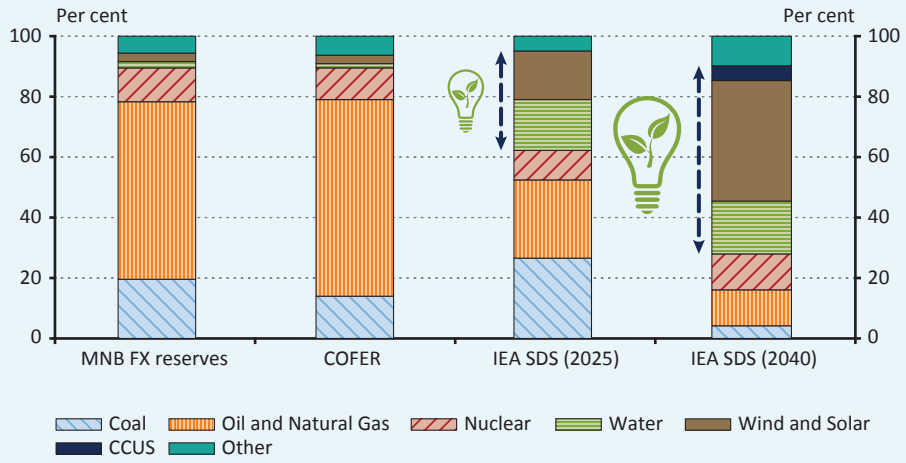

*Note: (1) The Portfolio contains the sovereign exposures of the foreign exchange reserves. (2) IMF COFER is a reference portfolio weighted according to the foreign exchange composition of official foreign exchange reserves as published by the IMF, based on the allocated foreign exchange reserves.*

*Source: MNB calculation based on IMF, OECD, World Bank, UNFCCC GHG Data Interface, and Climate Watch data*

### 4.3.1.2 Transition risk: energy mix analysis

**The analysis examined the energy mix of issuers of sovereign securities included in the foreign exchange reserves.** As with the WACI, one of the benchmarks used in this analysis was the portfolio represented by the IMF COFER, and in addition, serving as a forward-looking estimate, the Sustainable Development Scenario (SDS) published by the International Energy Agency (IEA) was used as a benchmark (Chart 9). The SDS is an integrated scenario that sets out a pathway to ensure access to reliable, sustainable and modern energy services, contributes to reducing air pollution and effectively tackles climate change. This IEA scenario also examines, among other things, how to meet the climate targets of the Paris Climate Agreement.

**Chart 9**
**Energy production by sources**




*Note: Carbon Capture, Utilisation and Storage (CCUS) refers to innovative technologies to reduce GHG emissions.*
*Source: MNB calculations based on 2020 energy production data from the International Energy Agency*

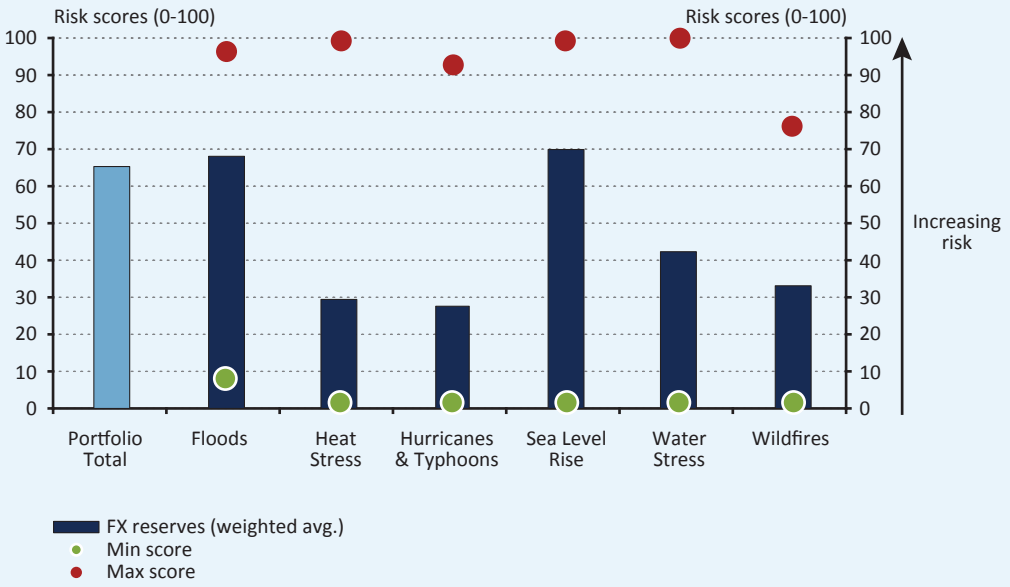
**The current energy mix of the sovereign assets of foreign exchange reserves is almost identical to the IMF COFER value approximating the world's foreign exchange reserves.** However, the current energy mix of the foreign exchange reserve countries differs substantially from the 2025 mix assumed as necessary in the IEA sustainability scenario. In the context of reserves, the dominance of natural gas and oil feedstocks is the largest (over 60 per cent), which is significantly higher than the 26 per cent set for 2025 in the IEA scenario. Based on the IEA scenario, a substantial development of renewables is needed in the IMF COFER countries. This is supported by data from CAT (Climate Action Tracker),[7] one of the best-known climate change monitoring organisations, which shows that the majority of countries in IMF COFER do not meet the requirements of the Paris Climate Agreement.

### 4.3.1.3 Physical risk

**As with the composition of COFER, the sovereign exposure of the foreign exchange reserves consists primarily of issues from developed economies, and thus the physical riskiness of the portfolio is determined by data from the world's leading economies.** The portfolio has a relatively risky ranking in the universe based on its overall risk score (66$^{th}$ percentile). The portfolio scores highest in the sea level rise and flood risk categories (70$^{th}$ and 68$^{th}$ percentiles, critical and high-risk ratings). In the other four physical risk categories, the relative position of the exposure shows a more favourable picture, ranking in the less risky half of the universe under review (Chart 10).

[7] https://climateactiontracker.org/

**Chart 10**
**Physical risk scores of sovereign exposure of foreign exchange reserves**




*Note: The scores represent the weighted average of the scores of the sovereign entities in a given category weighted by their shares in the foreign exchange reserves.*

*Source: Four Twenty Seven (Moody's Analytics), MNB*

**Box 4-2**
**Green bond-portfolio**

**The increase in environmental risks and their shift into the focus of economic policy has put new financial instruments on the investment map, with one of the fastest growing asset classes being green bonds.** In the case of green bonds, the funds raised are invested by the issuer in specific investments that are beneficial from an environmental and energy efficiency perspective. Green bonds simultaneously facilitate the channelling of capital into green investments, reduce the cost of access to finance and raise awareness of the financial risks associated with environmental degradation.

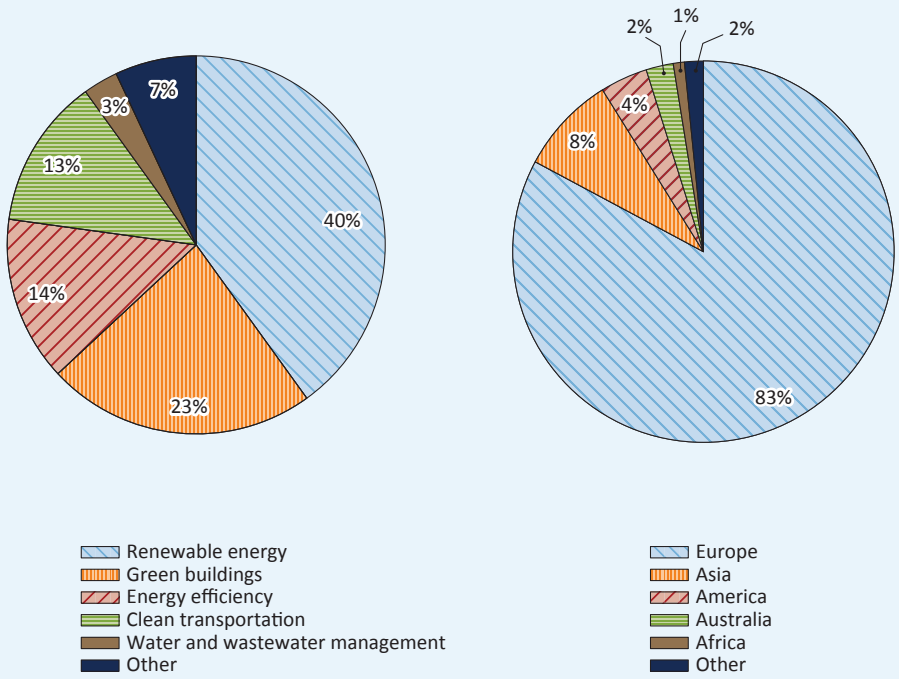
**The development of green bond standards was an important step towards promoting green finance.** In 2014, the International Capital Market Association (ICMA) developed the Green Bond Principles,[8] one of the most important international standards in the green bond market. The green label ensures that bond proceeds are used exclusively to finance specific activities related to the environment and the tackling of climate change. As a result, the annual volume of certified green bond issuance has increased from around USD 1 billion in 2011 to nearly USD 290 billion in 2020. The most significant issuers are the US, Germany and France, mainly government-sponsored entities and financial and non-financial corporations. In 2020, green bonds were issued in 33 currencies, of which the share of the three most important currencies – EUR, USD, CNY – increased to 82 per cent. It is characteristic for the market that bonds are issued with longer maturities but at lower nominal values than non-green bonds from the same issuer. Although these instruments represent only a fraction of the total global bond market, experts see significant potential, supported by the growing awareness of environmental issues and the fight against climate change.

[8] Green Bond Principles, 2021: Voluntary process guidelines for issuing green bonds, ICMA

**In 2019, the MNB decided to set up a dedicated green bond portfolio, making it one of the first central banks to integrate sustainability considerations into its reserve management.** The portfolio includes EUR-denominated green bonds issued by mostly supranational issuers from Germany and France. With the exception of duration, the risk-return characteristics of the portfolio do not differ significantly from similar types of investments; it is well diversified and the MNB's management aims to reflect as closely as possible the structure of this market segment. The creation of the green bond portfolio supports the development of the market, is in line with the recommendations of the main relevant central bank forum (NGFS) involving the MNB, and demonstrates the MNB's commitment to international cooperation.

**Once a green bond portfolio has been created, it is also crucial to monitor the positive environmental impact generated by the investments.** With this in mind, the MNB has carried out an environmental impact analysis of its green bond portfolio, showing that the impact of the green bond portfolio is equivalent to avoiding $CO_2e$ emissions amounting to approximately 94,000 tonnes per year, equivalent to the carbon footprint of a Hungarian municipality of 19,000 inhabitants. More than half of the projects funded are renewable energy and green buildings. As the green bond portfolio is denominated in euro, this is reflected in the predominance of European issuers and the geographical distribution of green projects realised. However, projects in Africa and Asia have also been financed, mainly thanks to projects by supranational issuers, which in many cases generate an even higher overall green 'return' due to the green investments that have replaced often more polluting operations in these countries (Chart 11).

**Chart 11**
**Type and geographic distribution of financed green projects**




*Source: bond issuers' own reports*

## 4.3.2 Climate risk analysis of the Government Securities Purchase Programme (GSPP)

**The MNB started purchasing government bonds on the secondary market in May 2020.** The introduction of government bond purchases was justified to address the adverse effects of the financial market turbulence caused by the coronavirus epidemic on domestic markets. As a result of the purchases, the MNB now holds in its balance sheet government securities with a nominal value of EUR 8.85 billion, mostly with maturities of 5-20 years. The government bond purchase programme was ended by the MNB in December 2021.

### 4.3.2.1 Transition risk: carbon intensity (WACI)

**The WACI metric used to analyse the sovereign exposure of foreign exchange reserves, which is a measure of the total economy's emissions (greenhouse gas emissions) to GDP, is used to assess the government bond portfolio in the central bank balance sheet.** The implicit assumption behind the use of this metric is that government bonds ultimately finance the activity of the economy as a whole, and therefore the emissions of the whole economy should be taken into account. The advantage of the metric is that it is simple to calculate, the data are accessible and available for several countries (with similar methodologies), so that international comparisons are possible. It should be noted, however, that it is a very indirect metric in terms of assessing the emission implications of government bonds. Hungary has a WACI metric of 495 tonnes $CO_2e$ per million euro of GDP, which is considered below average for the wider region (Chart 12). Hungary's carbon intensity metric is compared to the carbon intensity index of the V3 countries,[9] due to their close cooperation and similar investor perceptions.

**Chart 12**
**Carbon intensity of domestic and regional economies**


*Source: Eurostat*

**Box 4-3**
**Carbon intensity of sovereign assets – methodological aspect**

**In the denominator of the weighted average carbon intensity (WACI) of sovereign assets, different GDP metrics can be used, and thus the GDP measured at purchasing power parity was also considered in the analysis, in addition to nominal GDP.** The advantage of using the carbon intensity calculated with nominal GDP is that it allows for greater consistency in the analysis of different asset classes, which is an important principle for TCFD recommendations. By contrast, GDP calculated at purchasing power parity is specifically a statistic used in international comparisons to eliminate the distorting effect of different price levels. The issue of GDP used in the denominator can present a significant discrepancy, especially for developing countries. One of the main reasons for the lack of uniform practice

[9] V3 countries refers to the members of the Visegrád Cooperation (V4) other than Hungary: Czech Republic, Poland and Slovakia.

among central banks to measure the WACI metric is that the TCFD recommendations are primarily developed for the analysis of corporate portfolios.

**In its TCFD report, the MNB calculates its carbon intensity on a nominal GDP basis for consistency across asset classes, but in the case of Hungarian government bonds it is also calculated using GDP at purchasing power parity.** In 2021, the carbon intensity of Hungarian government bonds was 495 tonnes $CO_2e$ per million euro of GDP calculated with nominal GDP, while with PPP GDP it was 313 tonnes $CO_2e$ per million euro of GDP (Chart 13). The results are in line with expectations, and accordingly using PPP GDP results in a lower carbon intensity for the Hungarian sovereign exposure.

**Chart 13**
**Carbon intensity of Hungary calculated using nominal and PPP GDP (2020-2021)**


*Source: Eurostat, HCSO*

**In addition to the TCFD's recommended weighted carbon intensity metric (WACI), other analyses can be used to assess the environmental impact of a portfolio.** In the case of sovereign portfolios, the analysis can be complemented by a sectoral analysis of fiscal expenditure, which can provide a more detailed picture of the climate risk impact of the activity financed by the investment.

**Box 4-4**
**Analysis of fiscal expenditure**

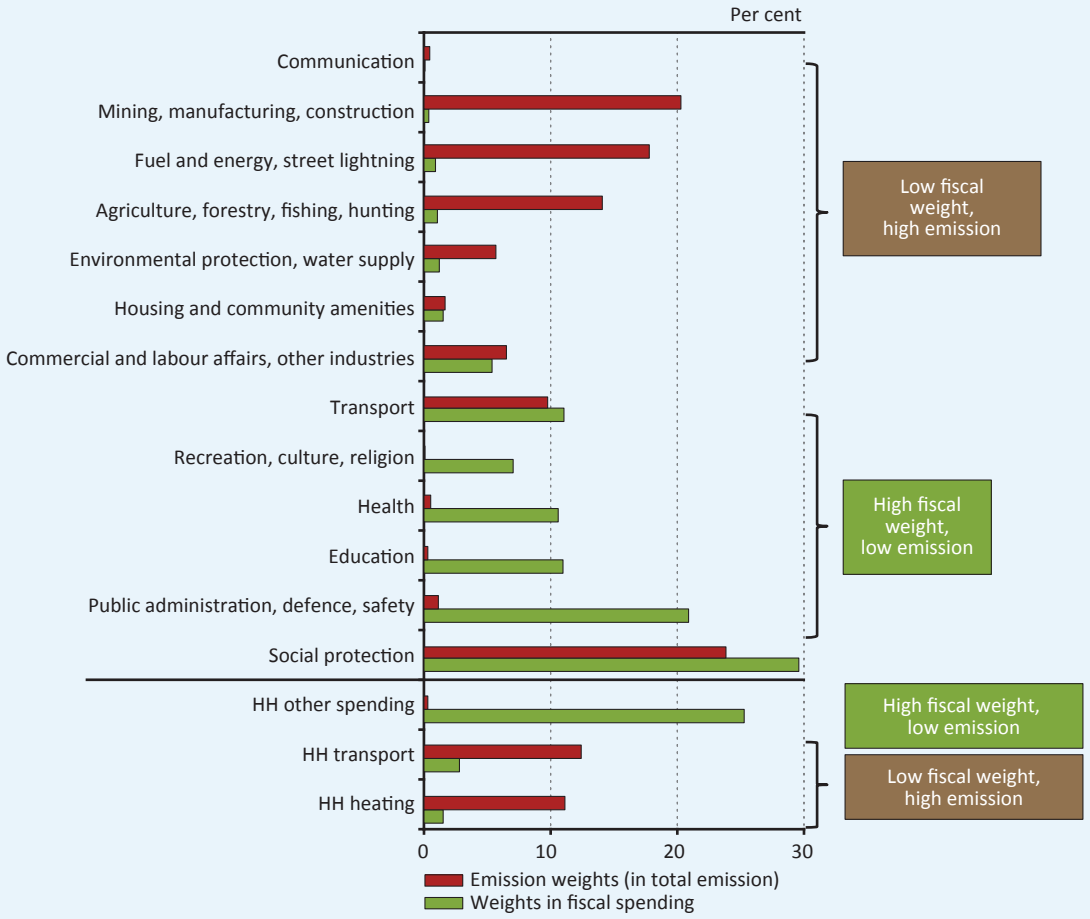
**The analysis of the carbon footprint of the government bond portfolio should be complemented by a sectoral analysis of fiscal expenditure.** This approach is based on the implicit assumption that fiscal expenditures are financed in equal shares by tax revenues, EU funds and government bonds. The carbon footprint of government bonds can be derived from the sectoral distribution of fiscal expenditure that they also finance, and from the sectoral emissions.

**The sectoral analysis of fiscal expenditure requires the matching of fiscal expenditure types with economic sectors, which requires additional assumptions for some expenditure types.** In the case of social expenditure, it is assumed that it finances household expenditure and is therefore allocated and assigned to the household emission categories on the basis of the consumption-expenditure structure of the population. Subsequently, the volume of emissions associated with each expenditure type within the total economy emissions was examined.[10]

[10] The reason why the energy intensities for each sector are not shown is that while sectoral emissions are uniformly projected to the sector's value added, no value added is available for household emissions. Where appropriate, household energy intensity could be quantified in relation to consumption expenditure. However, this would no longer provide a consistent methodology for calculating the energy intensity assigned to each fiscal expenditure and would not allow for a comparison of the values assigned to each fiscal expenditure.

**Fiscal expenditure can be divided into two distinct groups in terms of emissions.** Relatively low (below 5 per cent) fiscal expenditure flows into sectors with higher emissions (e.g. mining, energy supply), while sectors with higher (above 10 per cent) weight in fiscal expenditure (e.g. education, health) have negligible emissions. Transportation is an exception, with emissions above 5 per cent. Within social expenditure, the emissions of other household expenditure with the highest share is very low, while household expenditure with higher emissions is lower (Chart 14).

**Chart 14**
**Fiscal expenditure and the corresponding emission weights**




*Source: Eurostat 2019 data*

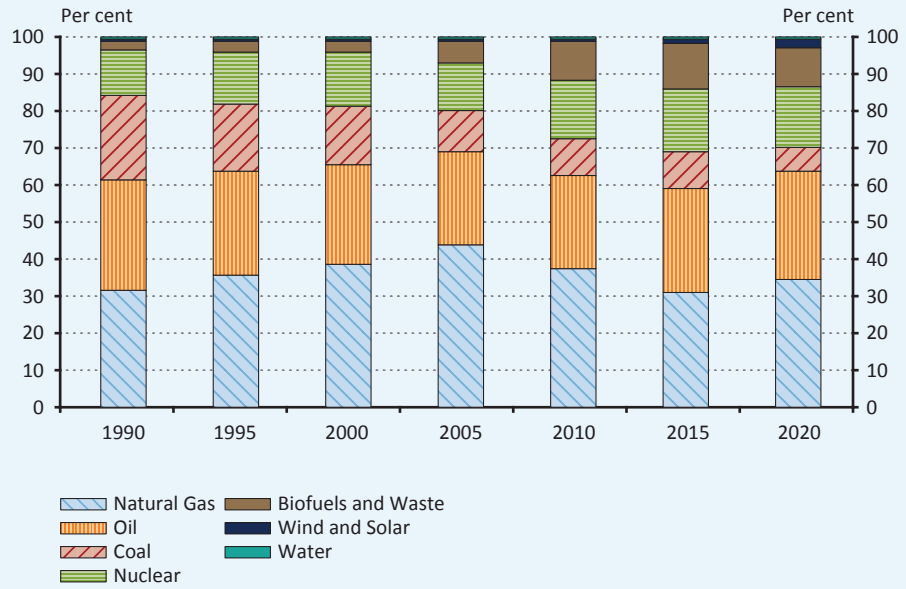
**The analysis shows an overall favourable picture of emissions.** From an emissions perspective, it is positive in itself if the state allocates substantial funding to low-emission sectors, but it is not clear whether low levels of funding to brown sectors are positive for supporting the green transition of the economy. The extent to which government bonds finance the green transition in a given sector could be subject to further investigation.

### 4.3.2.2 Transition risk: energy mix analysis

**Based on historical data on the distribution of Hungary's total energy production by source, the country's energy supply has been greening in recent decades.** Looking back at the past almost 30 years, it can be observed that although the amount of energy produced in Hungary has remained almost constant over time, the structure of energy production has been shifting towards less polluting and renewable energy sources. The importance of one of the most polluting, coal-based energy production, is gradually declining and the importance of wind, solar, biofuels and, in the case of the Paks nuclear power plant, nuclear energy sources is increasing (Chart 15). Despite these positive trends, it is important

to note that the future desirable energy mix of the sustainability scenario published by the International Energy Agency differs from the current energy mix in Hungary.

**Chart 15**
**Total energy production by source – Hungary**




*Source: International Energy Agency*

**Based on the analyses and forecasts in the National Energy Strategy 2030[11] published by the Ministry of Innovation and Technology, further capacity expansion and power plants are needed to meet the full consumption demand and ensure secure supply.** Based on current measures, nuclear and renewable energy sources will replace imports and coal energy in the future.

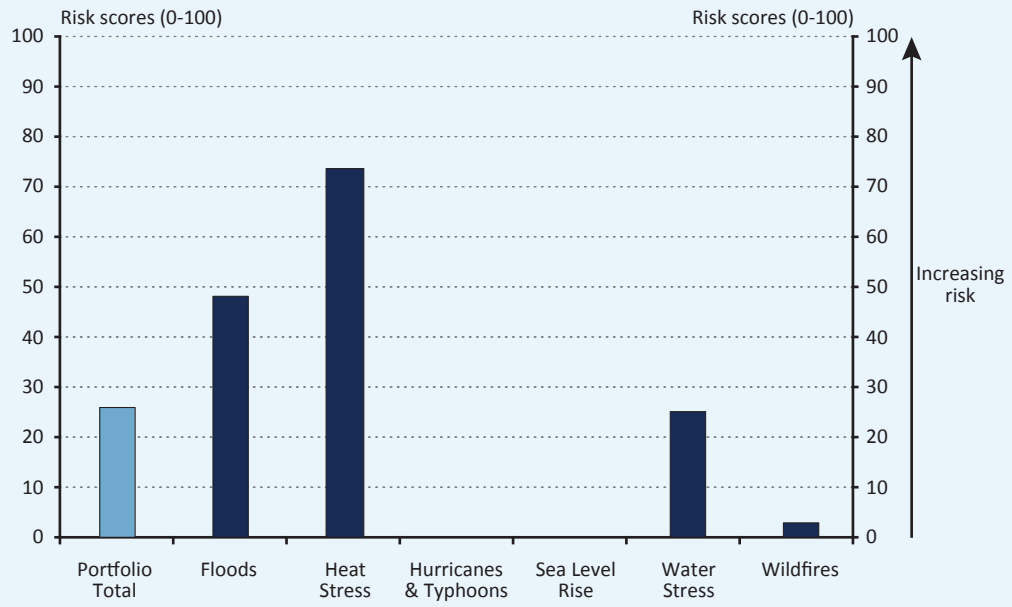
### 4.3.2.3 Physical risk

**Socio-economic aspects are added to the analysis of the physical risk of sovereign entities.** The results of the physical risk model should be linked to socio-economic aspects, as it is important that only geographical areas relevant for economic activity and population are included in the analysis. In practice, the model does this by assessing the proportion of the country's economic activity (GDP), population and agricultural area that is located in areas considered to be at critical levels in terms of physical risk categories.

**To assess the physical risks of the government bond purchase programme, an overview of Hungary's physical risk profile is necessary.** Overall, Hungary's exposure to physical risk is considered to be relatively low, in the lower third of the universe analysed by the data provider (26$^{th}$ percentile). Among the risk categories, Hungary is most exposed to the risk of heat stress (75$^{th}$ percentile), while in the other categories it is in the less risky half of the universe. Due to Hungary's geographical location, hurricanes, typhoons and sea level rise do not pose a significant physical risk (score 0) (Chart 16).

[11] Ministry for Innovation and Technology: National Energy Strategy 2030, with outlook to 2040

**Chart 16**
**Physical risk scores for Hungary**




*Source: Four Twenty Seven (Moody's Analytics), MNB*

## 4.3.3 Climate risk analysis of the Bond Funding for Growth Scheme (BGS)

**The BGS was launched by the MNB in 2019 as a result of a strategic decision to develop the capital markets in order to increase liquidity in the corporate bond market.** Under the programme, the central bank will purchase EUR 4.2 billion of bonds issued by non-financial non-public corporations and public corporations with good credit ratings.

**The Monetary Council places a high priority on ensuring that all elements of the central bank's monetary policy toolbox support the achievement of price stability as quickly as possible. In line with this, the Council decided at its meeting in December 2021 to end the BGS. Once the ongoing negotiations with issuers have been completed, up to the maximum size of the programme, the central bank will no longer purchase new corporate bonds.**

**Prior to the launch of the bond programme, bank loans dominated the debt-type borrowing of Hungarian companies, with only a very small segment of companies having access to the bond market.** The MNB aims to ensure that domestic companies have sufficient access to other forms of financing, including bond issuance, in addition to bank loans, by increasing liquidity in the bond market.

### 4.3.3.1 Transition risk: carbon intensity (WACI)

**The average carbon intensity metric of the BGS portfolio is 551 tonnes $CO_2e$ per million euro of value added, which is higher than the value of the Hungarian corporate sector as a whole, but approximately the same as the average corporate carbon intensity of the V3 countries (Chart 17).**

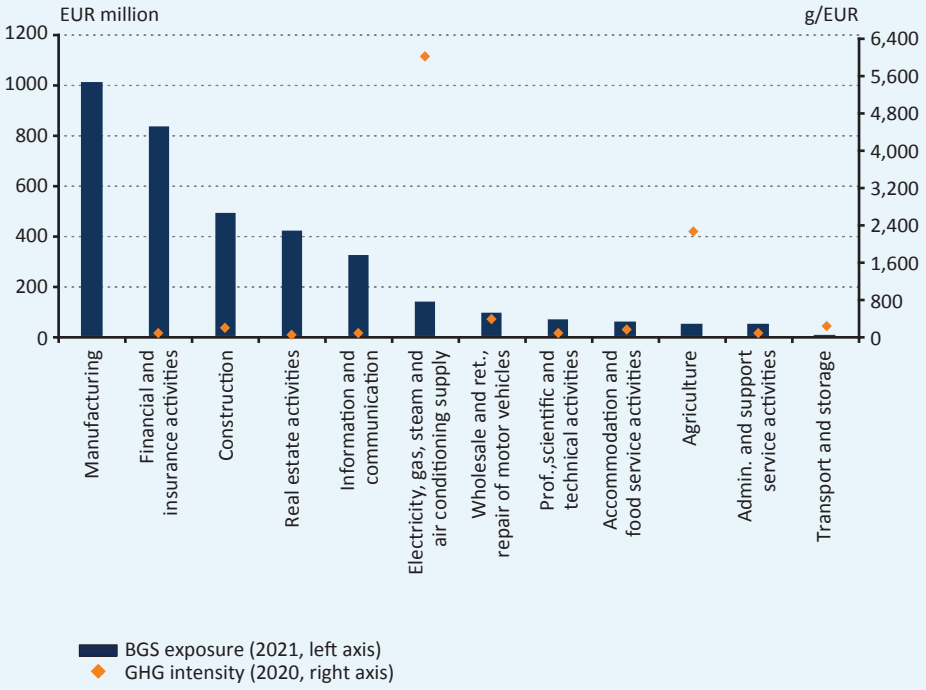
**Chart 17**
**Carbon intensity of the BGS portfolio, Hungarian and V3 companies**


*Source: Eurostat, MNB*

**Beyond the aggregate metric, it is worth looking at the carbon intensity of the portfolio by sector.** For the sectoral classification, the MNB has used the economic sections defined by NACE Rev. 2, within which more detailed industry carbon intensity data are also used, weighted according to the shares within the portfolio. The resulting sectoral GHG intensity data may differ from other MNB portfolios (FGS portfolio) for the same economic sections, as the more detailed industry breakdown also differs across portfolios.

**Based on the sectoral analysis, the most carbon intensive sector held by the portfolio is electricity, gas, steam and air conditioning, but with a weight of only 4 per cent (Chart 18).** However, the carbon intensity of this section contributed significantly to the weighted carbon intensity (236 tonnes $CO_2e$ per million euro of value added), as the GHG intensity of this sector is extremely high at 6,012 tonnes $CO_2e$ per million euro of value added.

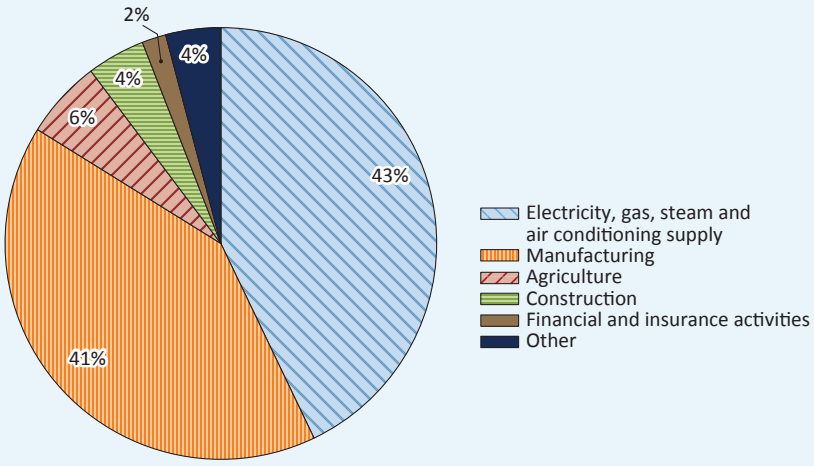
**Chart 18**
**Sectoral distribution of the BGS portfolio and carbon intensity of each sector**




*Source: Eurostat, MNB*

**Only three sectors, electricity, gas, steam and air conditioning, manufacturing and agriculture, contributed 90 per cent to the WACI of the BGS portfolio (Chart 19). The high value of electricity and agriculture is mainly explained by the high GHG intensity of the sector, while for manufacturing by the high BGS stock**.

**Chart 19**
**Contribution of the main sectors to the GHG intensity of the BGS stock**

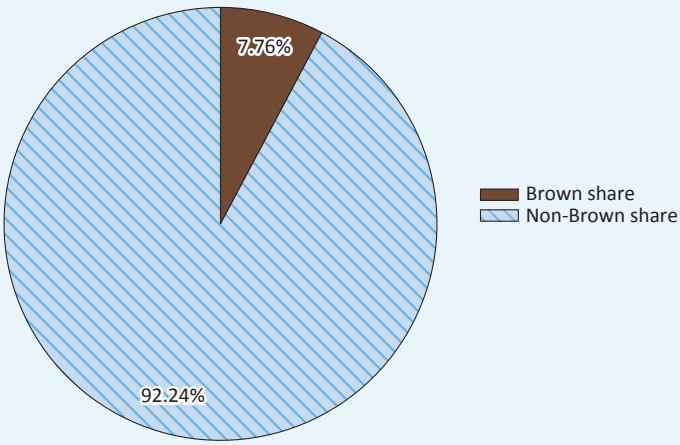



*Source: Eurostat, MNB*

### 4.3.3.2 Transition risk: brown share

**The brown share of the BGS portfolio was close to 7.76 per cent at the end of December 2021 (Chart 20).** Up to 31 December 2021, there were three carbon-intensive issuers in the portfolio.

**Chart 20**
**Brown share of the BGS portfolio, 2021 (percentage of MNB portfolio)**



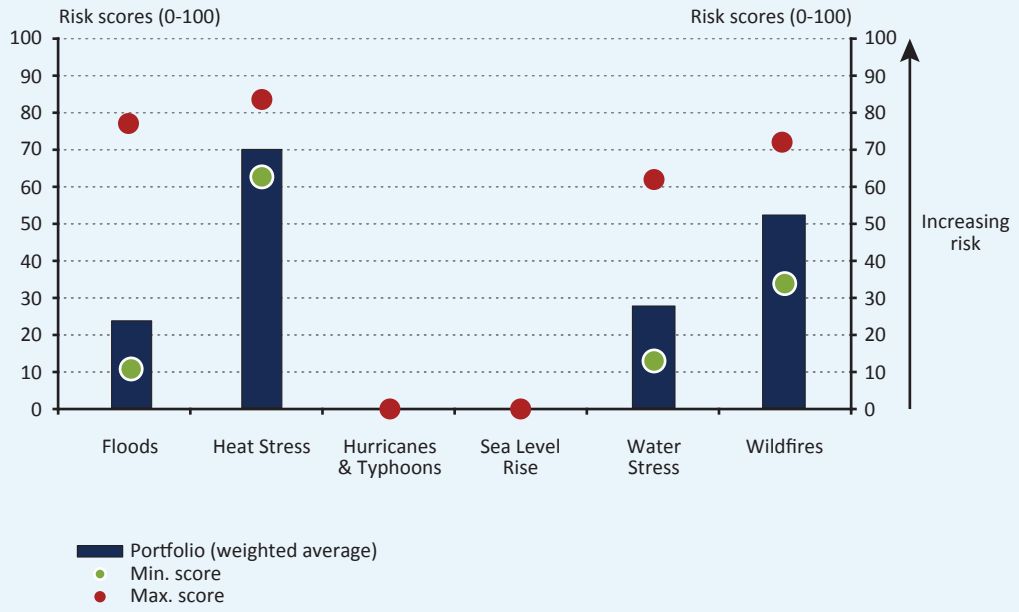

*Source: Eurostat, MNB*

### 4.3.3.3 Physical risk

**The BGS corporate bond portfolio exhibits relatively low risk across most of the physical risk categories.** While the coverage of Hungarian entities is complete, the depth of analysis of Hungarian companies is not complete due to data gaps. In the corporate exposure, the headquarters of the issuing companies are highly concentrated geographically (the vast majority are located in Budapest), which also has a strong impact on the physical risk assessment of the exposure. Among the physical risks in the portfolio, heat stress and wildfires are dominant (71$^{st}$ and 53$^{rd}$ percentiles,

respectively), while based on the other risk metrics, the exposure is only moderately or not at all risky. Hurricanes and typhoons, as well as sea level rise, do not pose a risk to corporate exposures, similar to the Hungarian sovereign exposure (Chart 21).

**Chart 21**
**Physical risk scores of the BGS bond portfolio**



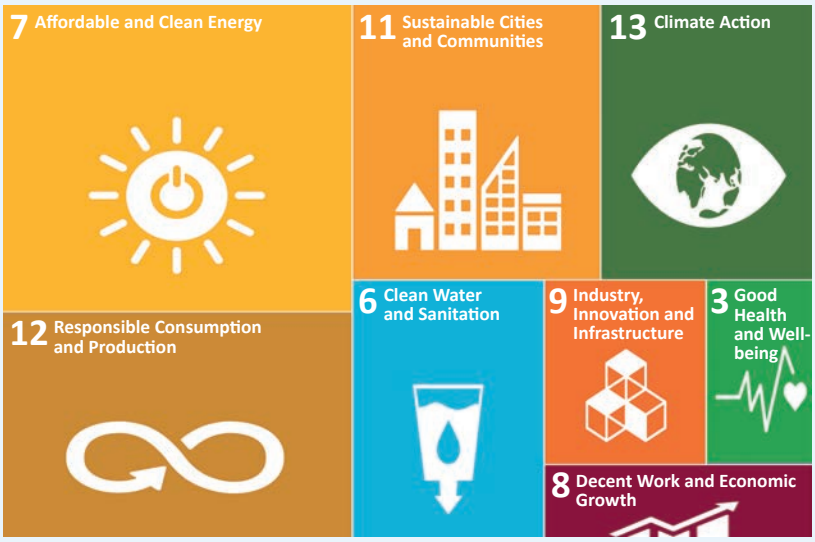

*Source: Four Twenty Seven (Moody's Analytics), MNB*

**Box 4-5**
**Green bonds in the BGS portfolio**

**While it is not a dedicated purpose of the BGS programme, the MNB also buys green corporate bonds under the programme**, the first of which was issued by real estate developer CPI in August 2020. The central bank purchased 13 green bonds up to 31 December 2021, raising the share of green bonds in the total BGS portfolio to over 14 per cent. The largest issuers were real estate developers, manufacturing and agricultural companies.

**All green bonds issued under the BGS are part of a Green Bond Framework that has been externally reviewed by an independent third party, i.e. they can be designated as green bonds in line with international standards.** Based on the objectives set out in Green Bond Frameworks, companies contribute to a number of UN Sustainable Development Goals (SDGs) (Chart 22). The positive environmental impacts of green bonds have not yet been measured by the MNB, which is due to the short time since the bond purchases and thus the lack of corporate impact reports.

**Chart 22**
**Distribution of SDGs in the BGS Green Bond Frameworks by frequency**




*Source: MNB*

## 4.3.4 Climate risk analysis of the Funding for Growth Scheme (FGS)

**The first targeted credit stimulus instrument of the central bank, the Funding for Growth Scheme (FGS), was launched in 2013 to restore the functioning of the SME lending market.** Under the programme, the MNB provided funds to participating credit institutions at an interest rate of 0 per cent, which they could re-lend to micro, small and medium-sized enterprises at a maximum interest rate of 2.5 per cent over the period analysed, up until 2020. At different stages of the FGS, the MNB set a number of parameters, including the maximum maturity, amount and purpose of the loan, but was not restrictive in terms of sectors, so that any enterprise in any economic activity could apply for funding under the scheme.

### 4.3.4.1 Transition risk: carbon intensity (WACI)

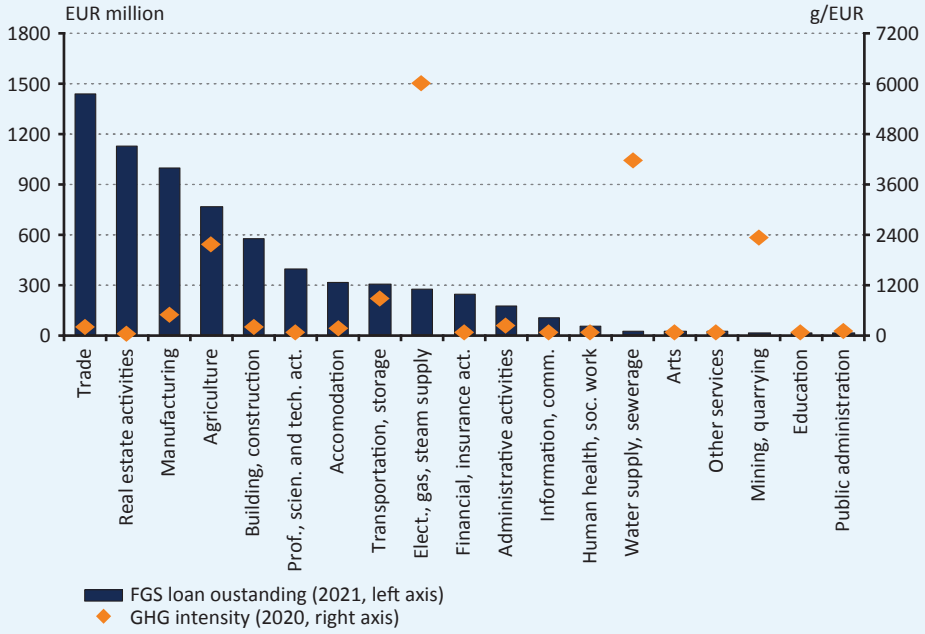
**The WACI metric for the outstanding stock of FGS loans is 692 tonnes $CO_2e$ per million euro of value added.** The carbon intensity of the FGS portfolio exceeds both the average corporate carbon intensity of the Hungarian corporate sector as a whole and that of the V3 countries (Chart 23).

**Chart 23**
**Carbon intensity of the FGS portfolio, Hungarian and V3 companies**


*Note: The FGS portfolio does not include the portfolio of sole proprietors and agricultural primary producers.*
*Source: Eurostat, MNB*

**The sectoral distribution and GHG intensity of the outstanding stock of loans under the FGS of around EUR 6.87 billion at the end of 2021 also showed a heterogeneous picture (Chart 24).** Almost 94 per cent of the outstanding loan portfolio was concentrated in 10 sectors with GHG intensities ranging from 41 to 6,012 tonnes $CO_2e$ per million euro of value added. The largest loan stocks are in less carbon intensive sectors, with the exception of agriculture.

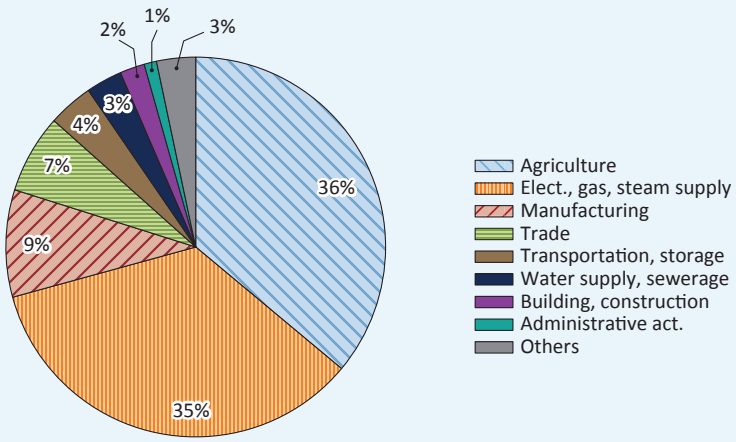
**Chart 24**
**Sectoral distribution of FGS stock and GHG intensity of each sector**




*Source: Eurostat, MNB*

**Only five sectors contributed to 90 per cent of the WACI metric of the FGS portfolio: agriculture, electricity generation, manufacturing, trade and transport and storage (Chart 25).** The high contribution of the agriculture, electricity generation and transport and storage sectors can be explained largely by the high GHG intensity of these sectors, while for manufacturing and trade by the high FGS stock.

**Chart 25**
**Contribution of the main sectors to the GHG intensity of the FGS stock**




*Source: Eurostat, MNB*

**Within the FGS portfolio at end-2021, the carbon intensity of investment loans was higher than that of working capital and redeeming loans, based on the WACI metric.** The WACI metric for investment loans, representing almost 51 per cent of the stock analysed, was 840 tonnes $CO_2e$ per million euro. The electricity, gas, steam and air conditioning sub-sector had the highest added value, with a weighted GHG intensity of 354 tonnes $CO_2e$ per million euro, but crop and animal production and hunting also contributed significantly to the higher metric.

**The WACI metric calculated on the basis of the outstanding stock of working capital type and redeeming transactions was 536 tonnes $CO_2e$ per million euro of value added.** Besides the crop and animal production and electricity, gas, steam and air conditioning sectors, the wholesale trade sub-sector contributed the most to this, as a significant part of the EUR 3.3 billion of loans, almost 19 per cent, was related to this sub-sector, mainly in the form of working capital loans. However, working capital financing to support operations was more evenly distributed between sectors and less concentrated towards sectors with a higher GHG intensity.

### 4.3.4.2 Transition risk: brown share

**In the outstanding stock of loans under the FGS amounting to around EUR 6.87 billion, the weight of carbon-intensive sectors can be considered low, with only 3.8 per cent of the total FGS portfolio linked to these sectors at the end of 2021 (Table 3).** In terms of brown assets, the largest contributors to the FGS portfolio, in the amount of roughly EUR 261 million, were the borrowings of companies active in electricity generation, which account for more than 95 per cent.

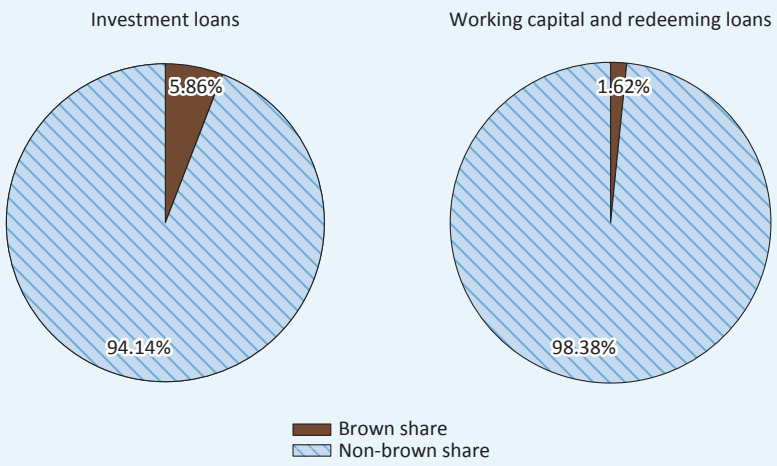
**Table 3**
**Carbon-intensive sectors within the FGS portfolio**

| Carbon intensive sectors (NACE code) | Outstanding loans (EUR million) | Number of Contracts | Number of Corporates |
|---|---|---|---|
| Production of electricity (3511) | 250,11 | 507 | 409 |
| Trade of electricity (3514) | 4,08 | 21 | 18 |
| Wholesale of solid, liquid and gaseous fuels (4671) | 3,29 | 119 | 55 |
| Transmission of electricity (3512) | 2,13 | 1 | 1 |
| Support activities for other mining and quarrying (0990) | 0,49 | 30 | 9 |
| Trade of gas through mains (3523) | 0,36 | 5 | 3 |
| Others (0520, 0910, 3513, 3521, 3522) | 0,40 | 22 | 11 |
| Total | 260,85 | 705 | 506 |

*Source: Eurostat, MNB*

**Similar to the WACI, the brown share is higher in relation to investment loans (Chart 26).** However, for both investment and working capital type and redeeming loans, electricity generation accounts for about 95 per cent of brown assets. In the investment loan stock, electricity trade is also significant, while in the working capital and redeeming loans, the contribution to the metric of wholesale trade in fuels is significant.

**Chart 26**
**Carbon-intensive sectors within investment, working capital type and redeeming loans**




*Source: MNB, Eurostat*

## 4.3.5 Climate risk analysis of the Mortgage Bond Purchase Programme (MBP)

**In 2018, the Magyar Nemzeti Bank launched its Mortgage Bond Purchase Programme, the first phase of which lasted until the end of 2018, and reintroduced the purchase programme in 2020 to mitigate the negative economic impact of the coronavirus pandemic.** These two phases of the Mortgage Bond Purchase Programme successfully supported the objectives pursued: domestic mortgage bond issuance increased substantially and the MNB helped banks to obtain long-term, stable forint funding. Under the programmes, the MNB purchased fixed-rate mortgage bonds denominated in forints from domestic mortgage institutions and placed a strong emphasis on participation conditions enhancing transparency.

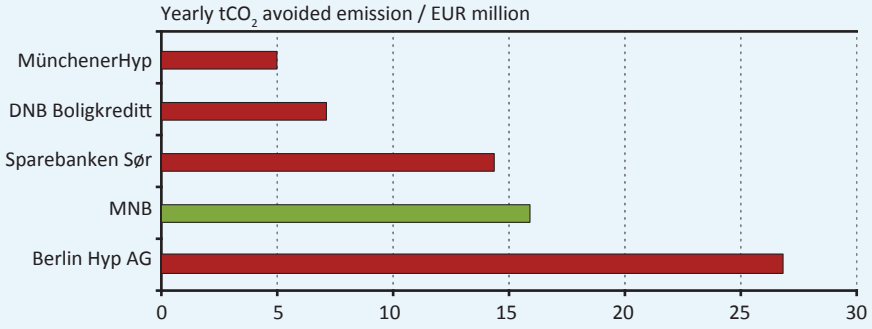
### 4.3.5.1 Positive environmental impact of the Mortgage Bond Purchase Programme

**The aim of this analysis is to estimate the $CO_2$ emission reductions resulting from the MNB's Mortgage Bond Purchase Programme**. The analysis covers the environmental impact of the first two phases of the programme: hence, the Green Bond Purchase Programme, which was launched at the end of 2021, is not covered by this analysis as data are not yet available for this phase. Mortgage bonds are special securities backed by at least 80 per cent of the principal repayments and interest payments on mortgage loans granted by mortgage banks and their partner banks, as required by law. These loans are secured by real estate; thus, the MNB's mortgage bond purchases indirectly finance the construction or purchase of real estate. The model includes a number of simplifying assumptions: consequently, due to the high estimation uncertainty, several values and scenarios were tested for a number of parameters.

**It is estimated that due to the MNB's Mortgage Bond Purchase Programme, through the modernisation of the housing stock, annual emissions amounting to between 19,000 and 46,000 tonnes will be saved, which is roughly equivalent to the carbon footprint of a Hungarian municipality with 4,000-9,000 inhabitants.** According to the experts carrying out the analysis, the best estimate is a reduction of 31,000 tonnes of emissions. By way of comparison, the 2019 $CO_2$ emissions of the Magyar Nemzeti Bank were in the order of 6,000 tonnes, so Hungary will save 3 to 8 times the annual carbon footprint of the MNB on an annual basis thanks to the housing stock modernisation impact of the programme.

**In an international context, the emissions savings of Mortgage Bond Purchase Programmes have been compared to the impact of green mortgage bonds issued in Western Europe (Chart 27).** Overall, the MNB's programme achieves relatively high emission avoidance per million euros. This may be partly due to the fact that, on the one hand, the Hungarian real estate stock is basically starting from a more outdated situation and, on the other hand, domestic real estate is relatively cheaper, thus the amount of money invested may result in a larger reduction of emissions. It is also important to underline that different institutions may have different loan targets and property types behind their mortgage loans, with different criteria, which also affect the reported results.

**Chart 27**
**$CO_2$ emissions avoided per million euros in tonnes per year for certain green mortgage bonds and the MNB programme**




*Note: The avoided CO2 emissions by the MNB's programme were calculated with a distinct, unique estimation methodology and more uncertainty, thus the comparison with other values should be considered with caution.*

*Source: MünchenerHyp, DNB, Sparebanken Sør, Berlin Hyp AG issuers' own reports, MNB calculation*

## 4.3.6 Climate Risk Analysis of the MNB's Collateral Management System

**The MNB only provides loans to the banking system in collateralised form.** By accepting collateral, the MNB minimises the risk associated with its lending activities. The risks associated with collateral management can be managed by the central bank through a conservative definition of the scope of collateral and the application of haircuts.[12] The MNB's collateral management framework already provided for the possibility of using green securities as collateral, but in September 2021 the MNB introduced a preferential green haircut as a first step towards integrating climate risks into the collateral management framework. The greening of the collateral management framework aims to reduce the MNB's exposure to climate risk, encourage the banking system to improve the climate risk aspects of their instruments and develop the Hungarian green bond market.

### 4.3.6.1 Transition risk: carbon intensity (WACI)

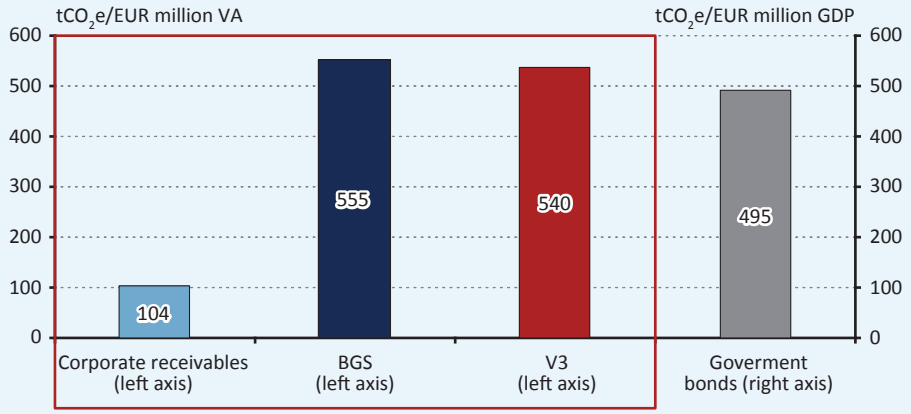
**The MNB accepts as collateral virtually all issuances of the Hungarian bond market, in addition to large corporate receivables, where – due to the structure of the market – government securities dominate the pledged collateral.** The range of eligible collateral is relatively wide, with government, corporate and bank securities (including mortgage covered bonds) in the eligible portfolio of EUR 43 billion. Besides securities, the MNB also accepts large corporate receivables as collateral starting from 2020. In the Hungarian securities market, government securities represent the largest volume and dominate the composition of the pledged portfolio (more than 70 per cent), while large corporate receivables, BGS bonds and mortgage covered bonds are also posted as collateral. The difference between the composition of eligible and pledged stocks is evolving dynamically, except for the dominance of government securities. Via its securities purchase programmes, the MNB purchases a substantial portion of corporate bonds and mortgage covered bonds, which has an impact on the pledgeable stock. The pledging of large corporate receivables is more complex, with higher documentation requirements compared to securities, and therefore the role of these collateral assets in pledged stocks is smaller compared to eligible stocks.

[12] Risk management tool used by the MNB in collateral valuation to determine the value of collateral accepted.

**Among the collateral, the WACI metric can be calculated for the holdings of BGS bonds, large corporate receivables and government securities.** The collateral universe to be analysed is determined by the limited availability of data. Overall, nearly 80 per cent of the pledged collateral is covered, with mortgage bonds and government guaranteed bonds being the two most relevant uncovered asset classes. Due to the composition and characteristics of the pledged stock, the metric is largely determined by the GHG emissions of Hungary.

**The WACI metric for pledged collateral is 395 tonnes $CO_2e$ per million euro of valued added for corporate holdings (BGS bonds and large corporate receivables) and 495 tonnes $CO_2e$ per million euro of GDP for sovereign holdings.** The value of the corporate metric is well below the corporate intensity metric of the V3 countries, which is explained by the low intensity metric for large corporate receivables (Chart 28). The GHG intensity of the stocks is similar in magnitude for all asset classes, except for large corporate receivables, but the substantial asset composition changes in 2021 affected the level of the metric. The recent acceptance of large corporate receivables as collateral increased eligible portfolios and, as reflected in the pledged portfolios, significantly reduced the WACI.

**Chart 28**
**Carbon intensity of portfolios pledged in collateral management**

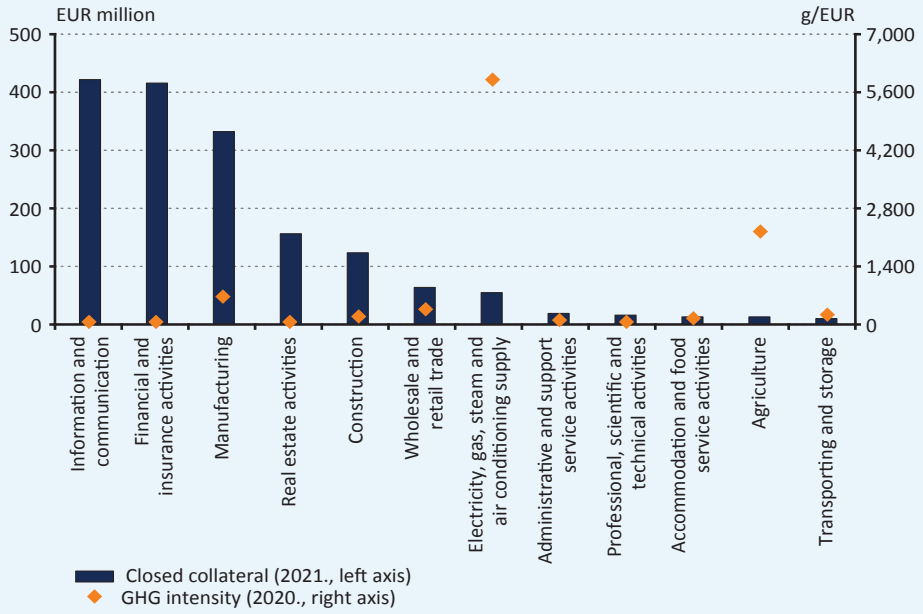



*Note: For large corporate receivables the primary debtor entity's carbon intensity has been analysed, which in the case of refinancing loans takes the financial institution's carbon intensity into consideration.*

*Source: Eurostat, MNB*

**The largest holdings of corporate exposures of pledged collateral are typically associated with sectors with a relatively low carbon footprint (e.g. IT-communication, finance).** Over 80 per cent of GHG emissions are attributable to the contribution of two sectors: electricity generation and manufacturing. This can be explained by the high GHG intensity of the electricity generation sector and the higher share of pledged stocks in the manufacturing sector. In the energy and agriculture sectors, which are most exposed to climate risk, the exposure of the pledged stock is low (Chart 29).

**Chart 29**
**Sectoral breakdown of the volume of BGS and large corporate receivables pledged as collateral and the carbon intensity of each sector**



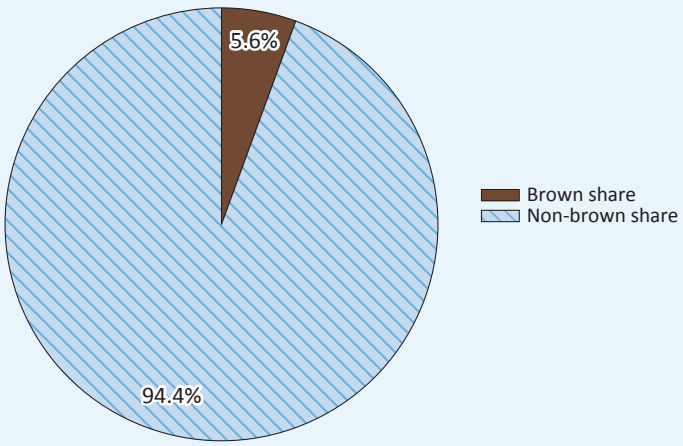

*Source: Eurostat, MNB*

**The level of the pledged corporate intensity metric is also lower than the WACI of the FGS and BGS exposures in the MNB portfolio.** Due to the difference between the market prices used for securities purchases and the acceptance prices used for collateral management, securities and emissions of the same issuer are weighted differently in the analysis of collateral management and securities purchase programmes. For example, in the case of corporate bonds, due to the credit rating and associated haircut assignment, in addition to the market premiums taken into account, a higher acceptance value is associated with capital-intensive firms in sectors with relatively high GHG emissions. In addition, the difference is explained by the different sectoral composition, for example, in the case of large corporate receivables, the role of agriculture and energy production is very small.

### 4.3.6.2 Transition risk: brown share

Of the EUR 1.6 billion in corporate holdings, EUR 92 million can be classified as brown assets, so that at the end of 2021, they accounted for nearly 5.6 per cent of the corporate exposure of the pledged stock (Chart 30).

**Chart 30**
**Brown share in pledged corporate stock**

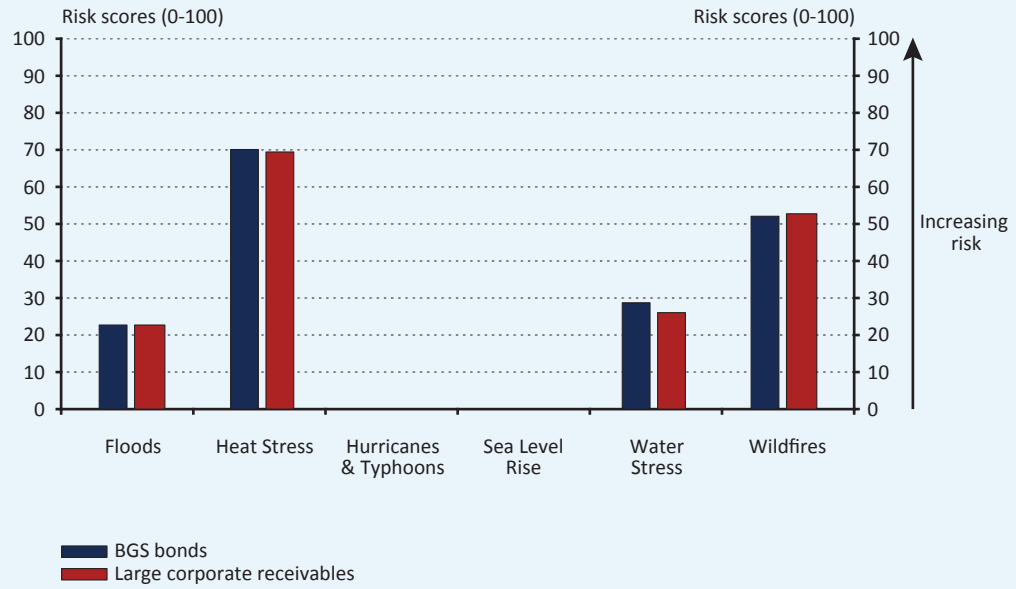



*Source: Eurostat, MNB*

### 4.3.6.3 Physical risk

**The physical risk of portfolios pledged in collateral management should be examined by asset category.** The largest part of the pledged stock (over 70 per cent) consists of Hungarian government securities, whose physical risk is in line with the results for the government bond purchase programme detailed in Subsection 4.3.2.3. Heat stress and wildfires represent the highest risk in the pledged stock of large corporate receivables (70$^{th}$ and 53$^{rd}$ percentiles, respectively), while water stress (26$^{th}$ percentile) and exposure to flood risk (23$^{rd}$ percentile) are considered low. Looking at the physical risk of the BGS portfolio pledged in collateral management separately, the results do not differ significantly from either the scores of the purchased BGS portfolio or the scores of the pledged large corporate receivables, with the Budapest location and its risk exposure dominating all portfolios, i.e. heat stress and wildfires risks are the highest (70$^{th}$ and 53$^{rd}$ percentiles, respectively). The exposure of the pledged portfolio to water stress is slightly higher than the scores for both the large corporate loan and the BGS portfolio (29$^{th}$ percentile). Hurricane, typhoon and sea level rise do not pose a risk in any of the asset categories (Chart 31).

**Chart 31**
**Physical risk scores of corporate assets pledged in collateral management**




*Source: Four Twenty Seven (Moody's Analytics), MNB*

## 4.4 CARBON FOOTPRINT OF THE OPERATIONAL ACTIVITIES OF THE MNB

**The Magyar Nemzeti Bank has been continuously monitoring its operational carbon footprint for 10 years and is striving to reduce it.** The volume of the carbon footprint has decreased by 30 per cent over the past 5 years (Table 4), with the per capita carbon footprint falling by almost 40 per cent, although it should be noted that the change in working patterns due to the coronavirus pandemic has also played an important role. Between 85 and 90 per cent of the carbon footprint is related to energy use, mainly heating and cooling energy consumption for the operation of buildings.

**Table 4**
**Trend in carbon footprint of operational activities**

| Type of Carbon emission | $CO_2$ emission (tons) | | | | | Change 2016-2020 (%) |
|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2020 | |
| Natural gas and district heating | 803 | 880 | 835 | 848 | 966 | 20,3 |
| Vehicles fleet | 137 | 135 | 125 | 123 | 104 | -23,6 |
| Refrigerants | - | - | - | - | 5,4 | - |
| **SCOPE 1 total** | **940** | **1 015** | **960** | **971** | **1 076** | **14,5** |
| Electricity | 3 771 | 3 785 | 4 010 | 4 092 | 2 624 | -30,4 |
| **SCOPE 2 total** | **3 771** | **3 785** | **4 010** | **4 092** | **2 624** | **-30,4** |
| Air travel | 1 077 | 1 122 | 843 | 945 | 201 | -81,3 |
| Business travel (abroad) | 3,1 | 3,9 | 2,8 | 2,4 | 0,4 | -87,1 |
| Business travel (domestic) | 7,8 | 7,1 | 9,0 | 7,8 | 1,9 | -75,6 |
| Taxi | 5,5 | 3,0 | 2,3 | 2,6 | 3,2 | -41,8 |
| Banknote briquette (used as an energy source) | - | - | - | - | 18,2 | - |
| Recycled paper | - | - | - | - | 1,9 | - |
| Communal waste | - | - | - | - | 156 | - |
| **SCOPE 3 total** | **1 093** | **1 136** | **857** | **958** | **383** | **-65,0** |
| **SCOPE1-SCOPE 3 total** | **5 804** | **5 936** | **5 827** | **6 021** | **4 082** | **-29,7** |
| **Carbon footprint per capita (tons/capita)** | **4,9** | **4,7** | **4,5** | **4,6** | **3,1** | **-36,8** |

*Source: MNB*

**Based on the targets presented in the section on strategy, the MNB aims to reduce its carbon footprint by 80 per cent by 2025 (on a 2019 basis), through the installation of a PV system and for electricity, through energy use from 100 per cent renewable energy.**

**The Covid pandemic has led to a significant change in work practices, with meetings and discussions moving to the virtual space, which has significantly reduced business travel.** There is no noticeable reduction in the carbon footprint of buildings related to working from home, given that the variable (headcount-dependent) part of energy use in office buildings is significantly lower compared to permanent use.

**It is important to address a seemingly contradictory piece of data, namely that the impact of global warming on heating energy use is not decreasing, but has been on a steady upward trend in recent years.** The heating season starts earlier and extends until late spring compared to the last 15-25 years. In addition, the winter weather is significantly colder, albeit for a shorter period than in the past. An analysis of the temperature trends during the heating period shows that even with the same or higher average monthly temperatures, there are occasions when higher energy consumption occurs, for example, when there are significant frosts for 7-12 days in a given month.

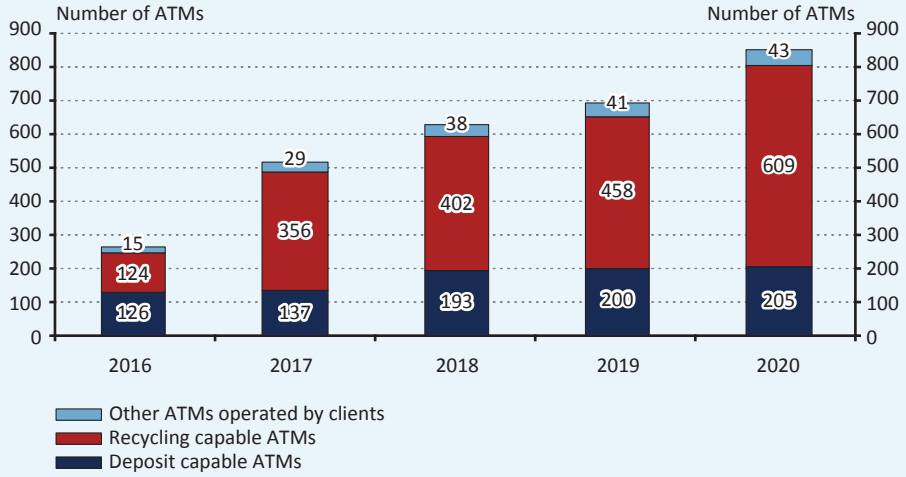
**Box 5-1**
**Carbon footprint of the cash supply chain**

**The transport of cash, which mainly involves the collection of banknotes from merchants and bank branches and their return to ATM machines after processing at central sites, can be deemed mainly responsible for the carbon footprint of the cash supply chain.** However, in recent years, many credit institutions have increasingly adopted client-operated banknote recycling machines, which allow banknotes to be processed locally without the need for transport, thus reducing the associated environmental impact. The total number of such machines has more than tripled since 2016 (Chart 32), reaching 857. The rate of expansion was also intense between 2019 and 2020,

exceeding 23 per cent. It can also be said that in December 2020, more than 26 per cent of cash deposits were made on client-operated machines, compared to 19 per cent a year earlier.

**At present, the MNB lacks sufficient detail on the operations of the companies involved to be able to accurately quantify the positive impact of this process on the carbon footprint of the cash supply chain.** However, it is likely that the above has led to significant environmental progress, which, based on observed trends, could continue at a similar pace in the coming years.

**Chart 32**
**Annual number of client-operated ATMs suitable for banknote recycling or depositing operated by domestic credit institutions**




*Source: MNB*

**The central bank plans to issue comprehensive environmental recommendations on the operation of cash handling companies in 2022; to this end, consultations with stakeholders to develop the recommendations started in the second half of 2021.** In line with the future recommendations, cash-processing companies can make progress with measures to reduce their carbon footprint in the following areas:

- scheduled replacement of the vehicle fleet, which will reduce environmental impacts via both reduced fuel consumption and the use of more advanced engine technologies;
- by using more advanced asset protection technologies, it is possible to reduce the weight of vehicles, which are otherwise very heavy for safety reasons;
- the use of vehicles that are as much as possible adapted in size and nature to the different client needs and to the road network;
- digital transformation is also part of the ecodesign measures, an important element of which is the reduction of paper-based documents and their replacement by electronic solutions for tracking and managing the content of shipments and for dealing with clients;
- where paper-based administration is still necessary, the use of dynamically variable vouchers can reduce the amount of waste generated.

**The MNB has reliable data on the carbon footprint of the cash supply chain from 2018.** While the volume of cash production has not changed significantly (a slight increase was recorded), the number of banknotes in circulation has increased every year over the period. Although lower than in 2018, the growth dynamics in 2020 showed an increase compared to 2019 (2018: 10.8 per cent; 2019: 5.2 per cent; 2020: 7.0 per cent).

**Based on the data received from cash-in-transit companies, the number of kilometres travelled decreased by more than 20 per cent during this period.** The decrease in mileage of cash-in-transit companies is in line with the increasing use of banknote recycling machines, which, together with the continuous modernisation of the transport companies' vehicle fleet, has significantly reduced the carbon burden of cash transport (Table 5).

**Table 5**
**Trend in carbon footprint of the cash supply chain**

| | Carbon footprint of the banknote supply chain (t) | YoY change (t) | YoY change (%) |
|---|---|---|---|
| 2018 | 21 204 | | |
| 2019 | 19 522 | -1 682 | -7.9 |
| 2020 | 18 462 | -1 060 | -5.4 |

*Source: cash-in-transit companies, MNB*

# Annex

## ANNEX 1

**Table 1**
**Characteristics of the key metrics in the TCFD report**

| | |
|---|---|
| **Weighted Average Carbon Intensity** | |
| Definition | Climate-risk metric included in TCFD recommendations measuring the average carbon intensity of the portfolios |
| General information | Advantages:<br>• The metric can be easily applied in different asset classes.<br>• The calculation of the metric is simple.<br>• The metric makes it possible to compare between identical asset types and portfolios, regardless of the portfolio size.<br>• The change of the metric over time provides useful information.<br>• It makes the decomposition analysis of climate risk of the portfolio possible.<br>Disadvantages:<br>• The metric is sensitive to outliers.<br>• Due to normalisation with current values (market value, current GDP), prices can have biasing effect. The improvement of the metric does not necessarily mean a decrease in GHG emissions. |
| **Sovereign asset portfolios (FX reserves, government securities purchase programme)** | |
| Description | The metric quantifying the GHG emissions of the assets in the portfolio arising in the production of a unit of GDP<br>Unit of measure: tonne CO2e/million euro of GDP |
| Formula | $WACI = \sum_i \frac{market\ value\ of\ exposure_i}{market\ value\ of\ the\ portfolio} * \frac{GHG\ emissions\ of\ the\ country_i}{nominal\ GDP\ of\ the\ country_i}$ |
| Data source | • GHG: Eurostat (Air Emissions Accounts, government securities), UNFCCC (FX reserves)<br>• GDP: Eurostat (GSPP), OECD and World Bank (foreign exchange reserves) |
| **Corporate asset portfolios (BGS, FGS, large corporate loans)** | |
| Description | The metric quantifying the GHG emissions of the assets in the portfolio arising in the production of a unit of value added<br>Unit of measure: tonne $CO_2$e/million euro of value added |
| Formula | $WACI = \sum_i \frac{market/collateral\ value\ of\ sector_i}{market/collateral\ value\ of\ the\ portfolio} * GHG\ intensity\ of\ the\ sector$ |
| Data source | • GHG intensity: Eurostat (Air Emissions Intensities) |

*Note: In the TCFD recommendations for the corporate sector, turnover data are used in the calculations, but in the MNB's TCFD report, due to data gaps, the corporate WACI metrics are calculated using value-added based sector GHG intensity data instead of turnover.*

*Source: MNB, TCFD*

**THE MAGYAR NEMZETI BANK'S CLIMATE-RELATED FINANCIAL DISCLOSURE**

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