GREEN FINANCE REPORT

2022
JULY

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Published by the Magyar Nemzeti Bank

Publisher in charge: Eszter Hergár

H-1013 Budapest, Krisztina körút 55.

www.mnb.hu

Pursuant to Act CXXXIX of 2013 on the Magyar Nemzeti Bank, the primary objective of Hungary's central bank is to achieve and maintain price stability. 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 environmental sustainability, without compromising its primary objective of achieving and maintaining price stability.

Following the decision of the National Assembly on 28 May 2021, the MNB's mandate was extended to support the government's policy on environmental sustainability, making it the first EU central bank to be granted a green mandate. Environmental sustainability includes mitigation of and adaptation to climate change, sustainable use of water resources, transition to circular economy, prevention and reduction of environmental pollution, and protection and restoration of biodiversity and ecosystems. The main objective of the „Green Finance Report" is to provide a comprehensive annual overview of the Hungarian financial sector's exposure to environmental sustainability risks and the financing actions promoting sustainability, as well as the related sustainability programmes of the Magyar Nemzeti Bank.

The analysis was carried out under the general guidance of Donát Kim, Head of Research and Analysis Unit, under the coordination of the Sustainable Finance Department. Contributors to the analysis were the staff of the Directorate for Sustainable Finance and Supervisory Coordination, Dr. László Bokor, Viktória Deák, Tibor Fejes, Gábor Gyura, Bence Hevér, Laura Jókuthy, Csanád Kiss Sándor, Dávid Papp, Szabolcs Párkányi, Vivien Pintér, Renátó Ritter, Balázs Sárvári, Nóra Szarvas, Nikolett Tőrös-Barczel, Dr. Kinga Trenka-Horváth, Bálint Várgedő and Edina Boros. Other contributors were Nóra Anna Sándor, Patrik Tischler and Orsolya Vida† from the International Relations Directorate, Katalin Juhász and Róbert Hausmann from the Fiscal and Competitiveness Analysis Directorate, Alexa Antal and Judit Pap from the Financial Literacy Centre, Laura Komlóssy from the Credit Incentives Directorate, Ákos Bereczki, Tamás Borkó, Evelyn Herbert, Gábor Izsák, Beáta Szabó, Sándor Winkler from the Financial System Analysis Directorate, Attila Bécsi from the Structured Finance Strategy Directorate, András Sulyok for the Monetary Policy and Money Market Analysis Directorate, Balázs Lóránt, Tímea Karácsony, Márton Varga from the Monetary Policy Instruments, Foreign Exchange Reserves and Risk Management Directorate, Bálint Danóczy from the Digitalisation Directorate, Gábor Malatinszky from the International Monetary Policy and Training of Economic Sciences Directorate and Veronika Tengely, Réka Szemenyei from the Economic Forecast and Analysis Directorate. The main content of the publication was approved by the Financial Stability Council. The Report incorporates valuable input from other areas of the MNB, from Csaba Kandrács, Deputy Governor for Supervision of Financial Institutions and Consumer Protection, and from the Financial Stability Council.

The report has been prepared mainly on the basis of data available as of 31 December 2021. The data with divergent frequencies are updated differently, and therefore the horizon of the analysis may also differ in some cases. The printed version has been produced using the solution with the lowest environmental impact realistically achievable. Please print the electronic version only if justified.

Tartalom

FOREWORD

The lesson learnt in recent years is that the world is on the path to a breakthrough towards sustainable economics. Green finance is one of the most prominent areas of this journey, and we now present a comprehensive report on its status, challenges and opportunities.

The new, long-term, and emerging theory of economics is not simply about preserving the status quo of the environment. The concept of sustainability is understood in terms of the survival of civilisation and is therefore based on the priority of the common good.

Green finance opens a common space of action for international and domestic actors, for all institutions and stakeholders in the banking, capital markets, treasury and insurance markets, academia and regulators. The internal structure of the report explores, along the major milestones achieved, where green finance is set to be in 2022, while also identifying the changes that are expected to affect the future development of the profession.

The changing spatial structure and the transformation of the division of labour between global, regional and local economies, as sustainability comes to the fore, is also a cornerstone for Hungary's further development. Sustainable economics is indeed a pillar of Hungary's convergence. Therefore, we play a key role in the ongoing revolution, in the transition it inspires and in green finance.

The present publication of the Magyar Nemzeti Bank is both a snapshot of international and domestic trends and insights in green finance and a forward-looking vision of all the disciplines and partner organisations that offer the way forward. We are all involved in green finance. That's why I trust in the wisdom of the reader to read this ground-breaking document and find for themselves how they can contribute to our common social mission of sustainability.

Dr György Matolcsy

Governor of the Magyar Nemzeti Bank

EXECUTIVE SUMMARY

The past year has seen significant progress in the field of green finance in Hungary. While 2020 marked the establishment of the foundations for sustainability in domestic finance, 2021 has seen substantial progress and growth. This year's Green Finance Report (the Report) is designed to provide a comprehensive overview of the state of the domestic green finance and capital market. While the TCFD report published by the Magyar Nemzeti Bank (MNB) in March quantifies its own impact on climate change, this Report focuses on financial market developments related to sustainability and the central bank's market regulation and market-shaping activities.

Based on complex indicators, Hungary ranks in the middle of the European Union in terms of competitive energy use and green economy. For the economy as a whole, the MNB examines, *inter alia*, sustainability issues using the methodologies developed in its Competitiveness, Growth, Productivity and Sustainability Reports. The Reports show that over the last 50 years, Hungary has been in a continuous biological deficit, i.e., its ecological footprint has exceeded its available biocapacity. This highlights the need for a transformation of the economy, for which the financial system must ensure the allocation of capital.

The MNB is therefore also placing great emphasis on being able to measure the greenhouse gas (GHG) emissions intensity of each financial institution's portfolio and quantify their climate exposure. In addition to the Bank Carbon Risk Index (BCRI) methodology presented in the Green Finance Report 2021, we are publishing in these Reports a climate risk matrix for banks, which can be used to measure the risk exposure of individual credit institutions and the overall corporate loan portfolio in terms of GHG intensity and exposure to sectors with increased exposure to transition risks. Based on the climate risk matrix, it can be concluded that domestic bank portfolios have the same proportion of exposure to sectors affected by climate change regulations, but presumably a higher proportion of exposure to sectors affected by GHG intensity than European banks. For BCRI, stagnation is observable. Overall, it can also be concluded that, under the current energy mix, energy supply is the most polluting and has seen an increase in exposure, while other sectors with high GHG intensity have typically seen a decrease.

A long-term climate stress test for the domestic banking sector published at the end of 2021 revealed significant risk differences across sectors. The analysis, based on the Cambridge Econometrics E3ME model, synthesised energy, environment and economic data to produce a projection up to 2050, looking at three climate scenarios. An important lesson is that Hungary would face a significant economic downturn if the sustainability transition failed, while an orderly transition would have a potential economic stimulus. The MNB has estimated bank default rates at sectoral level for these scenarios. It can be observed that, in terms of static stocks, in the event of a failed climate transition, the banking sector could expect an additional NPL stock of EUR 500 billion due to climate risks. The three most exposed sectors in Hungary are tourism, commercial real estate, and wood and paper.

In the Report, the central bank also presents the compliance of credit institutions with the Guide on climate-related and environmental risks. This suggests that the preparedness of the banking sector is uneven and that some actors need to accelerate their preparations. In order to help credit institutions comply with increased climate risks, the MNB published its **Guide on climate-related and environmental risks** for credit institutions last year. Credit institutions themselves have assessed their efforts towards a green transition, and the MNB has reviewed their sustainability actions based on the documents submitted. The central bank will publish an addendum to its **Guide on climate-related and environmental risks** in summer 2022, setting out also the deadlines for compliance with each of the recommendation items. The addendum will highlight the minimum requirements without which institutions can no longer be considered environmentally prudent this year.

Banks can respond to climate change by addressing climate risks and by ramping up green financing, with the green preferential capital requirement providing an incentive. Under the National Clean Development Strategy, the climate-friendly transition is projected to require an annual funding equivalent to 4.8 per cent of gross domestic product (GDP) up to 2050. The MNB has launched its preferential capital requirement programmes to help institutions identify new climate risks and green banking balance sheets. In addition to identifying risks, the uptake of green lending is expected to reduce medium-term systemic transition risks, while green lending will provide more favourable financing for

Hungary's sustainability shift. In 2021, more banks started to engage in green lending at a strategic level, launching new products. On a positive note, the OTP Group signed the UN Responsible Banking Guidelines and completed the first bank-level green lending framework, Eximbank Zrt. also laid down a bank-level green lending framework, and Takarékbank Zrt. obtained the European Energy Efficient Mortgage Lending Initiative's green mortgage label.

Hungary is lagging far behind in terms of energy efficiency of real property, so the central bank is taking a number of targeted measures to catalyse the necessary investments. Residential property accounts for a third of ultimate energy demand in Hungary: in 2021, only 6.4 per cent of all certificates issued were for properties rated BB or above, which can be considered low. The Green Home Programme was launched in October 2021 with a budget of HUF 200 billion, and the Monetary Council increased the budget by an additional HUF 100 billion at its meeting on 5 April 2022, due to the high demand. As part of its green monetary policy toolkit strategy, the MNB also announced a Green Mortgage Bond Purchase Programme in the summer of 2021. In addition, four commercial banks are now taking advantage of the green preferential capital requirement for housing financing, which supports both construction and purchase of green residential real estate.

In addition to energy efficiency, other priority areas for green financing include electromobility, agriculture and the renewable energy sector. The greatest need for financing for the transition to climate neutrality is in the energy sector, where the share of renewable energy sources, including solar energy, is growing dynamically. In the case of agriculture, in addition to reducing GHG intensity, it is important to promote efficient water management and organic farming. The green preferential capital requirement program for corporates and municipalities, extended in summer 2021, now „accepts" not only renewable energy but also sustainable agriculture and electromobility financing, among others.

In addition to the growth in green lending, the domestic green capital market has also shown signs of development. The emergence of green bonds in the market has been an important instrument, supported to a significant extent by the Bond Funding for Growth Scheme. Although the Monetary Council has decided to discontinue the programme, the use of the Green Bond Framework is still recommended as it can provide more favourable financing due to the spread of ESG (environmental, social and corporate governance) aspects. In addition to the corporate bond market, the stock of green government bonds issued by the central government has also grown significantly. A positive sign is that the greenium (lower yields at issuance for green bonds) in German government bonds is now well measured, which is also observed in Hungary.

Further positive news is that the recommendations underpinning Hungary's Sustainable Capital Market Strategy and Action Plan have been adopted. The recommendations will help the development of the green bond and mortgage bond segments, make recommendations on the collection and disclosure of non-financial data by companies, and further strengthen the quantitative and qualitative development of domestic ESG funds. Hungary now is significantly lagging behind in terms of ESG investment: while ESG funds accounted for 42 per cent of the net asset value of capital markets in the EU, in Hungary they accounted for only 1.8 per cent. In addition to investment funds, it is important to achieve the desired change in unit-linked asset funds, pension fund portfolios, private equity and venture capital funds.

The uptake of green finance requires significant specialist knowledge and expertise, which is why the MNB also carries out a range of green finance-related educational and research activities. The central bank has established active cooperation with the Budapest University of Technology and Economics, the Neumann János University, the University of Szeged, the University of Debrecen and the Budapest Institute of Banking, where it organises a number of study competitions and research workshops in addition to courses. The MNB's recognition of the most outstanding researchers in the field of sustainable finance through the Green Finance Science Awards and conducting its own research activities also serves to build capacity.

The final chapter of the Report provides guidance on legislative and data changes and expected developments related to sustainability. The MNB is also developing a Green Legislative Directory to help keep track of legislative changes. The MNB is mainstreaming sustainability not only in its market regulation but also in its own operations and

is the first European central bank to have been granted a Green Mandate in this respect. The Report summarises progress in this area in line with international recommendations.

The MNB's objective for 2022 is to review the results of existing green measures to date and to focus its resources on the most effective tools. An important criterion for this is to monitor existing programmes and to promote the spread of best practices with a supportive intent. A prerequisite for successful development is the establishment of an appropriate framework and the provision of transparent and objective information to clients. In line with the EU's sustainability taxonomy, consideration of environmental sustainability objectives beyond climate change mitigation, such as responsible water and waste management and biodiversity, will be essential in the near future.

Based on the key indicators measuring environmental sustainability in the Green Finance Report, Hungary is lagging behind the EU level again this year but has been able to show progress in many cases. Finally, Table 1 shows an improvement compared to last year in the mobilisation of green funds and in the financial sector's preparedness for climate risk. In the area of sustainability reporting, there is no significant improvement in the performance of the financial sector and green bond issuance has not exceeded the previous year's level, but there is an increase in corporate lending. Progress can be seen in several real economic indicators, but the deterioration in the energy intensity of the economy is notable. Due to less frequent updates of several indicators, it is not yet possible to identify the direction of change. Nevertheless, Hungary continues to lag behind the EU on most dimensions of environmental sustainability.

NGFS DASHBOARD

Cathegory	Indicator	Unit	HU last year's value	HU this year's value	EU average	Reference period	Change
Real economy	Share of area under organic farming within the agricultural area	%	5,71	7,59	8,49	2021	▲
	Share of the protected land areas	%	22,24	22,24*	26,00	2017	▬
	Internal renewable water resources per capita	m^3/capita/year	617,20	618,18	3 065,00	2018	▲
	Share of renewable energy sources in total final energy consumption	%	12,61	13,85	19,73	2020	▲
	Energy intensity of the economy	Oil equivalent (kg)/€ thousand	206,09	211,59	116,73	2020	▼
	Net energy import	%	69,70	57,49	56,63	2020	▲
	Proportion of electric and hybrid electric cars registered in a given year	%	1,90	4,60	10,50	2020	▲
	Recycling rate of municipal waste	%	35,94	35,94*	48,00	2019	▬
	Change in greenhouse gas emissions since 1990	%	67,82	67,82*	76,80	2018	▬
	CO2 emissions per unit of production	Thousand tons CO2/ $ million	0,17	0,17*	0,16	2018	▬
	Share of GHG emissions under the scope of EU ETS in Hungary	%	29,04	29,04*	40,00	2018	▬
	EU ETS CO2market price	EUR/tCO2e	32,71	80,65	80,65	2021	▲
	Fossil fuel subsidies	GDP %	0,19	0,19*	0,40	2019	▬
	Environmental tax revenues	GDP %	2,37	2,18	2,24	2020	▼
	Proportion of environmental expenditure	GDP %	1,90	1,90*	2,00*	2020	▬
	Environmental Performance Index (EPI)	index	63,70	63,70	70,67	2020	▬
	Adjusted net savings (ANS)	GNI %	14,53	15,10	11,50	2019	▲
	Adjusted national net income (ANNI) growth rate (2009-2018 average)	%	1,75	2,26	1,07	2019	▲
Risk	Natural resources rents	GDP %	0,38	0,32	0,20	2019	▲
	ND-GAIN vulnerability	index	0,36	0,351	0,32	2019	▲
	ND-GAIN change in vulnerability between 1995 and 2019	%	-3,43	-5,89	-7,27	2019	▲
	ND-GAIN readiness	index	0,50	0,499	0,59	2019	▬
	ND-GAIN change in readiness between 1995 and 2019	%	-8,01	-8,98	4,95	2019	▼
	Ecological deficit (biocapacity – ecological footprint)	Million global hectares / capita	1,16	1,16*	2,53	2017	▬
	Ratio of banks where the highest decision making body does not discuss climate risks	%	58,00	36,00	n/a	2021	▲
	Ratio of banks with no person or team dedicated to climate risks	%	81,00	77,00	48,00*	2021	▲
	Bank Carbon Risk Index (Linear)	index	0,08	0,08	n/a	2021	▬
	Bank Carbon Risk Index (Gompertz)	index	0,15	0,15	n/a	2021	▬

Cathegory	Indicator	Unit	HU last year's value	HU this year's value	EU average	Reference period	Change
Mobilisation	Ratio of green bonds – central government - stock	%	1,90	1,76	n/a	2021	▼
	Ratio of green bonds – central government - 2020	%	3,90	3,60	n/a	2021	▼
	Ratio of green bonds – companies - stock	%	5,60	7,36	n/a	2021	▲
	Ratio of green bonds – companies - 2020	%	11,40	9,18	n/a	2021	▼
	Ratio of green bonds – MNB FX reserve - stock	%	1,00	1,00	n/a	2021	–
	Ratio of green corporate loans (solar PV only)	%	0,84	2,01	n/a	2021	▲
	Ratio of energy efficient residential buildings	%	3,00	3,17	9,80*	2021	▲
	Green/ESG based investment funds – stock	%	0,50	1,30	n/a	2021	▲
	Insurance sector – ratio of green unit-linked funds	%	1,70	7,49	n/a	2021	▲
	Green/ESG based voluntary pension funds	%	0,90	0,29	n/a	2021	▼
Reporting	Ratio of banks where no information is disclosed on sustanability	%	45,00	45,00*	14,00*	2020	–
	Ratio of banks where no metrics on sustanability are disclosed	%	-	-	3,00*	2021	–
Global Innitiative	Ratio of banks where disclosures are fully in line with the TCFD recommendations	%	35,00	45,45	n/a	2021	▲
	Ratio of banks joining global initiatives on sustainability	%	18,00	75,19	n/a	2021	▲

*The data shown is the same as in last year's report

1. INTERNATIONAL DEVELOPMENTS AND DOMESTIC SUSTAINABILITY

In order to assess the development of the domestic green financial market and to identify areas for improvement and new directions, it is essential to mention international developments in 2021 and sustainability indicators of the Hungarian economy. Over the past year, both major international organisations such as the UN, the IMF, the OECD and the Financial Stability Board, as well as central banks in Europe and Asia – and now in the Americas – have made greening the financial system, supporting the transition to a sustainable economy and researching the negative effects of climate change on financial stability and the possible responses to them a top priority.

The sustainability of the domestic economy is assessed by the MNB through a number of indicators published in its Competitiveness and Sustainability Reports. Based on these complex indicators, Hungary ranks in the middle in terms of competitive energy use and green economy, ahead of its regional competitors. The same report underlines the need to increase the green energy mix to reduce Hungary's energy dependence and to reduce carbon emissions in order to achieve climate neutrality by 2050. It is important to underline that Hungary has been in a biological deficit along with most European countries for the last 50 years, i.e., its ecological footprint has exceeded its available biocapacity. The challenges identified in the reports also point to the fact that credit institutions and capital markets have a major responsibility and role to play in promoting environmental and economic sustainability.

1.1. International green developments

1.1.1. Key outcomes of the UN Climate Change Conference (COP26)

A global agreement was reached by the countries at COP26. The 26th United Nations Climate Change Conference (COP26) was held in Glasgow this year with 197 participating countries. The UN Climate Change Conference achieved progress on all four areas (mitigation, adaptation, finance and collaboration), including setting out new commitments to achieve global net zero carbon emissions and reaching a global agreement on adaptation finance for the first time. The most important outcome of COP26 was the adoption of the Glasgow Climate Pact, which not only complements the Paris Rulebook but also keeps alive hopes of keeping global warming below 1.5 °C..[1]

1.1.2. Network for Greening the Financial System (NGFS)

The NGFS published its publication supporting climate risk management last year and presented climate change scenarios in 2021, as well. Established in 2017, the Network for Greening the Financial System (NGFS) is currently a network of 108 members (including the MNB) and 17 observers[2] whose members are developing climate change-related risk management tools for the financial sector through the sharing of their expertise and best practices.[3] In March, the network published a report entitled "Adapting central bank operations to a hotter world" which describes central bank adaptation to help manage climate risks (physical and transition risks), with a focus on credit operations, credit risk mitigation policies and asset purchases[4] The main new feature of the NGFS Climate Scenarios report, published in June 2021, is the launch of an online portal (Climate Impact Explorer[5]) where users can learn about the impacts of physical risks from climate change.[6]

We are also seeing an increasing emphasis on court proceedings to enforce compliance with climate protection aspects. The NGFS has therefore carried out studies on the extent to which climate-related litigation poses a risk to micro-prudential supervision and financial stability monitoring.[7] In order to share knowledge among its members, the NGFS has carried out a survey entitled "Scenarios in Action" involving 31 members, in which the network summarises the different scenario analysis methods used by its members.[8]

[1] COP26(2022): UN Claimate change conference UK 2021

[2] According to information available on the NGFS website, on 1 April 2022 the network had 108 members and 17 observers.

[3] NGFS (2021): NGRS Glasgow Declaration Committed to Action

[4] NGFS (2021): Adapting central bank operations to a hotter world

[5] NGFS(2021): Climate Impact Explorer

[6] NGFS (2021): NGFS Climate Scenarios for central banks and supervisors

[7] NGFS (2021): Climate-related litigation: Raising awareness about a growing source of risk

[8] NGFS(2021): Scenarios in Action: A progress report on global supervisory and central bank climate scenario excercises

In December, the NGFS published its first guide for the preparation of central banks' financial reports on climate risks. The guide highlights the need for a different approach across central banks, rather than a single exact methodology, as central banks may differ in both their mandates and disclosure requirements.[9] The MNB has been actively involved in the development of the guide and has provided significant input in the context of its report on the climate risk analysis of its own financial instruments. For more information on the report, see Box 3.

1.1.3. Financial Stability Board (FSB)

In 2021, the Financial Stability Board (FSB) also played an important role in examining the financial stability implications of climate risks. On 7 July 2021, the global institution presented a comprehensive roadmap for addressing climate-related financial risks (FSB Roadmap for Addressing Climate-Related Financial Risks), which outlined the tasks to be undertaken by regulators and international organisations over a multi-year timeframe in four key areas (corporate-level disclosure; data; vulnerability analysis; and regulatory and supervisory tools).[10] In 2015, the 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 change disclosures.

In its October 2021 status report, the TCFD Task Force reported that implementation of TCFD recommendations accelerated in 2021, with more than half of large companies globally disclosing their climate change risks. More than 2,600 organisations have now expressed support for the recommendations, and the number of supporting institutions has increased by more than a third since the 2020 status report, making the TCFD recommendations a widely supported basis for climate change reporting today.[11]

1.1.4. UNEP - Finance Initiative

Membership of the United Nations Environment Programme Finance Initiative (UNEP FI) has continued to grow in 2021 and now includes over 450 financial institutions and 100 supporting organisations. To support the transition to a carbon-neutral economy, the Glasgow Financial Alliance for Net Zero (GFANZ) initiative was launched in April, with financial institutions with US$130 trillion in assets and covering roughly 40 per cent of the financial system. Of the four alliances that make up the GFANZ, three are under the auspices of UNEP FI: the Net-Zero Banking Alliance, launched in April 2021 and counting already over 100 members; the Net-Zero Asset Owner Alliance, established in 2019 and counting 60 members; and the Net-Zero Insurance Alliance, launched in July 2021.[12] The MNB is not aware of any Hungarian members.

Building on the experience of the TCFD, UNEP FI co-founded the Taskforce on Nature-related Financial Disclosures (TNFD) in 2021. The Taskforce has 35 members and more than 100 institutions working together to develop a framework to be completed by 2023.[13] The TNFD Co-Chair presented the initiative at the MNB's 2021 Green Finance Conference.

1.1.5. International Monetary Fund (IMF)

As a responsible multilateral financial institution, the IMF has in recent years strengthened its commitment to prioritising climate change issues and has started to build its expertise in this area. In line with these efforts, climate policy aspects are increasingly being mainstreamed in the IMF's flagship reports, policy papers and surveillance activities, as it has become timely to integrate climate and green aspects systematically and strategically into the IMF's activities.

In line with this, in July 2021, the organisation also published a working paper[14] reviewing the IMF's climate change activities to date and the issues related to climate finance. The IMF also stresses the importance for policymakers to make all efforts to promote a green recovery in the recovery from the pandemic crisis by making decisions that can catalyse green investments and contribute to “greening” the financial system to help recovery and reduce the likelihood of climate disaster.[15]

[9] NGFS(2021): Guide on climate-related disclosure for central banks
[10] FSB (2021) Roadmap for Addressing Climate-Related Financial Risks
[11] TCFD(2021): Status Report
[12] UNEPFI(2021): 28 banks collectively accelerate action on universal financial inclusion and health
[13] UNEPFI(2021): A year of private finance stepping up sustainability action
[14] IMF (2021): IMF Strategy to Help Members Address Climate Change Related Policy Challenges—Priorities, Modes of Delivery, and Budget Implications
[15] IMF(2021): IMF Strategy to Help Members Address Climate Change Related Policy Challenges

1.1.6. Organisation for Economic Co-operation and Development (OECD)

Launched last May, the International Climate Action Programme[16] aims to support member countries' progress towards net zero greenhouse gas emissions and a more resilient economy through regular monitoring, policy evaluation and feedback to the OECD. Since 2020, the OECD has also been monitoring the evolution of the COVID-19 pandemic and has established a Green Recovery Database[17] to identify and track the environmental impacts of recovery measures taken in response to the pandemic, the results of which were published in 2021. As a founding member, it remains an active member of the Green Growth Knowledge Platform, which is a global network of international organisations and experts to explore theories and practices related to green growth.

In 2021, the OECD contributed to the collective thinking around the environment, green growth, sustainability and climate change through a series of events and publications. In March 2021, it held a discussion on financing the UN Sustainable Development Goals; in October, the OECD Centre on Green Finance and Investment held its annual forum; and in November, it organised a conference on green recovery of cities and the transport sector at the Green Growth and Sustainable Development Forum (GGSD Forum).

1.1.7. European Central Bank (ECB)

The President of the European Central Bank (ECB), Christine Lagarde, has often made statements advocating a "greening" of the ECB and a green monetary policy. In July 2021, the ECB published the results of its Strategic Framework Review, which adopted an ambitious climate action plan. The ECB will consider how to integrate climate considerations into the monetary policy framework and will also enhance analytical capacity in macro modelling by taking into account the impact of climate change. In addition, it also integrates climate considerations into risk assessment, hedging frameworks and corporate bond purchases.[18]

In the area of European banking supervision, the ECB has identified climate-related risks as a key risk factor for the banking sector. Therefore, climate-related efforts and the appropriate management of environmental risks are included in the supervisory priorities for 2022-2024.[19] One of the ECB's key actions was to assess and monitor corporate and bank exposures to climate risks.[20] The 2021 climate stress test indicated[21] that the costs for banks and corporates of adapting quickly to green policies are much lower than the costs of non-action and of severe natural disasters in the future. The ECB also conducted its first assessment of climate change preparedness in 2021.[22] The ECB established the ECB Climate Change Centre in the first quarter of 2021 to centralise climate change-related (research) work within its own organisation, signalling the growing importance of climate change for both the economy and ECB policy.

1.1.8. Other central banks and supervisors

The MNB maintains contacts and organises regular bilateral meetings with a number of central banks and has also published a study on their sustainability-related activities. The MNB summarises the best practices presented at these meetings and is gradually incorporating them into its own operations. In addition, the MNB also assists other credit institution supervisors and central banks with knowledge transfer, for example by presenting the experience of the pioneering long-term climate stress test presented in chapter 2.3. In addition to coordination, it closely monitors the activities of other countries. As regards international exercises, the work of the Singapore central bank, which is described in detail in Box 1, is particularly noteworthy. Programmes in other countries are summarised in Table 2 and explained in detail in this paper.

[16] OECD (2021): International Programme for Action on Climate
[17] OECD(2021): Green Recovery Database
[18] ECB (2021): ECB presents action plan to include climate change considerations in its monetary policy strategy
[19] ECB (2021): Supervisory priorities and assessment of risks and vulnerabilities
[20] ECB (2021): Firms and banks to benefit from early adoption of green policies, ECB's economy-wide climate stress test shows |
[21] ECB (2021): ECB economy-wide climate stress test
[22] ECB (2021): The state of climate and environmental risk management in the banking sector

BOX 1: Example of a complex green banking programme: the Monetary Authority of Singapore (MAS)

The Singapore Central Bank is one of the most proactive central banks in Asia in developing green finance, integrating sustainability considerations into almost every aspect of its operations. Over the past year, MAS has taken active steps to green the financial life of the city-state, notably by promoting the integration of ESG criteria into the decision-making processes of financial institutions; supporting the development of various policies and standards on green finance and capacity building; and promoting the development of the green bond market through its initiatives. Under the auspices of the Green Finance Action Plan announced in 2019, MAS introduced a globally unique support scheme, the Green and Sustainability-Linked Loan Grant Scheme (GSLS), on 24 November 2020, which became operational on 1 January 2021. The GSLS supports firms to access green and sustainable finance regardless of the size of the company and encourages banks to develop green and sustainable loan frameworks to make such finance more accessible to small and medium-sized enterprises.[23]

The Singapore Green Finance Centre (SGFC), established on 13 October 2020, started its operations in 2021. The research centre was launched by Imperial College London Business School and the Lee Kong Chian School of Business at Singapore Management University (SMU) with the support of MAS, the central bank of Singapore, with the aim of conducting research on green finance and talent development. MAS has also supported an initiative by the National University of Singapore (NUS) to establish a new research centre in 2021 (The Sustainable and Green Finance Institute – SGFIN). The Green Finance Industry Taskforce (GFIT), a taskforce convened by the Central Bank in early January 2021, has developed a taxonomy for Singapore-based financial institutions to be able to distinguish between green activities and those that are not yet fully green but contribute to the transition.[24] In June 2021, MAS launched its first Sustainability Report online, which outlines the Reserve Bank of Singapore's strategies to build resilience to climate change and environmental sustainability.[25] MAS also expects financial institutions to report on climate-related issues in line with international disclosure frameworks from June 2022.[26] The Monetary Authority of Singapore also launched a USD 1.8 billion Green Investments Programme (GIP) in June 2021. The GIP aims to create a climate resilient investment portfolio that promotes green-focused public investment strategies by catalysing the implementation of supported green projects.[27]

Changes were also introduced within the structure of the central bank: in September 2021, MAS created a separate Sustainability Group within the institution. In order to meet the financial sector's demand for sustainability data, it was announced in the autumn that 4 digital platforms will be tested by the second half of 2022. These are designed to simplify ESG disclosure processes; aggregate data from multiple sources; capture ESG certifications; and connect green technology providers with investors, financial institutions and companies.[28] The MAS plans to carry out a climate stress test of the entire financial sector by the end of 2022 along various scenarios developed by the NGFS.[29]

[23] MAS(2020): MAS launches world's first grant scheme to support green and sustainability-linked loans

[24] MAS(2021): Industry taskforce proposes taxonomy and launches environmental risk management handbook to support green finance

[25] MAS(2021): Sustainability Report 2020/2021

[26] The Busniess Times (2021): Climate-linked financial disclosures to be legally binding, align to one global standard: MAS chief

[27] Green Finance Platform (2019): Singapore's green investment programme

[28] The Fintech Times (2021): MAS backs green finance with project greenprint

[29] MAS (2021): Being the change we want to see: A sustainable future

Table 2: Examples of the main sustainability-related actions of central banks from 2021, based on specific criteria [30]								
Central bank	**Climate risks in macro and micro prudential system**	**Sustainability elements in the central bank's portfolio**	**Developing awareness**	**Stress tests**	**Publication**	**Establishment of an organisational unit / working group**	**Time of publication**	**Other**
England	Manual for climate risk management	Greening the corporate bond purchase scheme	Joint conference with Banca d'Italia	Yes	CBPS greening Climate change		TCFD's second report	
Austria			„Climate protection"	Yes	Financial Stability			Conference
Belgium		Reducing carbon footprint		Yes		Climate risk hub		
Brazil	Climate change risks			Yes	Climate risks report		Quantitative reporting by banks	
Denmark			Disclosure of climate issues		Climate change			
United States			On the financial implications of climate change	Yes	Growth at Risk from Climate Change	Financial Stability Climate Committee		
Estonia		Sustainable principles				Yes	TCFD report	Counselling
ECB	Part of the 2021 Climate Action Plan	Green bond purchase	ECB/ESRB joint conference	Yes	ECB/ESRB publication	ECB climate change centre		
France		Portfolio restrictions	Climate change seminar		Climate change publication	Climate Change Centre		

[30] The list is not exhaustive, some of the priority actions are listed.

Greece			Climate change Impacts Study Committee		Annual Report (2020)	Climate Change and Sustainability Centre		
Netherlands		Sustainable Finance Strategy 2021-2025			Financial Climate-related Risks	Sustainable Finance Office	Climate risk appendix	
Croatia	Questionnaire survey on climate risks	Climate strategy plan	The Role of Banks		In the Report on Financial Stability			Joined the NGFS
Ireland		Associated with the BIS green bond investment fund	Climate Risk Forum		Green Bonds and Insurance	Climate Change Unit		
Japan		Developing a climate strategy				Climate Coordination Hub		
China		Green Bond Projects Catalogue		Yes			Climate risk disclosure	Taxonomy
Korea					Response to Climate Change	Climate Change Task Force		
Latvia	Sustainable strategy section	Sustainable strategy	Sustainable Economy		Report on Financial Stability			
Lithuania	Climate risks	Responsible investment principles			Financial risk assessment		CO2 Footprint Report	
Luxembourg		Sustainable Corporate strategy			Climate Risk Exposure	Green Commission (2021)	Portfolio climate risks	
Malaysia	Consultation paper		Finance for Change Conference				TCFD principles proposal	Green taxonomy

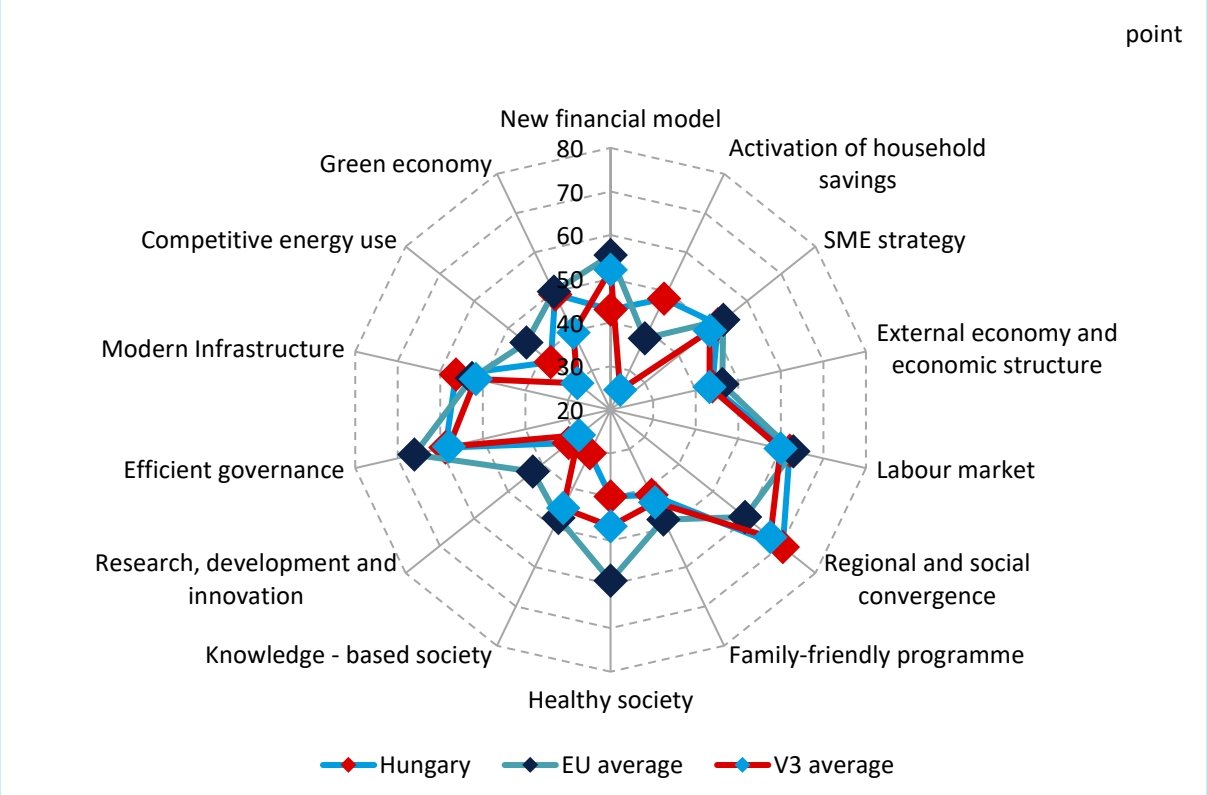
Mexico			„Biodiversity Challenges"		In the Report on Financial Stability	yes		
Italy			Conference		Climate Risks; Green Bonds			Announced a competition hirdetett
Russia	Capital requirement relief	Climate strategy		Yes		Working Group on Sustainable Fin.	Recommen-dations	
Portugal		Associated with the BIS green bond investment fund	Investment and digitalization					
Spain		Associated with the BIS green bond investment fund	Climate change section on the bank's website		Climate change monitoring			
Sweden		Corporate bonds purchase regulations			„Climate Risks "			
Singapore	„Handbook"	Green Investments Programme (GIP)	Creation of SGFC and SGFIN	Yes	„Sustainability Report"	Sustainability Group	Climate reporting	Taxonomy Regulation

1.2. Sustainability of the Hungarian economy

In addition to the Green Finance Report, several annual publications of the MNB examine the sustainability of the Hungarian economy through a number of indicators. It also focuses on the most important domestic steps taken towards sustainability. In addition to energy production and use, the MNB's Competitiveness and Sustainability Reports also address the sustainability of the environment and the financial resources needed to achieve it. While the Competitiveness Report stresses the close link between competitiveness and sustainability as one of its messages, the Sustainability Report draws attention to the responsible use of our environmental resources (soil, air, water), among others. The Competitiveness Mirror publication, which aims to quantify the implementation of the Bank's competitiveness programme, devotes a special chapter to domestic measures to achieve green econoic transition.

The MNB's Competitiveness Report uses a total of 159 metrics in 14 areas to examine Hungary's competitiveness in an international comparison, including Competitive Energy Use and the Green Economy. Based on the results of the MNB Competitiveness Index 2021 presented in the Report, Hungary ranked 18th overall in the competitiveness ranking of the 27 countries of the European Union, still ahead of the average of our Visegrád region competitors. The regional breakdown of the results shows that Hungary is slightly below the EU27 average in Competitive Energy Use, but performs about the same in Green Economy, outperforming its regional competitors in both areas.

Chart 1.1: MNB Competitiveness Index results by area (2021)



Source: MNB

In the case of Competitive Energy Use, the Report stresses that Hungary's energy dependence can be reduced by reducing energy use, developing a green energy mix and, in parallel, reducing the share of net energy imports. In this interpretation, a country's energy mix can be made sustainable if at least half of its total energy use is provided by environmentally friendly but domestically produced energy sources. For

environmentally friendly energy sources, we can rely heavily on the use of renewables. The government intends to achieve Hungary's target of 21 per cent of total energy use from renewables by 2030, mainly by expanding solar, non-fuel wood biomass and geothermal energy capacity.

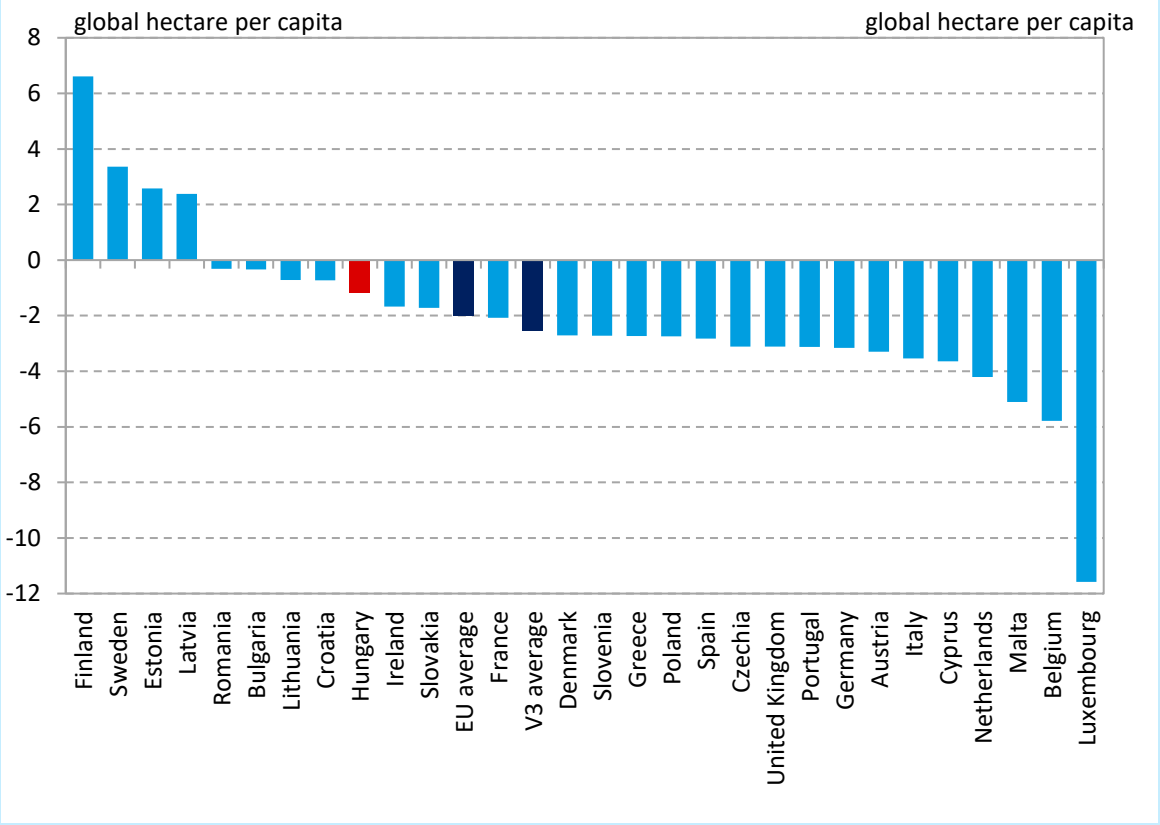
In this area, not only the quantity and structure of the energy consumed but also its price plays a major role, both for industrial actors and households. In Hungary, electricity and gas prices for industrial use have fallen close to the average of the Visegrád region between 2013 and 2017, which could provide a competitive advantage by reducing costs for companies. Electricity and gas prices for households were significantly reduced in several steps between 2011 and 2014, bringing them below the average of the Visegrád region and then below the EU average. In many cases, the reduction in the cost of gas heating due to public utility price cuts have replaced the highly polluting wood-burning heating that is mostly common in rural areas. However, it is important to stress that it is desirable to replace natural gas with renewable energy sources and to reduce energy waste by increasing energy efficiency.

The Report also points out that reducing carbon emissions is essential for Hungary to achieve climate neutrality by 2050 along with the rest of the European Union. Hungary is one of the countries that have been able to significantly reduce their per capita carbon dioxide emissions since the regime change, while increasing their economic performance, although this was not so much the result of greening efforts but rather of the structural change that accompanied the demolition of the socialist economy. Reducing our emissions has allowed the Hungarian value to fall below the EU and regional averages, although it has risen somewhat in recent years as a result of economic growth. In the future, it is necessary to strive for even lower carbon emissions from domestic production and manufacturing processes, which can best be facilitated by a transition to a technology- and knowledge-intensive growth model. While carbon emissions per unit of output have been around the EU average and below the Visegrád region average, our total carbon emissions have been increasing in recent years.

Reducing carbon dioxide emissions is important not only to meet emission reduction targets, but also to maintain the health of the population, which is a competitiveness factor. We can currently provide heating for our homes, industrial production or everyday transport only with significant air pollution. Much of this air pollution consist of tiny pollutants of less than 2.5 microns which, once in the lungs, are not excreted and thus increase the risk of respiratory and circulatory diseases. In other words, fine particle emissions are also detrimental to the health of the workforce and to work productivity. Exposure to such fine particles in Hungary is above the EU average, although below that of the Visegrád region.

Protecting not only air but all our natural and environmental resources (natural capital) must be a priority on the way to sustainable convergence. The use of our environmental resources is measured by the so-called ecological balance, which shows how much of the available environmental resources (biocapacity) in a country's territory is used in a given year (ecological footprint). Countries whose consumption exceeds their biocapacity fall into an ecological deficit. Over the past 50 years, Hungary has consistently exceeded the carrying capacity of its available productive land, as have most countries on Earth. Although Hungary is only in a slight ecological deficit, better than the EU and V3 averages, the world as a whole currently uses 1.7 Earths of resources.

Chart 1.2: Ecological balance (2017)



Note: The ecological balance is obtained by deducting the ecological footprint from a country's biocapacity. A deficit occurs when the ecological footprint exceeds the available biocapacity.
Source: Global Footprint Network.

The Sustainability Report of the MNB assesses and ranks Hungary's sustainable convergence position in the European Union using a composite Sustainability Index of 108 indicators based on four main pillars. In the Index, Hungary ranks 15th out of the 27 EU Member States, slightly below the EU average and slightly better than the V3 average. For the key pillar of Environmental Sustainability, highlighted below, Hungary's performance is slightly above the EU average and significantly above the average for the Visegrád region.

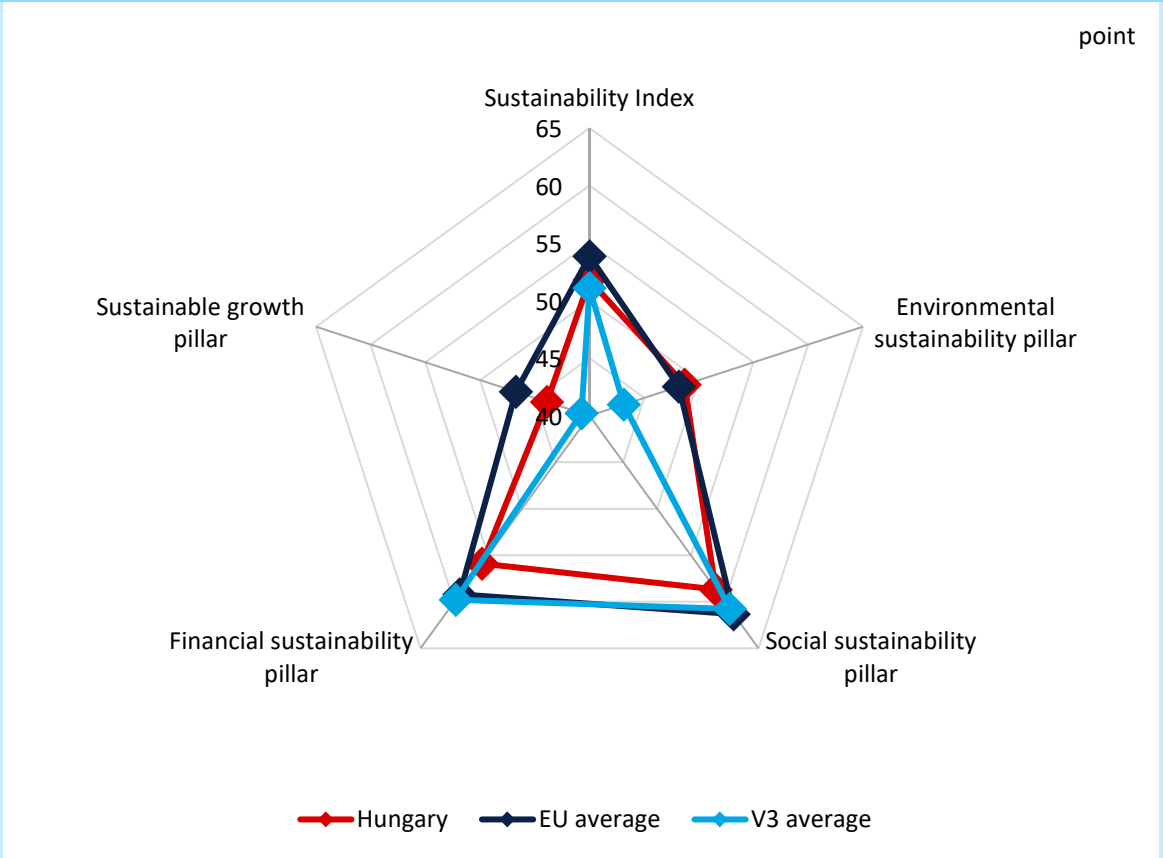
The chapter on Environmental Sustainability in the Sustainability Report provides an even more in-depth look than the Competitiveness Report at the areas that characterise the sustainability of the domestic energy sector and our environment. Following a characterisation of the energy sector, it provides a detailed overview of various environmental resources in separate groups such as soil, air and water, and finally, with regard to green finance, it outlines the financing options available to promote a circular economy.

This Report argues that the key to sustainable energy production is an environmentally friendly energy supply structure, in line with the Competitiveness Report. However, it is no longer only the share of renewables in energy production that is being taken into account, but also the role of nuclear energy in electricity generation. Although the use of nuclear energy is a controversial issue among EU Member States, due to its efficiency, several Member States (e.g. France, Slovakia, Slovenia, Finland and the Czech Republic, including Hungary) consider it as a fundamental pillar. After lengthy discussions, the European Commission proposed in February 2022 that nuclear energy, along with gas, should also be considered sustainable in the EU during the energy transition, under certain conditions, which will be included in the EU taxonomy. Nuclear energy could be a key element in the transition to net zero greenhouse gas emissions in the near future. In Hungary, the Paks Nuclear Power Plant provides almost half of the gross electricity generation, and the Paks2 project is designed to ensure that the installed nuclear capacity of around

2000 MW will be maintained and even increased after 2035, when the current units are exhausted.

Protecting soil is as vital as conserving other environmental resources, as it allows us to access sufficient and sustainable food, preserve the planet's biodiversity and tackle the challenges of climate change. Forests play an essential role in protecting terrestrial ecosystems by retaining soil, limiting soil erosion, protecting built infrastructure and limiting sediment run-off into rivers and lakes. However, there is still room for increasing the proportion of forested and other wooded areas in Hungary, both in EU and regional terms. Similarly, we need to improve the rate of waste recycling and reduce the proportion of waste deposited on or in the soil, which is the most harmful to the environment and food production. Although the amount of waste generated is increasingly recycled, the average for Hungary and the V3 is below the EU average. In addition, in Hungary and the V3 countries, on average, around half of all waste is still landfilled or disposed of in soil.

Chart 1.3: Results of the MNB Sustainability Index and its 4 main pillars (2021)



Note: Scale range 0-100 points, where 100 is the best value
Source: MNB

The Sustainability Report also places a strong emphasis on responsible water management and keeping our waters clean, both for the water supply of households and agricultural land, and for the conservation of freshwater ecosystems. Hungary has a large groundwater reserve base and a high per capita water supply in international comparison. However, we are among the most vulnerable nations in the world in terms of our internal renewable water resources per capita, because 95 per cent of Hungary's water resources flow into the country from abroad. The renewal and availability of domestic water resources is essential for agricultural irrigation. In Hungary, currently just over half (53 per cent) of irrigable land is actually irrigated, which is around the average for the V3 (47 per cent) and the EU (58 per cent). A more efficient use of the available water

resources would significantly increase the productivity of domestic agriculture and its ability to respond to extreme weather conditions (erosion, flooding, drought) and climate change. In the case of irrigation, it is important to stress that unsustainable irrigation practices have already posed a serious problem in Hungary.

BOX 2: Households' attitudes towards sustainability

Long-term economic growth and sustainable development are inseparable and closely linked. The evolution of a country's economy and the steps it takes towards sustainability can be strongly influenced not only by public and business actors, but also by the everyday choices of citizens. For this reason, the MNB launched a programme called Családi Zöld Pénzügyek (Family Green Finances – CsZP in brief) on 1 December 2020, which is an integral part of the MNB's multi-dimensional work on sustainability.

In 2019, the MNB launched its Green Programme, which aims to provide a favourable regulatory environment for domestic financial institutions to promote sustainable operations and the introduction of green products. However, while promoting the supply of green financial products, it is also important to stimulate potential demand. One of the means to achieve this is to prepare and raise the awareness of economic operators targeted by green products, including families and households.

The MNB has launched the CsZP (Family Green Finances Programme) to support recognition of individual responsibility and the opportunity that finances can have positive environmental impact. The aim is to help households recognise that choosing budget-friendly financial solutions that also support sustainability, can help reduce their ecological footprint. On the other hand, they should also recognise that their investments can indirectly finance corporate investments in sustainability, and that their consumption choices can influence producers and service providers and indirectly accelerate innovation and the uptake of new solutions.

In recent years, several studies have been published on the attitudes of the Hungarian population towards sustainability. The results show that a significant proportion of the Hungarian population is concerned about the environment and that the willingness to take action is increasing. In many cases, however, concrete action is still missing. Already in a survey in 2019, 95 per cent of respondents said that they consider environmental protection important,[31] but real action does not necessarily follow. The latest research shows that people are now even more concerned about sustainable living and protecting our environment, and there has been an improvement in terms of actions. This is backed up by a December 2020 European Union survey which shows that Hungarian consumers' environmental awareness is not significantly below the European average, but that there is still room for further improvement in terms of concrete actions taken[32].

, Results show that Hungarians are most likely to take the following actions related to sustainable living: selective waste collection – (53 per cent), avoid single-use plastics (45 per cent) and save energy (38 per cent)[31]. The data underline the importance of an integrated approach, i.e. people are more likely to take actions that are supported by public incentives (selective waste management, limiting single-use plastics) and intensive communication. In response to a targeted question, 77 per cent of Hungarians said they would like the state to encourage the development of green financial solutions targeting consumers that support the take-up of sustainable, climate-friendly industries[33]. This confirms the interest in the topic, giving cause for optimism about future demand.

[31] Eurobarometer (2020): Attitudes of Europeans towards the Environment
[32] EC(2020): Key consumer data
[33] Greenpeace (2020): Public opinion poll on green economic recovery and green finance packages

The research studies show that the need for sustainable lifestyles is increasingly recognised by the Hungarian population and there is openness to make further progress in this area. However, lack of knowledge, financial means or even convenience in some cases can be barriers to this. The CsZP (Family Green Finance Programme) therefore aims not only to raise awareness but to shape attitudes. Research also shows that the majority of households are less aware of the link between investment opportunities and sustainability. To explore this among other things, the MNB conducted its own retail survey in the summer of 2021 as part of the CsZP, details of which are outlined in section 4.4.

Achieving a carbon-neutral economy and promoting the conservation of environmental resources will require a significant mobilisation of adequate financial resources. Environmental taxes are intended to make the biggest polluters in the economy pay for the use of our environmental resources. In Hungary, the share of environmental taxes in total tax revenue amounted to more than 6 per cent in 2019, slightly lower than the EU's and Visegrád countries' average of around 7 per cent. In terms of environmental expenditure as a percentage of GDP, Hungary's expenditure rate (1.7 per cent) is slightly lower than that of the EU (1.8 per cent) and the region (2.1 per cent), which also points to room for improvement. In terms of financial markets, raising funds through green bonds could help green economic investment. In Hungary, the state issued the first green government bond in 2020, followed by several corporate issues. Green bonds and government bonds are discussed in more detail in chapters 3.2.1 and 3.2.2. A challenging factor in the area of green finance is that a common EU taxonomy for green securities or green loans has only been developed in the context of climate change.

The Competitiveness Mirror published by the MNB monitors measures that promote circular economy and greening the economy in a separate chapter. The Mirror tracks the implementation of the 330-point set of recommendations listed in the MNB's Competitiveness Programme in 12 areas. As in previous reports, this chapter of the Mirror covers both government measures to improve energy efficiency and measures to green the economy (such as support for wind and solar power or increasing the recycling rate of waste). In the Competitiveness Mirror, a number between 1 and 3 in the header of each proposed measure listed indicates the priority of the measure (with 3 being the highest priority measure), while the colour of the header (red, yellow, pale green, green) indicates the degree of implementation.

The chapter devoted to sustainability shows that there have been several improvements in energy use, both in case of households and businesses. For example, a tender launched in July 2021 by IFKA Iparfejlesztési Közhasznú Nonprofit Korlátolt Felelősségű Társaság (IFKA Industrial Development Nonprofit Limited Liability Company), with a budget of HUF 1 billion, will help companies and sole proprietors to green their energy use by supporting the purchase of electric vehicles. In addition, a HUF 7.6 billion Digital Renewal Operational Programme Plus project, planned for 2021-27, could contribute to the uptake of energy auditing among SMEs and public institutions. The tender of the National Research, Development and Innovation Office (2021-2.1.1-EK) will support the development of excess electricity storage with a budget of HUF 6 billion. The diversification of Hungary's energy supply routes, and thus its energy security, will be strengthened by several projects, such as the two new 400 kV cross-border power lines linking the electricity systems of Hungary and Slovakia, which have doubled the capacity of electricity transmission between the two countries.

Energy efficiency improvements in the residential property stock can also be supported by the MNB Green Home Programme, the Green home purchase subsidy for families (HPS) and the renovation of energy systems in properties, launched in October 2021. The MNB's Green Home Programme provides a loan at a preferential rate for the construction or purchase of new near-zero emission properties and is accompanied by an interest-free green CSOK-loan (Housing Subsidy for Families) of up to HUF 15 million, as described in more detail in sub-section 4.2.3. The HUF 200 billion tender for the promotion of residential solar and heating systems combined with solar PV systems, announced by the government in October 2021, will also support energy efficiency improvements of real estate. However, little targeted action has been taken so far to deep renovate existing housing stock, which is largely poor in energy efficiency. The expansion of installed solar PV capacity (industrial solar parks and residential solar PV) is also in

line with the MNB's energy policy recommendations, reaching more than 2,000 MW by the end of 2020.

There have also been numerous developments in green economic measures, such as environmental investments, water utilities, e-vehicles and the development of agricultural irrigation. The Hungarian government has allocated significant resources for environmental investments by SMEs: the Green National Champions programme offers applicants a conditional non-repayable grant for greening their businesses, while HUF 8 billion is available for forest managers to protect forest ecosystems until the end of 2022. A total of HUF 95 billion has been earmarked in 2 applications to improve the infrastructure of water utilities and increase their efficiency, while HUF 367 billion will be allocated to improve the wastewater network between 2015 and 2023.

In addition, an increasing portion of the Climate and Nature-protection Action Plan was implemented during 2021. One of the most important elements of the Action Plan is the creation of a circular economy, with many single-use plastics (such as plastic cutlery and straws) banned from July 2021, and at the same time the government supports technology change in the companies affected by the ban. In addition, the “Let us Clean the Country!” programme aims to remove illegal waste from public areas between 2020 and 2022, while a law will severely punish illegal dumping. Another key element of the Climate and Nature-protection Action Plan is the electrification of transport, with the state providing HUF 7 billion in 2021 for electric cars, HUF 1 billion for electric bicycles and HUF 18.4 billion for electric buses since the programme's launch. Tenders to support the development of irrigation infrastructure will help adapt to climate change, with a total budget of more than HUF 100 billion until the end of 2022.

Two other publications published by the MNB, providing valuable and new information on the green economy, should also be highlighted. The Growth Report, published annually since 2014, presents a comprehensive overview of the development path of the Hungarian economy over a longer horizon and the most important factors determining this path. The analysis assesses Hungary's ecological readiness for the post-coronavirus period through indicators on the circular economy, green finance and electromobility, in addition to readiness in several other areas. While in terms of overall ecological readiness we are performing at a similar level to the EU average and above the V3 and Baltic averages, substantial room for improvement can be identified compared to the performance of the Nordic countries. The lesson of the Growth Report is that, in addition to a change in the mindset of economic actors, directed technology change is essential to make progress. The Productivity Report looks at the key sources of long-term growth and catching-up in the economy, including in detail the ecological efficiency of the economy. The publication presents a coherent methodology for measuring efficiency in a total of 4 areas (labour productivity, innovation, digitalisation and ecology). Hungary is at 89 per cent of the EU average in terms of eco-efficiency, but only about half of the TOP5 average.

2. MEASURING FINANCIAL RISKS AND NEGATIVE ENVIRONMENTAL EXTERNALITIES FROM CLIMATE CHANGE

Several methodologies already exist to quantify the risks from (GHG) intensive activities, one is the Bank Carbon Risk Index developed by the MNB, while the other is the weighted average carbon intensity indicator as recommended by the TCFD. A common methodology for measuring the carbon risks impacting banks' portfolios has not yet been adopted, but several calculation methods have been defined to quantify these risks. The MNB developed its climate risk grid by implementing new international methodologies to better measure the transition risk of banks' current portfolios. The climate risk stress test, on the other hand, aims to assess the longer-term risks of the Hungarian banking system and was conducted by the MNB for the first-time last year. The new methodologies can provide banks with guidance for their own practices, and their results can be used as a basis for business decisions, in addition to raising awareness. The MNB's self-assessment survey related to its **Guide on climate-related and environmental risks** has provided a number of lessons and experiences that can be well used by both the domestic banking sector and the MNB as a supervisory authority. The Hungarian banking sector has a long way to go, but several promising programmes and initiatives are already visible, and the bank action plans envisage further progress.

2.1. New methodologies for climate risk measurement – climate risk grid

The MNB has used internationally applied methodologies to assess the domestic banking system's exposure to climate change adaptation risks. Banks, as one of the most important actors in the economy, deserve special attention from a climate change perspective, as their financing activities have a significant indirect impact on the state of the environment. The analysis measures the extent of the transition risks built up on the balance sheets of credit institutions in Hungary in a way that allows the comparison of the results with other authorities' assessments, in particular the European Banking Authority (EBA). The year-end 2021 stock data used in the analysis include credit exposures of non-financial corporations and non-profit institutions serving households. The EBA's own survey was based on year-end 2019 exposures of 29 European banks, including only loans to large corporates operating in Europe.

Both methodologies on which the analysis is based relies heavily on the EU standard for the statistical classification of economic activities[34]. The first methodology uses these to classify activities into sectors affected by climate policies. The Climate Policy Relevant Sectors (CPRS) methodology has been adopted by a number of supervisory bodies and financial institutions. The CPRS approach assumes that sections of the economy whose activities involve higher GHG emissions will be more affected by regulatory action to mitigate climate change than their counterparts with lower emissions.

The methodology identifies six risk sectors (CPRS 1-6 exposures) which, by their nature, may be particularly affected by transition risks. All economic activities considered fall into three categories: (i) fossil fuel suppliers, (ii) electricity suppliers and (iii) fossil fuel or electricity users. All economic activities can be categorised according to the NACE Rev2 level 4 classification into a sector affected by climate policies or into other sectors. The methodology classifies business exposures into the following sectors: (1) fossil fuel, (2) utility provider, (3) energy intensive, (4) buildings, (5) transportation, (6) agriculture, (7) financing, (8) research and development, and (9) other sector. Of these, sectors 1 to 6 are deemed to be involve increased exposure to transition risk and will be referred to hereafter collectively as CPRS 1-6 exposures. Under the approach, sectors marked 7 to 9 do not carry transition risks.

After carrying off the CPRS classification of domestic credit exposures, 58 per cent of the banking system's exposures were classified as highly exposed to transition risks. This is consistent with the results of the EBA's[35] assessment. The analysis identified 58 per cent of bank credit exposures to large corporates in Europe as CPRS 1-6 exposures. In Hungary, the sectors most responsible for CPRS 1-6 exposures are real estate activities (33 per cent) and manufacturing (24 per cent),

[34] Nomenclature générale des activités économiques dans les Communautés - NACE)

[35] European Banking Authority (2021): Mapping climate risk: Main findings from the EU-wide pilot exercise

in contrast to the EBA survey, where the real estate sector is less represented in CPRS 1-6 exposures (22 per cent). The EBA results do not specifically mention the share of agriculture in CPRS 1-6 (it is included in the other category), but in Hungary, these loans are represented to a greater extent proportionally (Table 3).

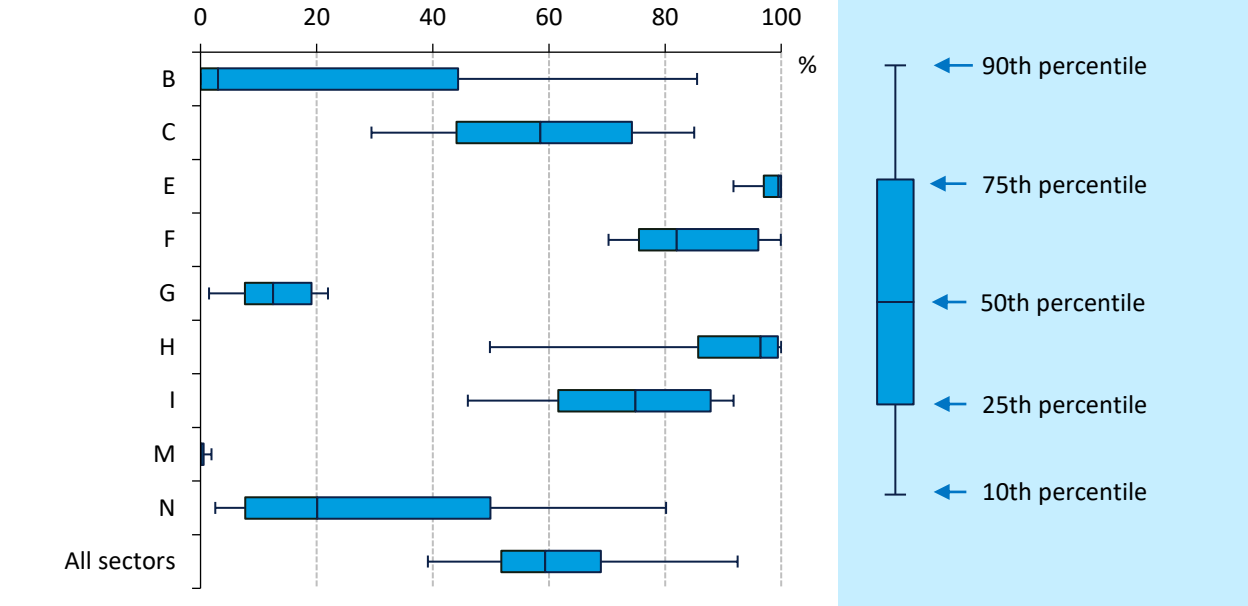
Table 3: Breakdown of CPRS 1-6 exposures by sections

Economic sector	Distribution of Hungarian exposure (%)	Distribution of European exposures (%)
A – Agriculture	8%	N/A
C – Manufacturing	24%	34%
D – Energy sector	6%	13%
F – Construction industry	8%	10%
H – Transportation and storage	9%	9%
L – Real estate	33%	22%
Other	12%	12%

Source: MNB, EBA

Economic sectors are affected differently by climate policies, with the most exposed sectors being agriculture, energy supply and real estate. In order to quantify the exposures, the MNB has examined the CPRS exposure of each bank within a sector relative to the bank's overall sectoral exposure. Chart 2.1 shows the distribution of the sectoral CPRS ratio of credit institutions, which can be interpreted as each institution's sectoral exposures being classified as either CPRS 1-6 or CPRS other, so that each institution's sectoral exposure ranged from 0 to 100 per cent, where 100 per cent means that the total sectoral exposure is CPRS 1-6 exposure. Only values between the 10th and 90th percentiles are shown in the charts to eliminate outliers. Several institutions have accumulated significant CPRS exposure within a sector. Half of the banks' exposures in the water and waste treatment, construction, transportation and warehousing, and accommodation and food services sectors account for more than 70 per cent of their CPRS exposures. This means that even more than 70 per cent of some banks' sectoral portfolios could be affected by the introduction of tightening sectoral regulations, impacting the ability of borrowers in the sector to meet their credit obligations. In both surveys, 100 per cent of exposures to sectors including agriculture, energy supply and real estate were identified as CPRS exposures, indicating that these activities could be entirely affected by future regulations.

Chart 2.1: CPRS 1-6 exposures in each section



Note: B – mining and quarrying; C – manufacturing; E – water supply; sewerage, waste management and remediation activities; F – construction; G – wholesale and retail trade, motor vehicle repair; H – transportation and storage; I – accommodation and food service activities; M – professional, scientific and technical activities; N – administrative and support service activities
Source: MNB

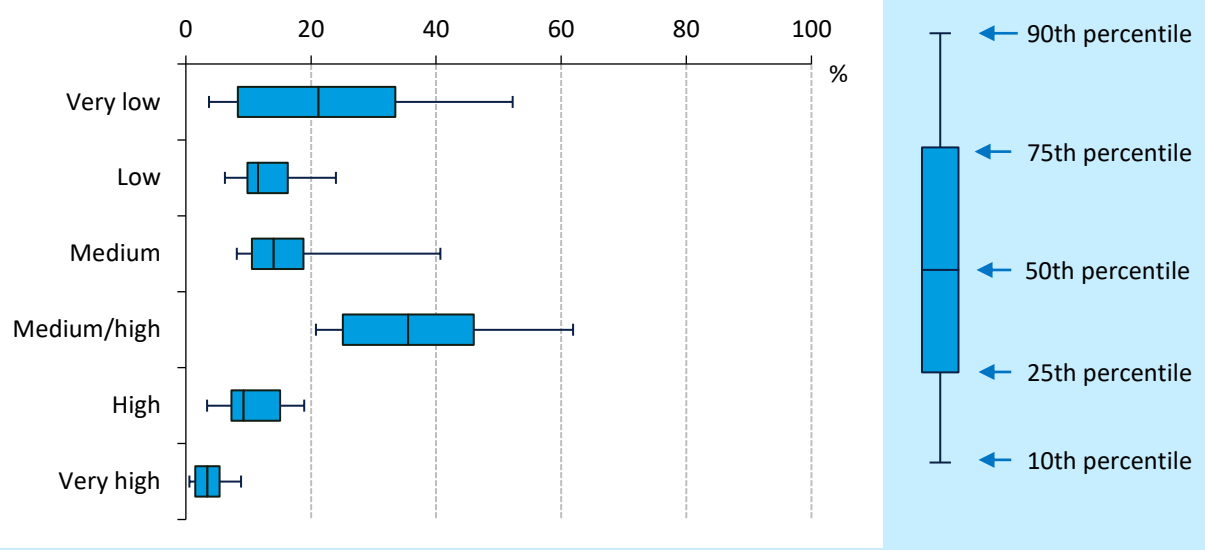
Half of the banks' exposures were identified as CPRS exposures at a rate greater than 59 per cent. 10 per cent of institutions finance sectors affected by climate change regulations with at least 93 per cent of their exposure. In the EBA's survey, the sectoral CPRS concentration of European institutions shows a similar result, with more than 70 per cent of the exposure of half of the banks in the manufacturing, water and waste management, construction, and transport and storage sectors financed by CPRS exposure.

Based on the EBA methodology, credit exposures were classified into six GHG groups based on available GHG intensity data. Using available GHG intensity data, the EBA methodology classifies bank exposures into six GHG groups: (i) very low, (ii) low, (iii) medium, (iv) medium/high, (v) high and (vi) very high. Corporate exposures are matched with their corresponding GHG intensity value based on NACE Rev2 Level 2 and then assigned to the appropriate group based on the criteria derived from the GHG intensities (Appendix 1). EBA also used individual corporate GHG emissions data in its analysis, resulting in more nuanced group thresholds in contrast to using only sectoral intensity data. For the MNB analysis, individual company emissions data were not available, so grouping was based solely on sectoral GHG intensity data published by Eurostat.

53 per cent of Hungarian corporate exposures finance activities above the median GHG intensity, which is significantly higher than the 35 per cent measured by the EBA. The discrepancy may be partly explained by the difference in GHG intensity data (individual-sectoral) used for grouping. Overall, it can be concluded that more than half of the corporate exposures may be affected by transition risks to varying degrees, based on GHG intensity. Although proportionally larger GHG exposures are measured compared to the EBA survey, in terms of GHG concentration, Hungarian credit institutions' portfolios are more diversified than their European counterparts (Chart 2.2) While half of the banks in the EBA survey financed activities with a very high GHG intensity with more than 10 per cent of their exposure, the median for domestic institutions in the same group was just over 3 per cent. However, it is important to note the outliers: 10 per cent of domestic institutions finance such activities with more than 9 per cent of their exposure, and the most polluting institution contributes 57 per cent of its exposure to highly polluting activities. The median value for the high category is above 9 per

cent, i.e. half of the institutions' portfolios finance activities with a high GHG intensity above 9 per cent, which is about the same as the EBA results. There are also institutions with outliers in the high category, with two institutions financing 35 and 33 per cent of such activities respectively.

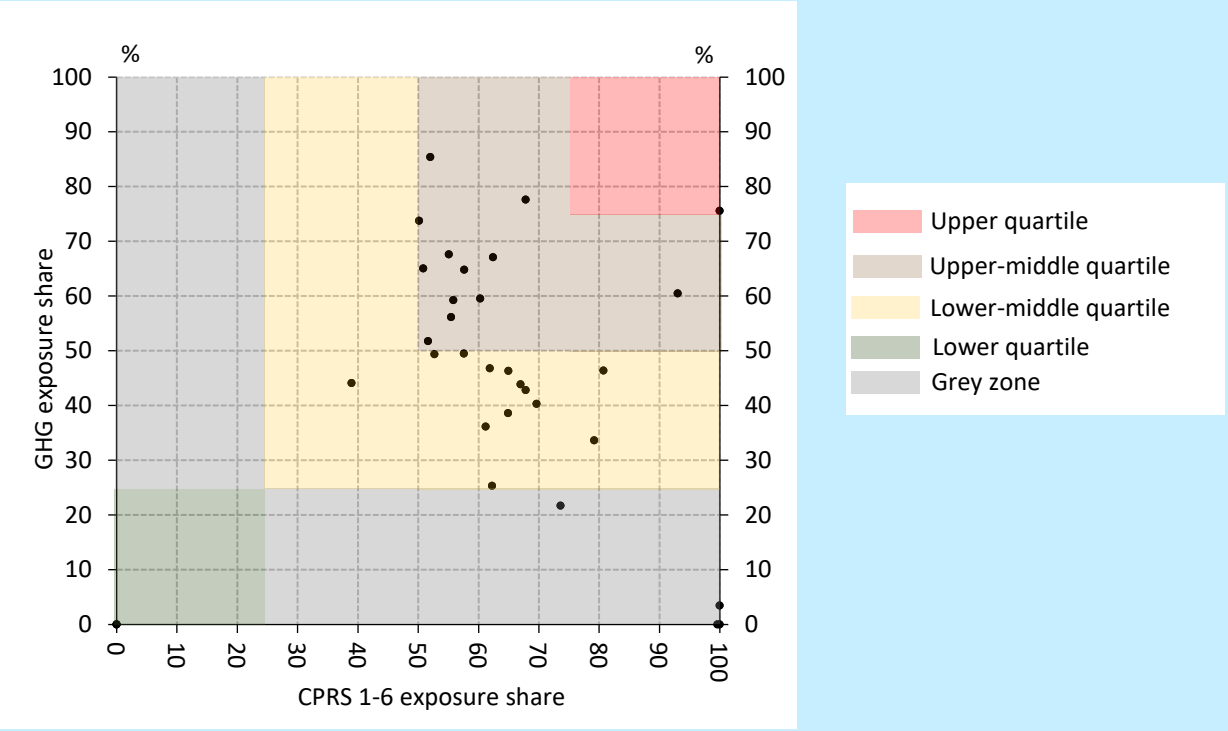
Chart 2.2: Distribution of bank portfolios by GHG groups



Source: MNB

Five exposure groups have been identified in the climate risk grid obtained by plotting the CPRS 1-6 exposures from the CPRS methodology and the median GHG exposures above the median GHG intensity from the GHG intensity grouping. While the two methodologies presented so far can be used separately to provide a picture of a portfolio's exposure to climate change risks, it is worth using them together to avoid omitting risky activities that only one or the other method can successfully identify. The risk exposure of individual institutions has been determined by the MNB by placing their exposure values on a scatter plot, where the X-axis shows the ratio of the bank's exposure value to its total corporate exposure as assessed under the CPRS approach and the Y-axis shows the share of exposures above the median GHG intensity in the total corporate exposure (Chart 2.3). In the resulting climate risk grid, the top quartile includes institutions whose portfolios finance at least 75 per cent of climate change exposed activities based on both GHG intensity and the CPRS methodology, accounting for 1.2 per cent of the domestic banking system in terms of total assets. The next group includes institutions whose exposures under both methodologies finance at least 50-50 per cent of activities exposed to transition risks and these account for a substantial share of the domestic banking system, with more than half of institutions, 54.6 per cent, falling into this category (Appendix 2).

Chart 2.3: Climate risk grid of the Hungarian banking system



Source: MNB

The methodology can be used to assess both systemic and institutional level transition risks. The methodology outlined above can be used not only to assess the riskiness of the corporate loan portfolio of the banking system as a whole, but also to assess the transition risks inherent in corporate loans at the institutional level. The two methodologies allow institution to assess which of its debtors are identified as risky by the CPRS methodology, which by GHG intensity and which debtors are identified as risky by both methodologies (or by neither). The advantage of the methodology is that it is an easy-to-implement analysis method, with both the table of correspondence for CPRS classification[36] and Eurostat sectoral GHG intensity data[37], updated annually, from which GHG groups can be calculated. In addition, institutions may have additional information on the activities of their debtors, whether it be multi-sectoral operations, individual emissions data or corporate climate adaptation strategies, thus refining the results of the baseline classification.

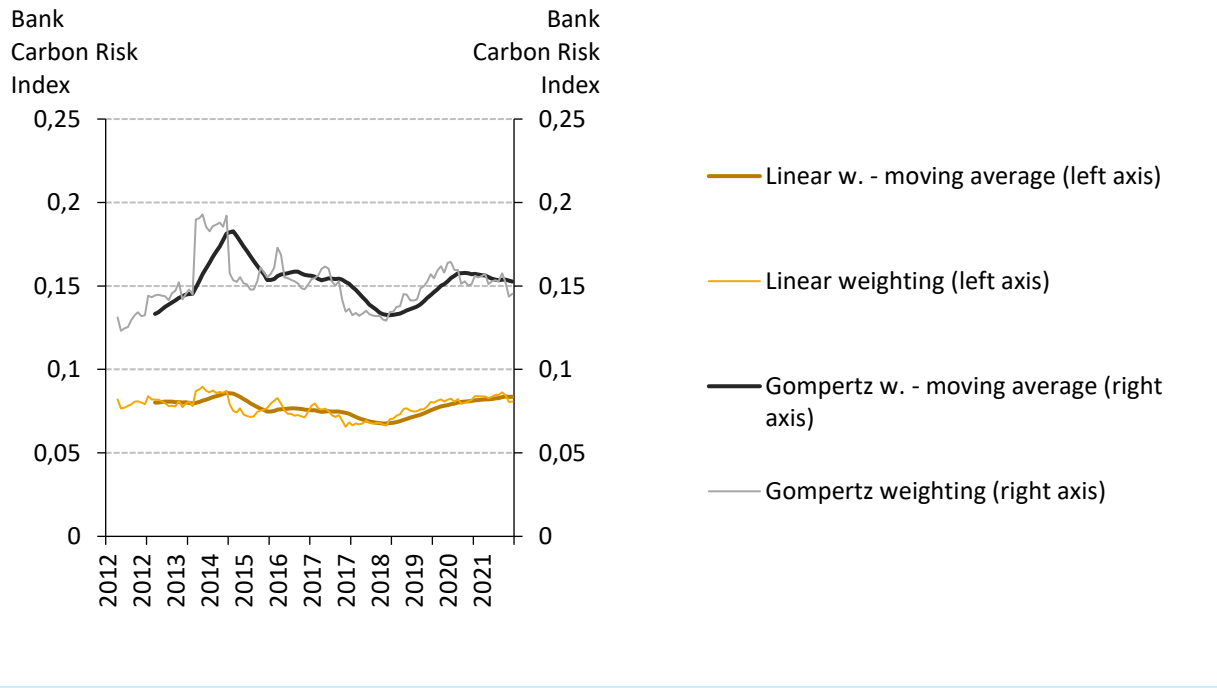
2.2. Development of the Bank Carbon Risk Index

The MNB uses the Bank Carbon Risk Index to monitor the build-up of transition risks in the banking system. The BCRI, previously developed by the MNB, is based on similar principles as the climate risk grid methodology presented earlier. The baseline assumption of the BCRI is that the transition risk impacting financial institutions is higher if their lending is more concentrated towards GHG intensive emitters. The Index continues to consider two scenarios. Linear weighting indicates the assumption that the GHG price will be sector-neutral, i.e. the risk is directly proportional to the intensity. The Gompertz weighting assumes that the measures will basically hit larger polluters, meaning that the relationship is not linear. Under the parameterisation used, it assigns similarly small and large weights to each activity above and below a certain emission level, separating outlier emitters from others.

[36] Center for Financial Networks and Sustainability (2021): Climate Policy Relevant Sectors

[37] EUROSTAT (2021): Air emissions intensities by NACE Rev. 2 activity

Chart 2.4: Monthly values of banking system BCRI with annual backward-looking moving average



Source: MNB

The value of the index covering the entire banking system was mostly stagnant in 2021, after an increase between 2019 and 2020, but showed a slight decline at the end of the year (Chart 2.4) Based on the chart, roughly 15 per cent (HUF 1512 billion) of the banking system's corporate credit exposures could be severely affected by regulatory actions (Gompertz function), while the linear function shows a very slight increase in risks compared to 2020, with more than 8 per cent (HUF 840 billion) of corporate loans being risky. The difference between the trend of the two functions is due to the fact that among the credit exposures of the most polluting sectors, the share of the most polluting sector D - energy supply increased the most, pushing up the linear value but not increasing the value of the Gompertz function[38], while the BCRI shares of the other polluting sectors (except agriculture) rather decreased (Appendix 3).

The annual variation of GHG intensity data has a large impact on the value of the Index, compared to the original Index values using GHG intensity data from 2017, the Index run with 2019 data measures lower risks for the banking system. The BCRI is also based on data produced by Eurostat, similar to the climate risk grid methodology. Data are generally available with a two-year backlog, with the latest available GHG intensity data for 2019. The observed trend is a steady year-on-year decrease in GHG intensity values compared to the first values in 1995. As a result, using recent 2019 data, the BCRI measures higher risk exposures in the banking system based on a linear function and lower risk exposures based on a Gompertz function (Appendix 4). The reason for this is that the largest polluting sectors have experienced a significant decrease in GHG intensity between 2017 and 2019, reducing the values obtained from the Gompertz function, while exposures to several less polluting sectors have increased, increasing the value of the linear function. The increase in the exposure share of sector D - energy supply, which is considered the largest polluter, also in this case pushes up the value derived from the linear function, while this deviation no longer changes the value of the Gompertz function. The contrast highlights that from a regulatory point of view it does matter how polluting companies are approached. A significant difference may arise from the fact that

[38] As the largest polluter, the exposures of sector D are already considered completely risky under the linear function, and therefore cannot be further "penalised" by the Gompertz function.

regulations affecting only large polluters or all polluters will be introduced.

2.3. Long-term climate stress test methods and results

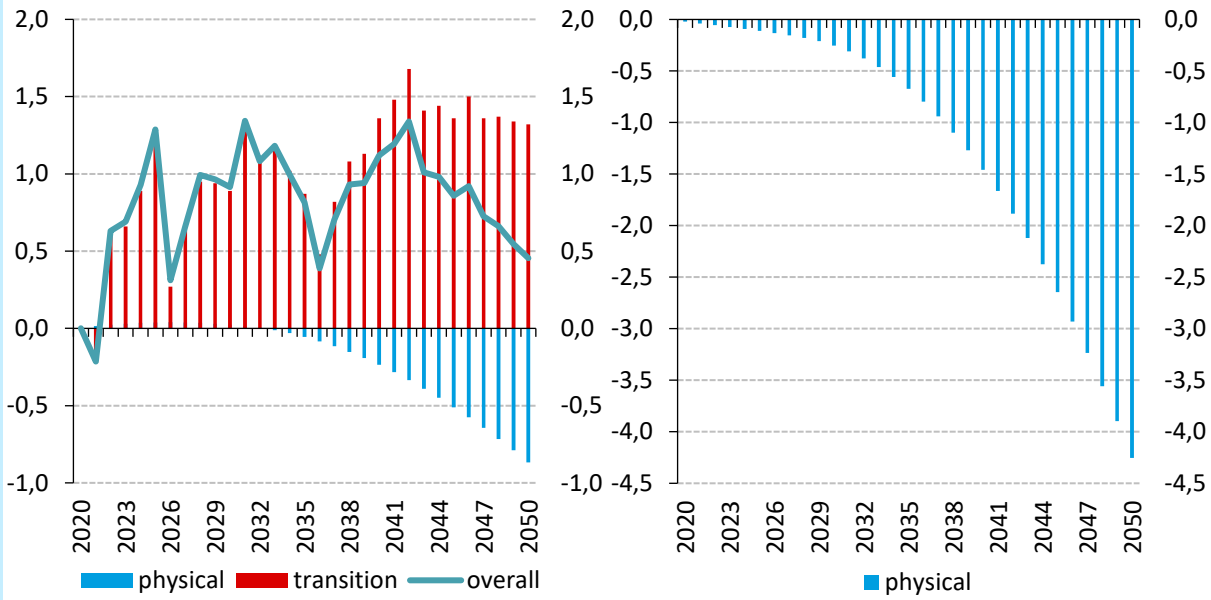
The impacts of climate change will also affect the banking system, and the MNB intends to lead the way by introducing climate stress testing of its lending activities. The physical risks increasing in the wake of global warming and the transition risks arising from measures to mitigate them are having an impact on all aspects of our existence, including the economy. However, the exposure of different economic actors is highly heterogeneous in space and time. Different default risk paths resulting from these differences will affect the position of lending banks depending on their exposure. At the global level, we are still at the early stages of the process, at the stage of knowledge accumulation. The current objective is therefore by no means to impose supervisory sanctions, but to raise awareness and engage with the relevant actors. The MNB is also part of this pioneering approach, having carried out its first thirty-year climate stress test focusing on banks' lending activities.

For a climate stress test of the financial system, we need to look at the climate-affected trajectories of the economy at the sectoral breakdown, allowing for feedbacks. Among the prerequisites, on the one hand, we need a model that can translate the evolution of climate drivers (e.g. atmospheric CO_2 concentration) into economic consequences. On the other hand, it must do so breaking down to sectoral level because of the different levels of involvement. Thirdly, there must be scope for feedbacks between the natural and economic modules, as this will ensure that the different physical and transition consequences of different policies can be derived simultaneously. For this purpose, the MNB's pilot project used the Cambridge Econometrics (CE) climate-integrated model and mapped the unfolding relationships from the three-decade forward trajectories of the macro and sectoral economic variables provided to the banking system lending plane.

The baseline Cambridge Econometrics model is used to run climatic scenarios, and three such scenarios were examined. CE's E3ME macro-econometric model, which has been continuously developed for 30 years, integrates global economic, energy and environmental processes. It provides the expected evolution of several aggregate (country/regional) and sectoral scale variables as a final product, based on assumptions on economic policy and regulatory actions and hence on the evolution of climate variables. Looking ahead to 2050, we consider three outcomes: orderly transition, failed transition and disorderly transition. For the MNB, CE has provided hypothetical paths in these three scenarios with an outlook to 2050.

In the orderly transition scenario, countries ratifying the Paris Agreement take further decarbonisation steps beyond their previous commitments. As a result, by the end of our century, global temperatures are expected to be less than 1.5 degrees Celsius above the “pre-industrial” levels of the second half of the 19th century. In this scenario, most sectors are assumed to be brought under the umbrella of a global emissions trading scheme, with rising carbon prices, renewables receiving large subsidies and back-feeding tariffs, stricter standards for the share of electric vehicles and biofuel blending rates, high levels of investment in energy efficiency, and significant investment in carbon capture and storage (CCS) technologies. Hungary-specific assumptions (in addition to those for the EU) are based on the adopted National Energy and Climate Plan (NECP 2020-2030). In this plan, subsidies and investments are solar-focused, i.e. wind power generation, for example, is strongly disadvantaged.

Chart 2.5: GDP impact of the risks of failed and orderly transition (percentages)



Percentage deviation from climate-free baseline

Source: MNB, CE

The counter to all this is the scenario of a failed transition, in which no new ambition is articulated beyond previous commitments. Previously announced climate and energy policy measures remain in place, but in the absence of further action, the global temperature increase will rise to 3.6 degrees Celsius. In other words, in this scenario, the EU Emissions Trading System (EU ETS) continues to operate at low carbon prices, with continued modest biofuel blending requirements and moderate subsidies for renewables and energy efficiency projects. The specific Hungarian assumptions remain based on the NECP 2020-2030, with slower carbon phase-out and more moderate solar investments.

The intermediate, disorderly transition presents a scenario in which adaptation to the principles set out in the Paris Agreement takes place, but the financial system responds only with a delay. By this we mean that the market will price in climate risks shock-like after 2025. Thus, in this scenario, compared to an orderly transition, excess physical damage can be avoided, but unexpected repricing will have negative economic consequences. In contrast to the first two scenarios, the latter scenario differs significantly in substance from the same named NGFS scenario, as it mainly reflects only temporary frictions.

To interpret the macroeconomic paths, including the switch between the different risks, the concept of a so-called "climate-uninformed baseline" should be introduced. This theoretical concept denotes the trajectory that would emerge in the absence of additional decarbonisation steps, but without the physically destructive consequences. That is, it is the failed transition scenario itself, free of physical risks. Chart 2**.5** shows the impacts projected by CE on Hungarian GDP in the two extreme cases. (CE data are modelled from 2019 onwards.)

In the case of a failed transition, GDP levels are expected to be 4.25 per cent lower by the end of 2050 due to the physical consequences of climate change[39]. But the way to get there is just as important because it is not a one-off negative shock in the distant future, but – in the case of no-action – from year after year there will be relative fewer and fewer goods to share.

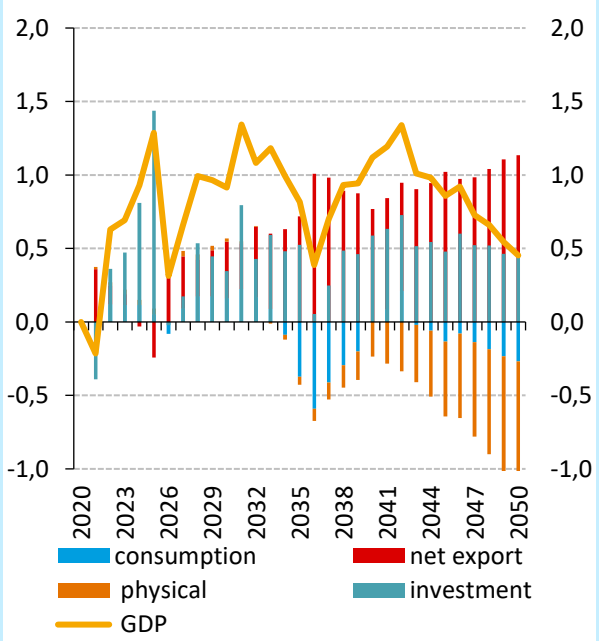
In the event of an orderly transition, the physical impacts would be significantly reduced as global temperatures increases more moderately. In fact, the CE

[39] Compared to the climate-uninformed baseline.

E3ME model explicitly shows that for the Hungarian economy as a whole, the transition is not a risk but an opportunity, as it will generate GDP gains. However, this also implies that according to the model, physical and transition risks are antagonistic for Hungary in at most some sectors. The combined effect of the risks is also positive, suggesting that an orderly transition to a climate-friendly globe is highly desirable for the Hungarian economy.

The transition could have positive benefits in terms of GDP at the macroeconomic level, as it has positive effects on the investment and net export components. Chart 2.6 shows the process in time, starting with increased investment in the sectors that are the focus of decarbonisation (including power generation, rail transport). Construction, metalworking and electronics manufacturing sectors will gain further opportunities from these investments. The transformation of the automotive sector to more fuel-efficient or electrically driven technologies will also provide a temporary boost to investment and external trade in related sectors. The situation of the fossil fuel extracting, and consuming sectors will deteriorate, but the trade balance is greatly improved by the declining imports of fuels, and even increases the income of the population that can be spent on other products.

Chart 2.6: Decomposition of GDP effects



Source: CE

The increase in disposable income will stimulate mainly output in the agricultural, food industry and consumer goods sectors. The increasing consumption hypothesis is also supported by the model assumption that the revenues from the carbon tax are used by the government to reduce one-to-one value added taxes. In the later stages, however, the catching-up of energy efficiency investments will have a moderating effect on consumption, but the resulting GDP effect will be kept positive by net exports. It is important to stress, however, that the assumption of the orderly transition model scenario is based on *all countries* and *international organisations* delivering on their commitments.

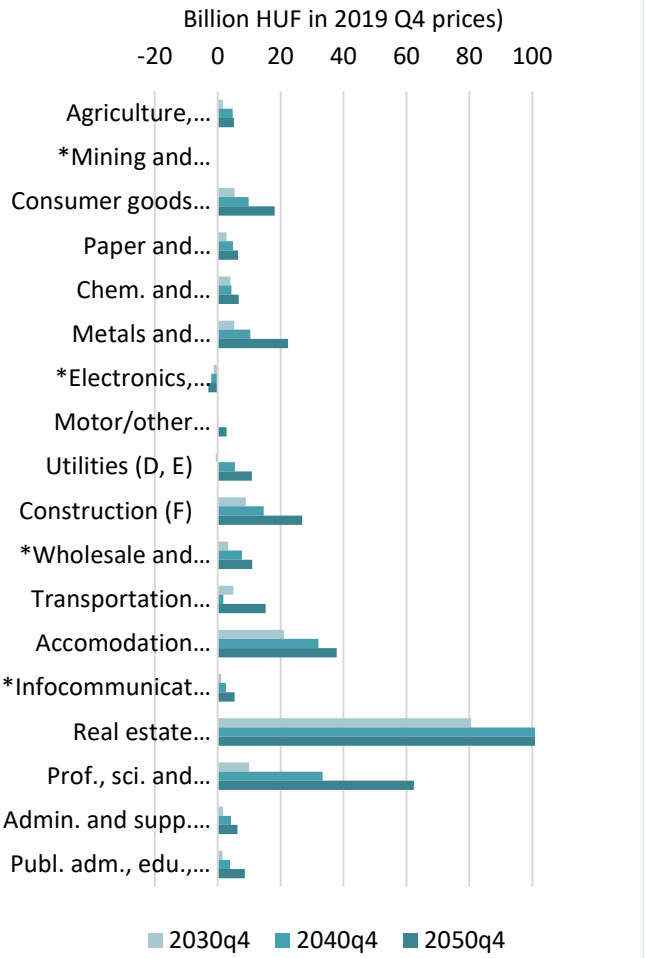
The focus of the MNB's climate stress test is on the non-performing loan ratio. The Non-Performing Loan (NPL) ratio, which is a key indicator of financial stability, can be considered relatively autonomous for the purposes of the analysis. Empirical evidence shows that the ability to pay is positively related to economic growth. While relaxing or tightening credit rating criteria may of course indirectly affect the probability of default, all other things being equal, weakening the validity of the previously observed correlation between economic conditions and ability to pay, in practice, the need to comply with capital requirements and the objective of profit maximisation leaves less room for such discretionary behaviour. Although other possible indicators are also affected by economic cycles, they are also significantly influenced by other motives. For example, pre-tax profit is affected by banks' decisions on provisions (e.g. for expected loan losses) or write-offs. Retained earnings are also determined by decisions to pay dividends. Capital adequacy is influenced by the capital injection decisions of the foreign parent bank (which, in addition, may operate in a very different macroeconomic environment). Accordingly, it seems less plausible to try to explain these variables by observable economic variables alone.

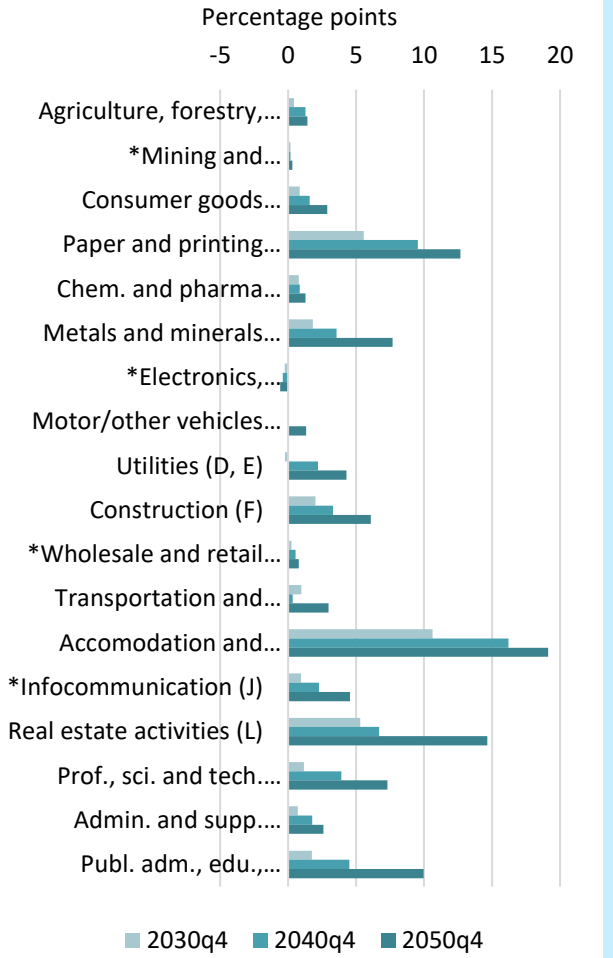
In the modelling, the relationship between the available sectoral variables and the NPL rate is estimated directly. The NACE rev. 2 code was used, similar to the Climate Risk Matrix and the Bank Carbon Index, also for the long-term climate stress test. Given that the CE data reporting aggregates the 99 sectors into approximately twenty groups, mostly into industries, this implies the estimation of close to twenty models. That is, emissions, investment, etc. data for nearly twenty sector groups need to be placed in context with default rates for the same sector groups. The models thus estimated are used to produce

conditional point forecasts of NPL ratios for all three scenarios.

The inverse relationship between the cyclical situation and the default rate can be reliably captured from the models. That is, in a relatively less favourable income trajectory, higher NPL rates can be expected, depending on the sensitivity. Chart 2.7 shows the differences in the estimates of the failed transition compared to the estimates of the orderly transition for each sector of activity.

Chart 2.7: Excess NPL rates and excess risks of failed transition





Compared to an orderly transition, excess NPL ratios are on the left and excess exposures, in forint terms, are on the right.
Based on fixed, Q4 2019 loan balances.
* The values of sectors marked with an asterisk are statistically insignificant (α=0.05)
Source: MNB

The result shows that the different global future paths mean that domestic companies operating in different industries, and therefore the banks that lend to them, have very different repayment capabilities. In the event of a failed transition, for example, the accommodation and food services (I) sector could see a surplus in default rates of almost 20 percentage points by 2050, due to the lagged positive effects of the transition and higher physical risks. By contrast, in real estate (L), for example, the benefits from the transition are minimal, so that the equally high divergence in default rates is partly due to higher physical risks and partly to slightly higher cyclical sensitivity. The similarly high deviations for paper and reproduction (C17-18) are explained by a very high level of lost profit and low cyclical sensitivity.

A failed transition carries increasing excess risks over time, and in some sectors these risks are very substantial. These nominal excess risks can be seen on the right-hand side of Chart 2.7**Error! Reference source not found.**, based on the loan stocks in the last quarter of 2019. The results cannot of course be taken out of context, for example, a difference of a given magnitude

has a significantly different message in an industry where the risk of non-performance is typically high than where the opposite is “normal”. Also, the excess risk will be material or less threatening depending on the weight in the portfolio of the bank/banking system. In the case of real estate (L), the huge loan stock and the strongly diverging NPL ratios in each scenario lead to a spike in the risk-weighted exposure. Although the NPL rate surplus for professional, scientific, and technical activities (M) is much more moderate, its loan stock is among the largest, so its high ranking is not surprising. Accommodation and food services (I) has significantly lower loans compared to the previous branches, but its excess NPL ratio is the highest.

In the event of a failed transition, the potential loss at the level of the national economy would be close to half a trillion forints by the end of 2050. We should note, however, that this is a severe underestimate, as it does not consider the loan stocks rising in line with economic growth. For example, by dynamizing sectoral loan stocks with underlying sectoral growth (i.e., assuming stability in the ratios of loan stocks to gross value added along the stress path), the overall HUF value at risk is one third higher.

The analysis shows that, in terms of risks, the most important issue for Hungary is which path the committed countries are collectively taking now and in the near future. The fact that there are certainly positive gains from the transition, which may dampen, and in some cases overcompensate for, the negative effects, even at the level of the national economy, is a lesson to be considered and thus an incentive to act. In doing so, as mentioned, it is important for lending not simply to be selective in terms of carbon neutrality - seeing that it is precisely the transition that can be capital intensive - but to be a new aspect of banks' risk analysis. These quantitative exercises aim to raise awareness that risks exist, can vary widely across the spectrum, and consequently their management is an aspect to be incorporated into banks' long-term risk management. The present analysis seeks to promote this and stresses that it is a regulatory task too, to which the most basic condition is the creation of measurability.

2.4. The sustainability of the Hungarian banking system in the light of the MNB's Guide on climate-related and environmental risks

The MNB was among the first, even by international standards, to issue a recommendation to credit institutions on the integration of sustainability considerations into their operations. In line with the practice of the European Central Bank, the MNB sets out prudential requirements in its Guide, with a focus on identifying, quantifying and managing sustainability and climate risks and integrating them into their business operations. The MNB's Guide on climate-related and environmental risks (the Guide) serves a dual purpose: on the one hand, the application of the expectations and best practices it sets out will improve banks' resilience to financial risks arising from climate change, and on the other hand, it provides forward-looking guidance for compliance with EU legislation expected in the coming years. The open communication of the expectations of the central bank as a supervisory authority will help to ensure a consistent application of the relevant legislation and its predictability.

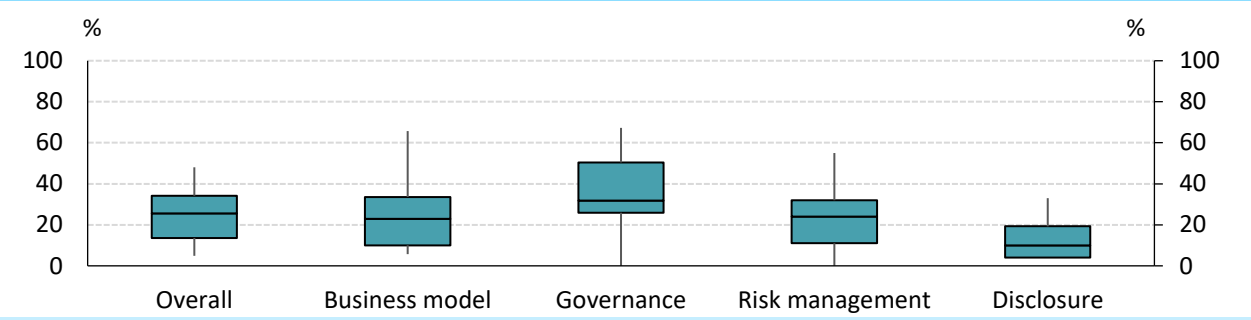
The Guide sets out expectations for managing financial risks arising from climate change and other environmental causes under four headings: business model and strategy, corporate governance, risk management and disclosures. The first logical “step” is to consider the risks from climate change and environmental degradation when designing a business model and strategy. The Guide points out that identifying and managing climate risks should be an integral part of corporate governance and internal processes. These activities are expected to be coordinated by a dedicated department or manager and to be regularly communicated to the management body. This should be accompanied by the quantification of physical and transition risks related to climate change, their integration into the institution's risk management framework, the disclosure of metrics and indicators related to environmental risks assessed as relevant to the institution[40], including the institution's own and funded GHG (greenhouse gas) emissions, and the communication of the contribution to sustainability goals. In addition to the thematic expectations reflected

[40] Institution shall mean the credit institutions subject to the Guide.

in the Guide, the MNB has required all Hungarian credit institutions to develop an action plan for sustainability transition.

In 2021, the MNB carried out a self-assessment questionnaire to assess the domestic banking system's preparedness for climate risks. The self-assessment questionnaire, following the chapters of the Guide, goes through the different topics, examining the level of preparedness from several aspects. Banks completing the questionnaire were also required to provide documentation in support of their answers, including the measure concerned. The questionnaire was completed by 21 domestic credit institutions with a combined balance sheet total of HUF 62,699 billion, representing 84 per cent of the Hungarian banking system's cumulative balance sheet total.[41]

Chart 2.8: Distribution of Guide on climate-related and environmental risks compliance ratings



Source: MNB

The MNB has quantified the responses to the questionnaire using an assessment methodology and aggregated them by topic, resulting in the percentage compliance rates assigned to each credit institution (where 100 per cent represents full compliance). Overall, Hungarian banks achieved a compliance rate of around 25 per cent, which is a low but regionally representative level of preparedness. The issue of climate risk measurement and other elements of the Guide are new to banking operations and should make significant progress in the Hungarian banking sector in the coming years. Interestingly, banks rated their own compliance at around 35 per cent on a self-reported basis, indicating that although they perceived their performance to be more advanced on certain points, overall, they are aware of their shortcomings. The aggregated compliance rates by topic following the analysis, monitoring and in some cases review of the self-assessment questionnaires by the MNB are presented in Chart 2.8 grouped by topics. On the box plot, the endpoints of the narrow line indicate the lowest and highest scores awarded to institutions by the MNB, and the horizontal lines of the boxes indicate the first, second (median) and third quartiles. The largest shortcoming of the domestic banking system as measured by the survey is the area of disclosures, but institutions typically performed better in corporate governance compared to other categories. In terms of climate risk, the lack of reporting containing accurate data on climate risk can be a particular problem for the sustainability shift, as accumulating the relevant data is one of the first building blocks for the green financial transition.

Looking at the sectoral results from a different perspective (Chart 2.9), it can be seen that institutions with a larger balance sheet total performed stronger in all other categories except disclosures. This may be explained by the economies of scale of large banks, i.e. the proportionately lower resource requirements to develop, for example, a comprehensive green strategy or a dedicated unit, compared to smaller institutions. In institutions with a foreign parent bank, sustainability policies may be defined at group level through the implementation of internal policies, or the relevant knowledge itself may be “imported” from the parent bank. However, it should be noted that medium-sized institutions are not significantly lagging behind large banks. In the rest of the chapter, the main findings of the

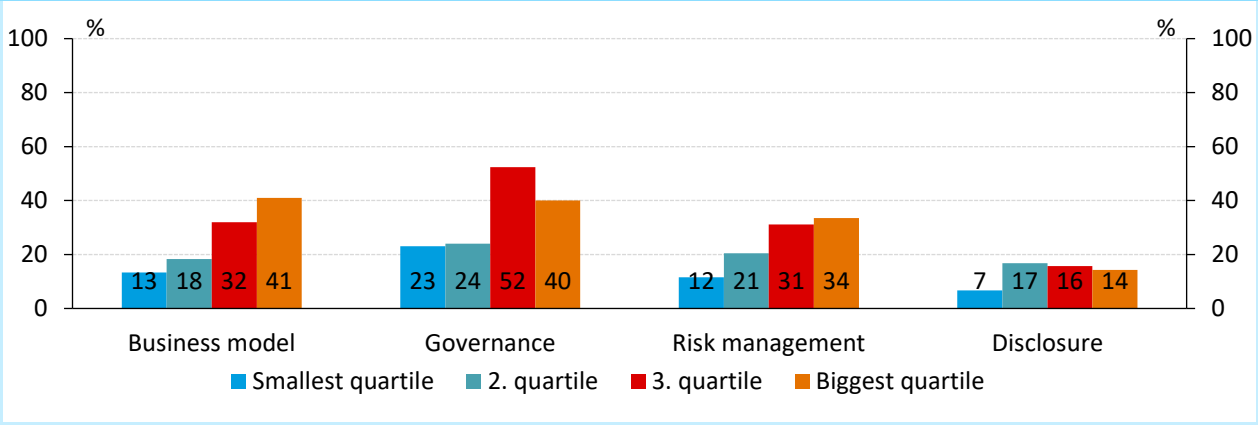
[41] The Hungarian branches of foreign credit institutions, guarantee institutions and foreign subsidiaries and branches of domestic banks are not subject to Recommendation No. 5/2021 (IV. 15.) of the Magyar Nemzeti Bank.

self-assessment survey are presented according to the topics of.

2.4.1. Mainstreaming sustainability into the business model and banking strategy

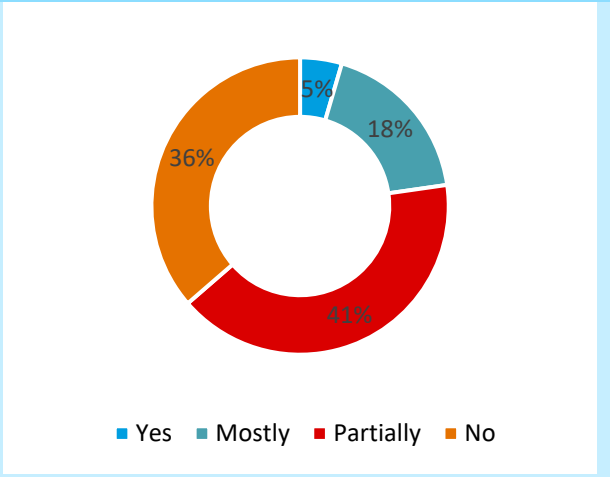
Environmental and climate related risks can have a direct impact on the effectiveness of a credit institution's existing and future strategy and the resilience of its business model. According to the Guide, when assessing the business environment, the MNB expects credit institutions to identify risks from climate change and environmental degradation at the level of key sectors and geographical areas, taking into account that some of these risks may materialise over a fairly long time horizon. While climate change and environmental degradation pose significant risks, efforts to mitigate or avoid adverse impacts can be seen as a business opportunity. While adaptation in a "greenhouse planet" scenario requires mobilising huge financial resources, a successful green transition cannot be achieved without the contribution of the financial intermediary system.

Chart 2.9: Average Guide on climate-related and environmental risks compliance ratings by category and by bank size



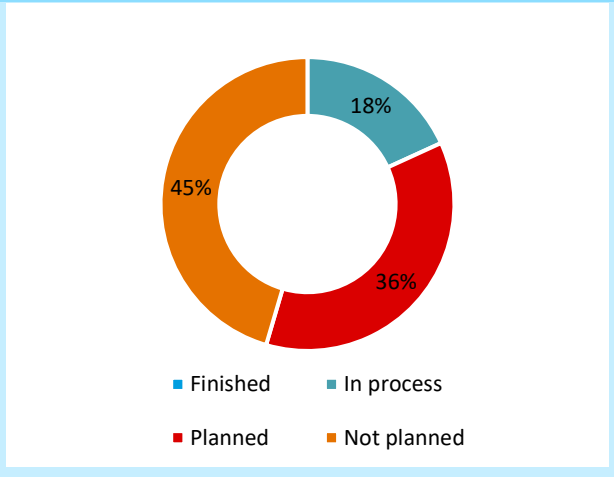
Source: MNB

Chart 2.10: Proportion of banks with processes in place to identify climate change risks



Source: MNB

Chart 2.11: Percentage of institutions which updated their business strategy with environmental risks



Source: MNB

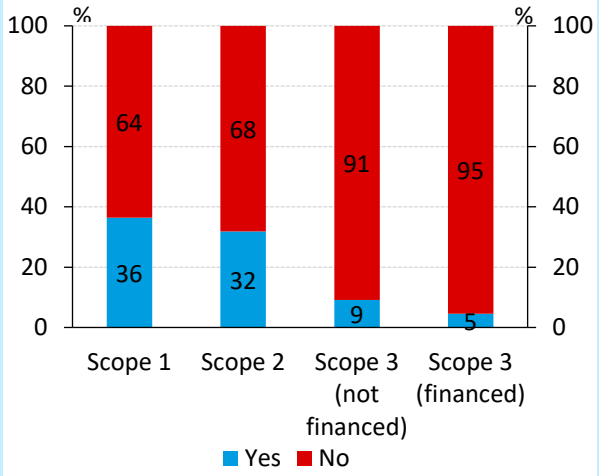
In order for banks to address threats to sustainable operations, it is of paramount importance that institutions are able to identify risks arising from climate change. Taking these risks into account is a crucial prerequisite for sustainable operations when implementing business planning and risk management. In this respect, the institutions surveyed are still at the beginning of their journey, with 77 per cent of respondents having no or only partially developed processes by the end of September 2021. For systemically important institutions[42], the picture is more positive, with 62 per cent of these institutions already have mostly developed the necessary processes. In terms of balance sheet total, half of the institutions in the range above HUF 3,500 billion have already identified or are in the process of identifying climate risks.

The identification of risks at the process level allows their integration into the business strategy. In order to create a sustainable banking system, in addition to "green" business opportunities, institutions need to consider material climate risks in their business planning. This also implies the emergence of longer business planning horizons, as some of these risks are expected to materialise over the longer term. The results of the survey reflect that while five domestic institutions are at the forefront of process-level risk identification practices, fewer have managed to integrate these elements into their business strategy. Four of the systemically important institutions surveyed are in the process of revising their business strategy, while the remaining banks are only at the planning stage or have not yet developed plans to implement such a measure.

In order to integrate risks into the business strategy, it is recommended to define sustainability and climate risk performance indicators tailored to the business profile of the institution. This can be achieved at a more advanced stage of the revision of the strategy in terms of sustainability. Among the banks updating their business strategy to take account of climate risks, only one institution has developed quantifiable performance indicators, but these indicators have not yet been disaggregated to business line and portfolio level.

[42] In Hungary OTP Bank Nyrt., UniCredit Bank Hungary Zrt., Kereskedelmi és Hitelbank Zrt., Erste Bank Hungary Zrt., Raiffeisen Bank Zrt., MTB Zrt., CIB Bank Zrt., MKB Bank Nyrt.

Chart 2.12: Percentage of banks that quantify their emissions



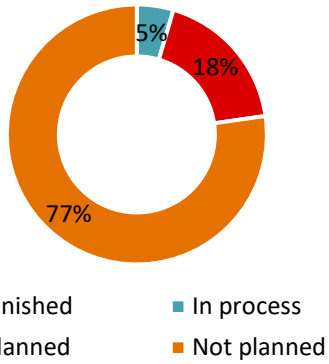
Source: MNB

In the context of strategic thinking, an important criterion for conscious and sustainable operation of a bank is its ability to measure the amount of GHGs produced by its own operations and energy consumption, as well as its indirect emissions. This includes the GHG emissions of the assets and investments financed by the bank. While measuring the latter (Scope 3) is more difficult, measuring own direct emissions (Scope 1) and indirect emissions (Scope 2) is easier. These steps are essential to get a complete picture of the environmental impact of a company's, in this case a bank's, operations. Measuring own GHG emissions is a necessary but not sufficient condition to achieve carbon neutrality. Companies that are not aware of their own negative impact on the environment are exposed to higher reputational and legal risks. Therefore, in addition to the ability to quantify emissions, it is important that market players have access to this information.

A common barrier to quantifying GHG emissions is the availability of data, particularly for Scope 3 emissions. Scope 3 emissions are made up of several elements, such as emissions from business travel or from purchased products, but most importantly for financial institutions, emissions from financed emissions. While roughly one third of institutions are able to quantify their own emissions (Scope 1 and 2), only one of the respondents measures financed emissions for certain portfolios. Experience so far[43] suggests that Scope 3 emissions from productive companies account for around 90-95 per cent of total emissions, but for banks the proportion is higher, as the operations of banks are not resource intensive per se. For example, the Scope 3 financed emissions calculated by the Equitable Bank of Canada account for 98.5 per cent of total emissions. This clearly illustrates the need to quantify financed emissions.[44]

The Hungarian market is also at an early stage for the disclosure of Scope 1 and 2 GHG emissions, with only a few institutions making Scope 1 and 2 GHG emissions available, but there is no domestic example of disclosure of financed emissions. Although less pronounced for banks, operational risks may increase more significantly for institutions that are unable to quantify and then reduce their demand for resources and GHG emissions.

Chart 2.13: Percentage of banks with a transition plan setting climate targets



Source: MNB

The scarcity of available data and other data constraints make it significantly more difficult for banks to develop carbon neutrality plans, i.e. to reduce and neutralise their GHG emissions in a timely manner. Their wider implementation is expected to take longer. It is important to note that carbon neutrality does not only mean reducing and offsetting banks' own emissions, but also reducing financed emissions to net zero. This is not possible of course without decarbonising the economic system.

Although only one institution is implementing a carbon neutrality plan, based on the data available at the time of analysis, 3 institutions have announced by the end of 2021 that they will achieve carbon neutrality by the end of that year by neutralising some of their direct

[43] For example: MOL Group, TotalEnergies, Danone

[44] Equitable Bank (2021): Equitable Bank Quantifies Entire Scope 3 Greenhouse Gas Emissions Portfolio

emissions. However, it is important to see that achieving carbon neutrality, including financed emissions, is a fundamental objective of international and domestic climate policy for the mid-century, and therefore the preparation of robust and well considered plans is essential. However, detailed information on how this is to be achieved is not available to the public, which could certainly be - as a good example - a catalyst to positive market developments and carbon neutrality.

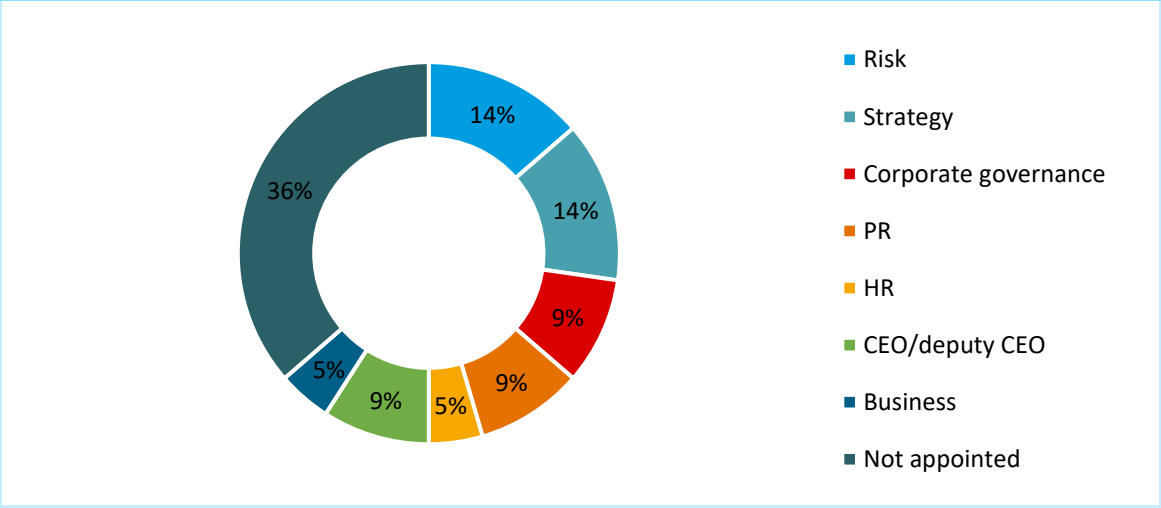
Based on the findings of the survey, only two domestic institutions operate an environmental management system according to an internationally accepted standard, which is a "best practice" for measuring GHG emissions. Almost three quarters of the respondents do not even plan to adopt such a framework. Smaller institutions may have a high compliance burden for certain standards and processes, while institutions with a foreign parent bank may "inherit" a framework tailored to the needs of the international banking group.

2.4.2. ESG risk management in corporate governance

The MNB considers it important that the governing bodies of the bank have a thorough knowledge and understanding of environmental and climate related risks. This will ensure that the level of risk taken by institutions is indeed in line with their risk-taking strategies and internal rules. These risks are typically not yet included in these frameworks, but their impact can be felt by all institutions, even in the short term. It is therefore of paramount importance that climate change and environmental risks are included in the responsibilities and tasks of internal management and internal control functions, defining the relationship of the overall operation to sustainability.

The MNB expects domestic banks to designate a manager responsible for sustainability within the institution or to set up a dedicated unit for this purpose. For smaller and less complex credit institutions[45], the MNB does not require the establishment of a dedicated unit or working group on the basis of the proportionality principle, but only the appointment of a responsible ESG manager. Half of these institutions have appointed a manager responsible for the management and control of climate and environmental risks, but the range of appointed managers is much more heterogeneous. In all but one of the small institutions, the management bodies with governance powers are regularly informed, and there are also banks among these institutions where a special ESG programme has been set up.

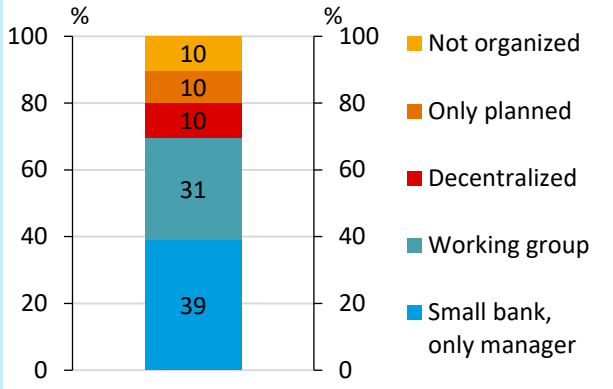
Chart 2.14: Domain of managers responsible for environmental risks



Source: MNB

[45] Banks included in the questionnaire survey that are not systemically important institutions.

Chart 2.15: Form of the organisational unit responsible for environmental risks

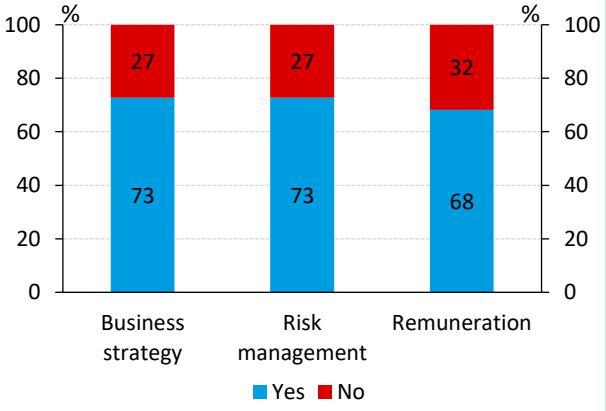


Source: MNB

The majority of the eight systemically important institutions have implemented significant organisational reforms in their internal governance systems in line with the requirements of the Guide. Seven of these institutions have appointed a manager responsible for the management and control of climate change and environmental risks, while the majority have assigned responsibilities for the ESG framework to the head of risk management or the strategic manager. Four out of these eight institutions have decided to set up ESG project or working groups to oversee and coordinate the sustainability-related activities and projects of the credit institution, supporting the role of the appointed manager. At two of these credit institutions, ESG risks are broken down by business unit and each business unit manages the risks separately and within its own competence as part of its day-to-day operations. In addition, six systemically important credit institutions have established internal processes through which governance bodies receive regular reports on climate change and environmental risks material to the institution.

From an ESG perspective, the responsibilities of internal control areas do not seem to have been defined in the majority of domestic institutions. Among all the credit institutions surveyed (21 respondents), two institutions have modified the scope of internal control and two additional institutions have indicated that from 2022 onwards, the annual internal audit plan will include the review of ESG risk-related activities. In 5 per cent of the credit institutions, ESG factors have been added to the scope of the compliance area, but the ESG risks have not yet been added to the management information system at any institution, although 28 per cent of the institutions are in the process of doing so. Institutions are yet to develop internal control systems that take into account climate change and environmental risks in a comprehensive way. The European Central Bank's survey shows that there is also a large deficit at EU level. The responsibilities of the risk management area and the area responsible for the risk control function have been defined in six institutions, four of which have a risk area manager as a member of the working group set up.

Chart 2.16: Development of responsibility for the followong areas



Source: MNB

The Guide expects that sustainability-related factors should be considered in remuneration policies, as this will help to shape the motivational environment and organisational culture. Remuneration policies should be in line with the bank's risk management and business strategy, therefore changes in these areas should be made first before any changes to remuneration policies. Chart 2.16 clearly shows that a number of banks are already in the process of changing their business strategy and/or risk management policy. In addition, there are plans to update the remuneration policy, but only after the adoption and implementation of changes to the business strategy. It can be seen that 27 per cent of credit institutions have not yet started to revise their business strategy and risk management policy, partly due to a lack of risk assessment or data, and therefore the remuneration policy is still to be revised.

Three systemically important credit institutions are in the process of revising their business strategy and risk management policies to take account of ESG risks, or have already done so. In line with this, the remuneration policies in these institutions have already been adjusted. The Hungarian subsidiaries of foreign credit institutions follow the guidelines issued by the parent bank, thus importing best practices. In addition, two systemically important and two small credit institutions are in the

process of revising their business strategy and risk management strategy to include ESG risks, and have already included ESG risk-related performance indicators in the remuneration of senior management.

Overall, it can be concluded that management bodies with supervisory powers have a rather limited insight into ESG risks and are often unable to effectively exercise their monitoring function in this respect. There are ten banks where the management body with governance powers receives regular reports on climate change and environmental risks and, on the basis of this information, has started or plans to develop a business strategy, risk management policy or risk appetite framework reflecting ESG risks. Although four of the responding credit institutions have not yet established a system whereby the management body with governance powers receives regular reports on climate change and environmental risks, the identification of ESG risks and the resulting changes to internal policies are underway.

32 per cent of credit institutions have not yet started to revise their business strategy, risk management policy, risk appetite framework and remuneration policies to take ESG risks into account. However, a process is in place to regularly inform the management body with governance powers. In seven of the systemically important credit institutions, the identification of ESG risks and the subsequent revision of these internal policies based on this are already in progress or at least have plans prepared by the institutions. Among the small banks, only half of the institutions have plans or are in the process of revising these policies and frameworks. The prevailing trend at EU level with regard to the revision of business strategies according to sustainability criteria also well describes the situation in Hungary: At EU level, 40 per cent of institutions while in Hungary 45 per cent of banks have a revised business strategy in progress or in a completed status.

Effective governance structures are data-driven, so it is essential to build appropriate data taxonomies, assess potential data gaps and develop a plan to eliminate them. In general, the actors in the domestic banking system are facing serious data gap problems, but not all of them have started to assess the gaps. On the one hand, this is due to the higher priority given to organisational reforms, which are often a prerequisite for building new types of data warehouses. On the other hand, some of the specialised credit institutions included in the survey and institutions in the process of change of ownership are lagging behind in terms of organisational restructuring.

2.4.3. Integrating climate risks into bank risk management systems

Banks face several risks in their lending and investment activities, but also at the operational level. Therefore, the quality and completeness of banks' risk management framework are of utmost importance. Since the Guide approaches the progress of sustainable banking through the assessment and quantification of risks stemming from climate change and environmental degradation, the expectations for banks' risk management systems are the key focus of the Guide. The first step in updating risk management practices and methodologies is to create processes to identify climate-related and environmental risks. As reflected in the section on business model development, 36 per cent of responding banks have not yet developed – not even partially – processes to identify relevant climate risks. Currently, only 23 per cent of banks have processes in place to identify climate risks. Thus, five banks can reasonably be expected to have the ability to quantify material risks after identifying them. However, these institutions do not have a holistic approach, as they do not always consider transition and physical risks together, focusing only on specific business lines, portfolios, and in most cases the largest transactions and clients are included in the analysis.

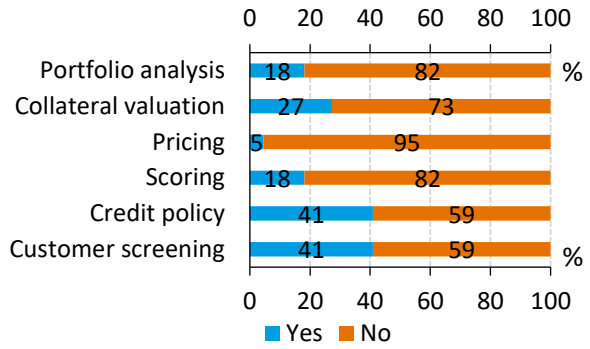
For credit institutions, credit risk is clearly the most relevant risk category, which is also substantially affected by climate change. This category is closely followed by operational risk, which also affects all institutions, although it can be considered material in fewer cases. Market and liquidity risks may also increase as a result of climate change, but the significance of these factors will depend on the business model. Based on our assessment, domestic institutions have assessed the relevance of these risks in a similar way, with credit risk and operational risk being relevant risk categories for almost all institutions in the light of climate change, even if they are only rarely quantified. Although banks have the most information on credit risk, quantifying the impact is still too challenging. Several estimates have been made with less robust results, generally focusing on the large corporate portfolio. It should be noted that for some portfolios, the impact of climate change on credit risk is either not quantifiable or very difficult to quantify. For example, in the case of discretionary personal loans, the impact of climate change can only be measured to a

limited extent with the currently available data and methodologies.

In the operational risk category, physical risk factors are the most relevant, with nearly 20 per cent of the surveyed banks being able to measure and quantify the impacts. Certainly, transition risks also affect operational risks, albeit to a lesser extent, for example through higher costs due to rising energy prices or more detailed reporting requirements. Measuring and quantifying operational risks is far from being the biggest challenge, as there have already been well-established measurement methodologies, many of which have already had environmental risks as a cornerstone, for example, to prepare for losses caused by extreme weather events. However, physical risks, which are increasing due to climate change, are becoming more severe and more frequent problems, and their detection is more important than ever. The operational risk category also includes reputational and legal risks (liability, litigation risk), which are growing in importance but are currently difficult to measure. According to the responses received, two thirds of banks consider market risks as a relevant risk, but no institution has yet managed to assess them.

The third stage of risk management, after successful identification and quantification, is the management and monitoring of risks. Certainly, due to the novelty of the problem, it is not only worth addressing risks assessed at portfolio level, but also to consider them even on a qualitative, individual basis for each client and transaction. There are different processes for implementing credit risk management, the most important of which are summarised in the following chart.

Chart 2.17: Proportion of banks that have incorporated environmental risks into the various stages of credit risk management



Source: MNB

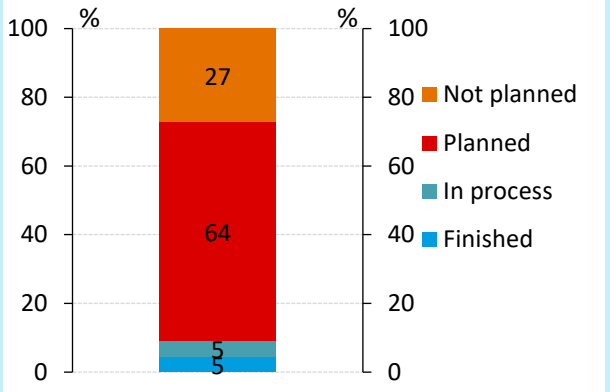
The MNB data shows a similar pattern to the survey results in the ECB report. Overall, however, practices that include ESG risks in most stages of risk management are slightly more widespread in the euro area. Around 40 per cent of banks already incorporate some form of ESG risk in their client and transaction due diligence procedures and lending policies, which is broadly in line with the practices of large banks in the euro area, according to the ECB survey. In practice, there may be separate assessment of individual clients, separate treatment of transactions subject to a threshold, or even some combination of these. A quarter of domestic institutions take sustainability and environmental aspects into account in their collateral assessment practices, which reflects a slightly more favourable picture compared to European banks, where a fifth of institutions apply a similar approach. The sustainability assessment of real estate is mostly carried out using qualitative indicators or estimates in Hungary.

Only 18 per cent of institutions take climate risks into account when determining risk ratings, compared to 28 per cent for euro area banks. The most widespread methodology draws on sectoral ratings, often limiting the scope to transition risks. It would also be important to consider physical risks in the future, for example, in the case of mortgages, the geographical location of the underlying property would be an appropriate indicator for determining local risk factors. In terms of portfolio analysis, the integration of environmental risks is still at a rather early stage both in Hungary and in the euro area, with less than 20 per cent of institutions using a framework that meets the requirements.

Mainstreaming climate risks in credit pricing is of particular importance as it would provide a good opportunity to adjust for price distortions (market

failure) leading to climate change. However, more reliable data is needed to update credit pricing practices. While 16 per cent of banks in Europe have integrated environmental risks into their pricing, we know of only one such example in Hungary. Therefore, some domestic banks are able to provide an approximate picture of the environmental risks of transactions, but they do not yet incorporate them in the pricing of the product. The most established case of differentiation in pricing is currently mortgage lending, where a higher energy efficiency rating is presumably associated with a lower credit risk.[46] If this hypothesis can be proven – and there are many indications that it can[47] – it should also be reflected in loan pricing.

Chart 2.18: Proportion of banks able to use forward-looking tools to assess climate risks



Source: MNB

Assessing environmental risks is therefore clearly a challenge for credit institutions. In order to maintain prudent operations, it is worthwhile to quantify climate risks using forward-looking methods, for which several methods are available. In the questionnaire, the MNB asked about the use of three such specific methodologies, the results of which are shown in Chart 2.18. Each of the methodologies examined may include physical and transition risks. The tools for assessing climate change and environmental risks included in the questionnaire are: 1) *Sensitivity analysis*: to take stock of and assess the bank's business lines and assets exposed to climate change and environmental damage; 2) *Scenario analysis*: to assess the impact of realistic climate change scenarios on the institution in order to prepare for severe impacts; 3) *Climate stress test*: a complex modelling framework to build up a picture of a bank's overall climate exposure, expected losses and possible ways to manage risks. For at least physical or transition risks, 10 per cent of banks currently use one of the above methods, two-thirds of banks plan to implement at least physical or transition risk assessment, and a quarter of banks do not even plan to assess climate risks in this way. Complementing the experience of previous MNB surveys, the new analysis finds that the last few years have been primarily spent developing relevant plans, with roughly the same number of banks using these methodologies as in 2020. At EU level, around 25 per cent of banks have carried out analyses in the above categories, a significantly higher proportion than in Hungary.

Almost all systemically important institutions in Hungary plan to carry out similar types of forward-looking analyses in 2022. For these analyses, many institutions use the climate stress test published by the MNB as a starting point. Different institutions have different approaches, some banks plan to run scenario analyses, while others plan to run partial industry-level climate stress tests relevant to their own operations. The availability of the necessary data will determine the direction of evolution of testing methodologies, with corporate portfolio analysis typically being the first step, while testing of retail mortgages is expected to take place from 2023.

The Guide consciously addresses both climate and environmental risks. It is clear already that the Hungarian banking sector has made significant progress in identifying and managing climate risks, but other environmental risks have not yet been addressed. This phenomenon is not limited to Hungary, only 6 per cent of banks at EU level have started to address other environmental risks. However, it is already clear from the analyses carried out so far that biodiversity loss also poses significant financial risks. As the world's central banks are only just beginning to address climate risks in a meaningful way, it is perhaps not surprising that only two European supervisory authorities have carried out analyses concerning the impact of natural risks. The

[46] The Energy Efficient Mortgages Initiative (2019): Technical Report on the Econometric Assessment and Results, The Energy Efficient Mortgages Initiative (2020): Final report on correlation analysis between energy efficiency and risk

The Energy Efficient Mortgages Initiative (2021): Buildings' Energy Efficiency and the Probability of Mortgage Default: The Dutch Case

[47] The Energy Efficient Mortgages Initiative (2021): Technical report assessing results of correlation analysis between EE and credit risk from a prudential perspective

Dutch central bank's Indebted to Nature study[48] found that 36 per cent of Dutch financial institutions' assets (EUR 510 billion) are strongly linked to ecosystem services, compared to 42 per cent for the French financial system, suggesting a high exposure also in Hungary.

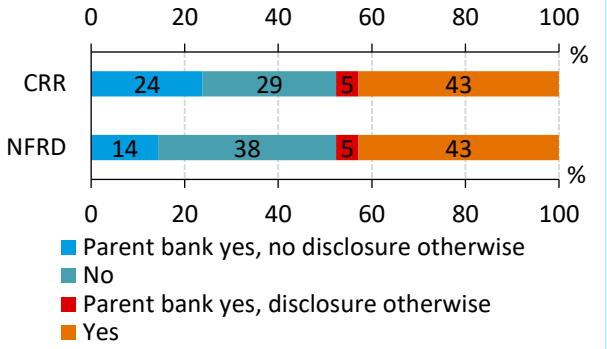
2.4.4. Sustainability issues in disclosures

Assessing and analysing climate and environmental risks is a data-intensive task for both companies and financial institutions. Disclosures of these risks increase market transparency and provide valuable input for all actors. Therefore, building up an adequate database(also) through disclosures is crucial to assess the financial risks of climate change, while improving the confidence and information of investors and financiers. Banks base their decisions, *inter alia*, on the data that companies make public, thus improving this is key to greening the financial system.

The expectations outlined in the Guide are also intended to improve the preparedness of credit institutions for changes in EU legislation. The scope of sustainability-related disclosures is constantly expanding, with two pieces of legislation currently making significant changes in this respect: 1) Under Article 8 of the *Taxonomy Regulation*, companies and financial institutions subject to the non-financial reporting directive (Non-Financial Reporting Directive, NFRD[49]) will be required from 1 January 2022 to provide additional transparency on the extent to which their activities are considered environmentally sustainable. 2) Article 449a of the *Capital Requirements Regulation* (CRR)[50] requires large financial institutions with securities traded on a regulated market to disclose certain ESG risk information after 28 June 2022.

A number of domestic credit institutions are also subject to the above-mentioned legislation, either directly or indirectly through their parent banks. Almost half of the institutions surveyed are also directly subject to the reporting obligations set out in the NFRD and CRR 449a. If the institution is not directly subject to the above legislation, but only through the parent company, it typically does not plan to disclose information on the Hungarian subsidiary on a voluntary basis.

Chart 2.19: Ratio of banks subject to the NFRD* or CRR**



*NFRD: Non-Financial Reporting Directive, **CRR: Capital Requirements Regulation

Source: MNB

The ability of a credit institution to quantify and address climate risks can be validated by making the relevant indicators, targets and other metrics publicly available. Sharing quantitative data creates opportunities to develop models to assess the impacts of climate change, to develop methodologies to quantify climate risks, and to encourage competitors to do the same. 77 per cent of domestic credit institutions do not disclose at all the metrics and indicators related to climate change and environmental risks considered relevant, while about a quarter of banks share information with the market at least partially, but so far no comprehensive climate risk reporting has been available in the Hungarian banking sector.

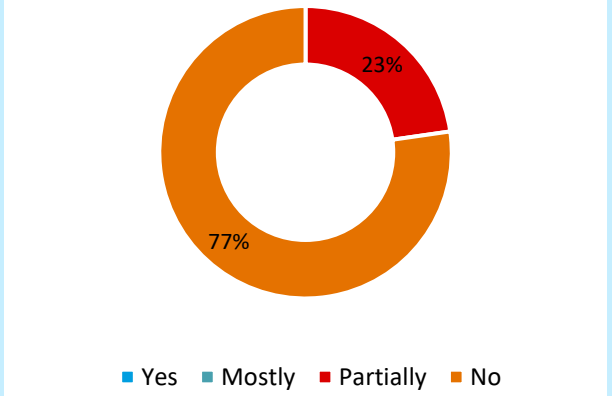
[48] DeNederlandischeBank (2020): Indebted to nature

[49] Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups, transposed into national law by Act C of 2000 on accounting.

[50] European Banking Authority (2022): Final draft implementing technical standards on prudential disclosures on ESG risks in accordance with Article 449a CRR

However, it can also be seen that credit institutions are trying to expand the range of published data that can be assessed from a sustainability perspective, so that they publish indicators on some aspects, at least partially (Chart 2.20). In total, 23 per cent of banks also disclose their exposures by sector, which gives a partial picture of the climate exposure of a given portfolio based on the carbon intensity index for that sector. In particular, the breakdown of exposures by geographical region, which is at least partially provided by three credit institutions, can be of great help in estimating physical risks. Different regions of the planet are exposed to different potential climate change risks, thus, for example, the value of an underlying real estate asset can be strongly influenced by its geographical location. One credit institution discloses the volume of its climate change mitigation collateral, thereby demonstrating to the market the institution's resilience to climate risks.

Chart 2.20: Ratio of banks that disclose climate risk indicators and targets



Source: MNB

BOX 3: Climate risk analysis of the MNB's balance sheet

In 2022, the MNB prepared its first Climate-Related Financial Disclosure. The MNB expects not only credit institutions to disclose sustainability-related information, but also wants to set an example itself. In the report, the MNB presents its climate-related risk exposures, which arise both through its own operational activities and through the financial instruments on its balance sheet. In preparing this report, the MNB has relied primarily on the recommendations developed by the Financial Stability Board's TCFD Working Group. As there has been no uniform practice as yet for the preparation of the report, the MNB has taken into account – in addition to the TCFD recommendations – the available international examples (Bank of England[51], Banque de France[52]) and the specificities of its own financial portfolios in preparing the analysis.

The TCFD's recommendations on climate-related financial disclosures are structured around four main areas - internal governance, strategy, risk management, metrics and targets - which are core operational elements of organisations (Chart 1). Accordingly:

- The first part of the report, covering **internal governance**, describes the role of the decision-making bodies and senior management in assessing and managing climate-related risks and opportunities.
- The second part (**strategy**) focuses on the short, medium and long-term risks associated with climate change and their implications for business operations, strategy and financial planning. In this part, the resilience of the strategy under different climate scenarios is discussed.
- The third major content unit (**risk management**) of the report is devoted to the processes that organisations undertake to identify, assess and manage climate risks, and the integration of these processes into the overall risk management framework.
- The chapter on **metrics and targets** includes the metrics used to measure climate-related risks, including the greenhouse gas emissions associated with the organisation's activities and the targets set to address the associated risks, as well as the results achieved.

Chart 2.21: Four main areas of climate-related financial disclosure

Internal governance

Governance of the organisation in relation to climate-related risks and opportunities.

Strategy

The actual and potential impact of climate-related risks and opportunities on the organisation's business model, strategy and financial planning.

Risk management

The processes used by the organisation to identify, assess and manage climate-related risks.

Metrics and targets

Metrics and targets used to assess and address climate-related risks and opportunities.

Source: TCFD, MNB

In recent years, the wider application of environmental sustainability considerations has also become increasingly important among central banks. The MNB's statutory objectives include, directly and indirectly, promoting sustainability. The MNB's commitment to sustainability has led it to present an analysis of climate risks arising from its activity, the main motivation for which, in addition to understanding and assessing climate risks, has been to support

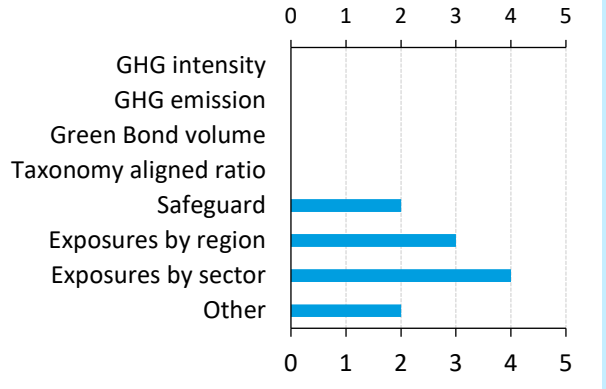
international practices and set an example for domestic financial actors. The MNB aims to provide information on the climate risk exposure of its assets as widely as possible.

The MNB has assessed the climate-related risks inherent in its financial assets according to two main risk categories, namely transition risks and physical risks. Transition risks refer to the risks arising from the transition to a carbon neutral economy, while physical risks are those arising from extreme weather events associated with climate change. The MNB has analysed climate-related risks mainly on the basis of metrics commonly used in international practice, supplemented by its own estimates for certain asset categories. As regards transition risks, the MNB has analysed the weighted average carbon intensity (WACI) of the portfolios, which quantifies the GHG emissions per unit of GDP or value added generated by the portfolios, for all but one of the financial asset portfolios/monetary policy programmes (Mortgage Bond Purchase Programme). In addition, the energy mix and the proportion of carbon-intensive assets were calculated for those financial instruments where data availability made this possible. The MNB has also carried out physical risk analysis for most of the portfolios under review, based on data and methodology from an external data provider (Four Twenty Seven, Moody's Analytics). Due to the specificities of the instrument, a specific methodology has been developed to estimate the environmental impact of the Mortgage Bond Purchase Programme, measuring the GHG emissions saved by the programme.

Climate risk analysis of financial instruments faces a number of challenges due to the evolving methodology and the quantitative and qualitative shortcomings in available data. Among these general challenges are the lack of consistent reporting practices in the area of climate risk and the significant time lags in the availability of GHG emissions data. Due to their production approach, the national GHG inventory data do not include GHG emissions associated with imported products produced in other countries, which can introduce significant bias in the metric. In addition, there may be significant differences in the methodology for measuring climate risks on a geographical basis and the lack of company-specific data may introduce some bias in the results. Physical risk analysis is also subject to a number of technical challenges, requiring detailed geographical data to determine the severity of different climate events.

It is good practice that an increasing number of credit institutions are preparing and publishing sustainability reports also in Hungary. In these reports, the ESG activities of the credit institution are explained, with a strong emphasis on social issues and operational greening of banks (lower energy and paper consumption, separate waste collection, etc.). While the MNB welcomes all ESG activities and programmes, identifying and addressing the financial risks of climate change is a key element in the sustainability transition of the banking system. At this stage in the development of the Hungarian green financial market, a data-driven approach and the widespread availability of quantitative data are needed.

Chart 2.22: Number of banks that disclose information about their portfolios



Source: MNB

A growing number of institutions are starting to address sustainability issues, but the level of preparedness of the banking system at sector level can still not be considered high. The picture is nuanced, as shown in Chart 23, by the fact that the Hungarian banking system's current low level of preparedness is coupled with relatively low overall exposure to transition risks. As can be seen, institutions with higher carbon intensity tend to be those that are better prepared. At the same time,

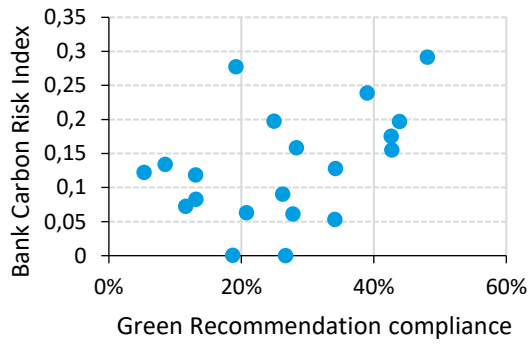
[51] Bank of England (2021): The Bank of England's climate-related financial disclosure 2021.

[52] Banque de France (2021): Responsible Investment Report 2020

some banks have corporate loan portfolios with potentially high climate change risk, but are not adequately prepared to manage these risks. For the time being, quantitative analytical tools are available for transition risk, in this case based on the Bank Carbon Risk Index discussed in sub-section 2.2, but the development

of analytical tools to quantify physical risks is in progress. The lessons learned from the MNB's survey and related bilateral discussions with domestic banks will be reflected in an update of the MNB's Guide on climate-related and environmental risk. The supervisory expectations set out last year, while still valid, need to be fine-tuned and made more specific in the light of international green finance developments and evolving domestic practices. The Green Supervisory Expectations, which will be published in mid-2022 and will include refined expectations and a detailed timetable, will be tailored to banks' current practices and challenges.

Chart 2.23: Risk and preparedness



The Gompertz version of the Bank Carbon Risk Index is shown in the Chart.
Source: MNB

2.4.5. The minimum requirements of the Green Supervisory Expectations for 2022

The MNB will give priority to the minimum requirements in the Green Supervisory Expectations, without which the institution cannot be considered sufficiently prudent. These practices have already been met or are included in the short-term plans of the majority of banks, but through supervisory inspections, the MNB wants to emphasise that compliance is expected of all credit institutions this year. Examples of such requirements include the appointment of a manager responsible for ESG or climate risks, ensuring that the management board is sufficiently informed about these risks, identifying existing data gaps and making a plan to address them, and starting to identify climate risks in the bank's business environment and integrate them into its strategy. Another important requirement included in this year's minimum requirements is that credit institutions belonging to a foreign banking group must demonstrate that they implement the group's green policies and activities in their domestic operations. In addition to mapping risks at the strategic level, in line with the European Banking Authority guidelines[53], the MNB expects that sustainability aspects are also taken into account in the lending process.

In summer 2022, the MNB will publish an updated version of the Guide, which will also set out further expected timelines. Expectations that are not yet considered a priority, or where there are serious difficulties in implementing them, will be aligned with the European regulatory change (CRD) agenda. In some cases, interim deadlines will be set to ensure that banks are progressively prepared to meet the requirements that will be included in the legislation by the statutory deadline.

[53] EBA(2020): Guidelines on loan origination and monitoring

3. THE GREEN FINANCE BOOST

In line with the needs of the Hungarian economy, credit institutions and capital market players have been financing sustainability-related investments, but separate data collection and analysis of these investments started to be available in the domestic money and capital market from 2020. In the last two years, the MNB has supported the promotion of domestic sustainability through several programmes. The transition risks discussed in detail in the previous chapter pose portfolio-level challenges for the credit sector as a whole. In order to mitigate these risks and promote financial stability, the MNB launched the Green Preferential Capital Requirement Programme for Housing in December 2019 and the Green Preferential Capital Requirement Programme for Corporates and Municipalities in December 2020, which is available for contracts signed after 1 January 2020. The programme is conditional on voluntary disclosure of the green financing to be included in the programme, in which 85 per cent of the relevant credit institutions already participate. This has provided an opportunity to assess the financing of energy efficiency, electromobility and renewable energy by domestic actors.

The energy efficiency of domestic residential and commercial real estate is lagging far behind and the MNB intends to promote the necessary investments through a series of targeted measures in addition to the capital requirement programmes, as 40 per cent of final energy consumption is linked to real estate. The Green Home Programme, which is widely known to the public, has been launched to subsidise the purchase and construction of energy-efficient new homes by the public at a maximum interest rate of 2.5 per cent, thus indirectly encouraging the real estate development side to build energy-efficient homes. Based on January 2022 data, 80 per cent of the contracted stock for new home purchases and construction is linked to the Green Home Program. With HUF 135 billion of the HUF 200 billion allocation already disbursed by 1 April and loan applications received by lending institutions reaching the original HUF 200 billion target, the MNB increased the volume of eligible green loans by a further HUF 100 billion in April 2022, tightening the criteria for eligible green homes. Furthermore, as part of the Green Monetary Policy Toolkit strategy, the MNB also announced a Green Mortgage Bond Purchase Programme in the summer of 2021 to create a domestic green mortgage bond market, complemented by a preferential treatment in the Mortgage Funding Adequacy Ratio for green mortgage bonds and refinancing loans.

The largest financing needs for the climate-neutral transition are in the energy sector, which, according to a 2021 estimate, will require more than HUF 22,000 billion of additional investment. A positive experience is the dynamic increase in the share of renewables, with solar energy as the main driver. The boom in electromobility also represents a significant business opportunity for credit institutions, with an additional 100,000 electric cars estimated in 2021 to be on the road by 2026. At the same time, the MNB also expects credit institutions to play a more active role in financing efficient water management and the promotion of organic farming in agriculture.

At the individual level, several banks have recently reached milestones of international importance:

- OTP signed the UN Responsible Banking Guidelines[54] in 2021, and adopted the first bank-wide green lending framework in March 2022;
- Takarékbank became the first domestic player to obtain the green mortgage label of the European Energy Efficient Mortgage Initiative[55];
- Erste Bank issued the first green bond (mortgage certificate) compliant with the Climate Bond Standards[56]

In 2021, in addition to the growth in green lending, the Hungarian green capital market showed signs of development. The active role of the MNB, global developments and the gradual evolution of the regulatory framework are important drivers of this progress. Among the most significant achievements is the emergence of green bonds on the market, which have been significantly supported by the Bond Funding for Growth Scheme. In addition to the corporate

[54] UNEPFI(2021): Principles for Responsible Banking: OTP Bank
[55] EEMI (2022): Takarék Mortgage Bank becomes first Hungarian bank to join EEM Label
[56] ERSTE Bank (2021): Erste issued green mortgage bond

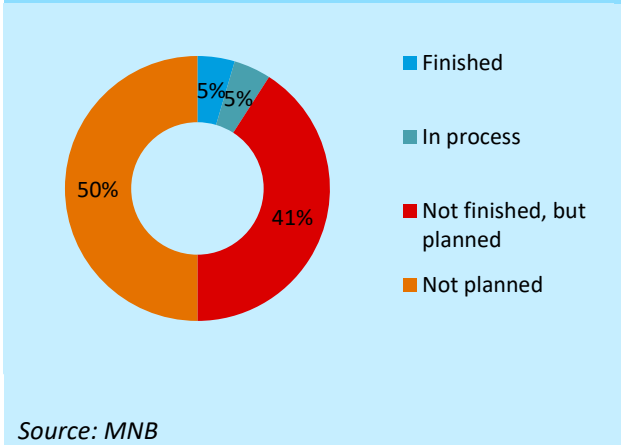
segment, there has also been a positive turn in government bonds issued by the central government, expanding the domestic green bond market with HUF 718 billion of issuance by the end of 2021.

The positive transition in the field of ESG investment funds is not only noticeable globally and in the European capital market, but also in Hungary. The emergence of investment funds with an environmental and social sustainability focus is also supported by EU regulations on sustainable finance, which also provide a guideline for the creation of sustainability-oriented funds. As a result, by the end of 2021, the value of assets managed in ESG investment funds in Hungary increased to HUF 158 billion. In addition, sustainability thinking has also penetrated the market for other investments such as unit-linked asset funds, pension fund portfolios, private and venture capital funds and equities, and this area of the capital market is also showing signs of development

3.1. Green lending trends in the banking sector

As discussed in sub-section 2.4, Hungarian credit institutions currently see climate change mainly as a business opportunity, which could provide a strategically important financing opportunity in the coming decades. In the view of the MNB, this is desirable if it is complemented by the implementation of an ambitious risk strategy and a detailed analysis of the risks the bank is taking and their prudent management. The MNB's actions so far - somewhat in contrast to the international mainstream - focus not only on incorporating climate risk, but also on greening the financial system and bank balance sheets. For example, green preferential capital requirement programmes aim to help the domestic banking sector to reduce the transition (sustainability) risks of its balance sheet by prioritising green lending.

Chart 3.1: Proportion of banks that have developed a sustainable credit risk policy



Source: MNB

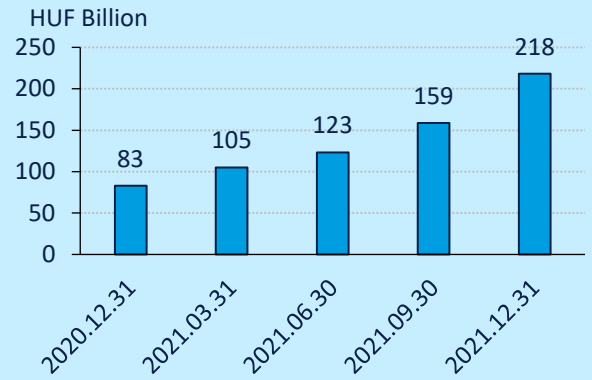
While the majority of credit institutions see a business opportunity in green lending, one tenth of institutions have green lending policies in place or developed. 41 per cent of self-assessing banks have only plans to implement one, while half of banks do not even plan to develop a sustainable lending policy. The market for dedicated green lending in Hungary has developed over the last year and a half and having a pre-developed green lending framework and targets could be an important positive shift in this respect. The MNB has similar experience with green financing frameworks that can be set up to use green preferential capital relief for corporates and municipalities, based on the EU Taxonomy or Climate Bonds Initiative Taxonomy, and the exposures included in the framework are eligible for preferential capital requirements. A very important positive development is that the first bank-level green lending frameworks have been established by OTP and EXIM Bank, and other banks are working on their own frameworks.

In addition to the Guide on climate-related and environmental risks, the MNB has built up a number of new data services to monitor green processes in the market during 2020-2021. For credit institutions, our most important data source is the MNB's Green Preferential Capital Requirement Programme for Corporates and Municipalities, launched in December 2020, which has been joined by more than 85 per cent of the banking sector covered by the capital requirements standards. The data reporting for the programme covers green corporate and municipal loans and green bonds. The measure aims to mitigate the climate risk of institutions' portfolios by providing preferential capital requirement for exposures that are considered green, in order to facilitate the uptake of this type of lending.

There has been a steady increase in the portfolio of green credit exposures, with HUF 218.19 billion of green credit exposures included in the MNB's Green Preferential Capital Requirement Programme for Corporates and Municipalities between 1 January 2020 and 31 December 2021. The MNB Programme will be open to loans originated after 1 January 2020, with the first available data point by the end of December 2020. The programme, extended in summer 2021, no longer

covers only the initially announced renewable energy production, but also includes green corporate exposures related to electromobility, sustainable agriculture and food, energy efficiency, among others. The green loan portfolio has increased by 163 per cent (Chart 3.2) compared to the volume included as initial portfolio at launch.

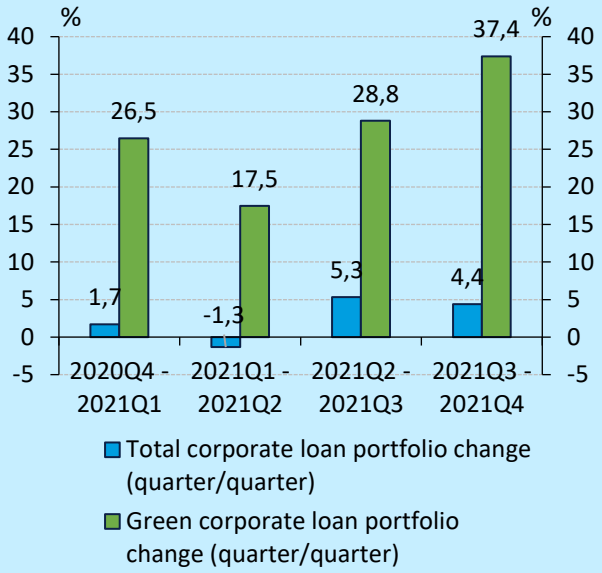
Chart 3.2: Evolution of the green loan portfolio of credit institutions participating in the Programme (2020 Q4 – 2021 Q4)



Source: MNB

The green corporate loan portfolio is growing dynamically relative to the total corporate loan portfolio. The green loan portfolio participating in the Programme represents 2.01 per cent of the banking system's corporate loan portfolio. While the overall corporate loan portfolio has experienced relatively modest growth, green exposures are building up dynamically in credit institutions' portfolios quarter by quarter (Chart 3.3).

Chart 3.3: Evolution of the green loan portfolio and total corporate loan portfolio participating in the Programme (2020 Q4 – 2021 Q4)



Source: MNB

The MNB supports the construction and purchase of green residential real estate with preferential capital requirement. The same applies to the financing of residential property modernisation, which has so far attracted more than HUF 10.5 billion in loans through the CIB, ERSTE, OTP and Raiffeisen banks currently participating in the programme.

The stock of green loans covered by the infrastructure support factor exceeded HUF 461 billion by the end of 2021. The Infrastructure Support Factor (ISF) is available to credit institutions from the end of June 2020 under the EU's Infrastructure Support Factor Regulation[57], allowing them to claim preferential capital requirement for green financing of public service infrastructure. Guidance on the correct domestic application of the ISF was provided by the MNB staff in the form of a management circular at the end of 2020[58].

In 2021, MKB Bank Nyrt. won the Green Bank Award as the largest green financier. In 2019, the winners were selected by a jury on the basis of applications submitted by institutions. Owing to the growth of the MNB's database, in 2021 the winners of the Green Finance Awards were judged using purely quantitative methods. In awarding the Green Bank Award, the MNB looked at

[57] Regulation (EU) 2019/876 of the European Parliament and of the Council

[58] MNB(2020): Management Circular on the application of the infrastructure support factor and the definition of compliance requirements

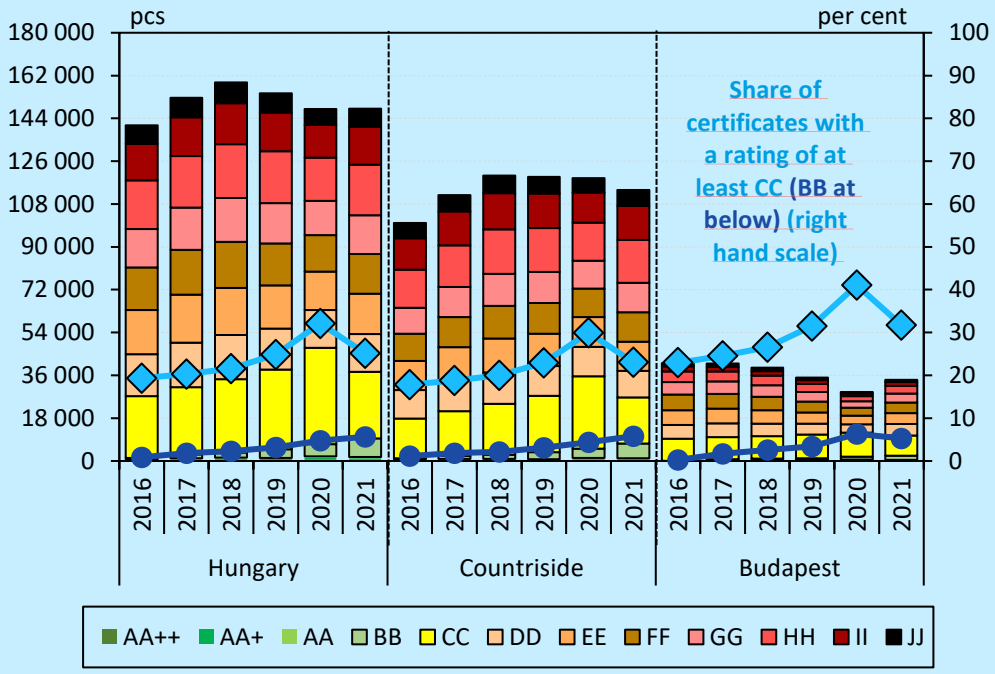
the extent of green lending, the green bond portfolio held by institutions and the institutions' exposure to climate change. The stock values of green loans and green corporate bonds were calculated as a proportion of total corporate loans and total corporate bond holdings. The ratio of green government bonds to conventional government bonds and the value of total green assets to total assets also played a role in the assessment of the award. The value of exposure to climate change was assessed by the MNB using two different methods: the Bank Carbon Risk Index as described in the previous chapter and the climate risk grid. Finally, the growth rate of institutions' green exposures and compliance with the MNB's Guide on climate-related and environmental risks were also assessed. As the green data asset continues to expand, the MNB will consider introducing other quantifiable factors in future assessments.

3.1.1. Energy efficiency in the Hungarian real estate and credit market

The energy efficiency of the domestic housing stock can be considered low based on the certificates issued. In the near future, after several postponements of the original entry into force on 1 January 2021, the energy compliance rules for new residential buildings will be tightened, so that instead of CC, i.e. modern, only residential buildings with an energy rating of at least BB, i.e. meeting near-zero energy requirements, will be allowed to be put into use. Since 2016, only 23.9 per cent of energy performance certificates issued for the sale of new and second-hand dwellings have been rated CC or better, while only 3.2 per cent have been rated BB (Chart 3.4). Since 2016, there has been a gradual annual improvement in the distribution of certificate ratings issued, mainly due to an increase in the number of new-build dwellings. Within the certificates issued, the share of those rated BB or higher increased from 0.9 per cent in 2016 to 6.4 per cent in 2021, while the share of those rated CC or higher decreased in 2021 compared to the previous year, also due to the regulatory tightening that was initially expected earlier. In addition, the proportion of better-rated properties in Budapest was slightly higher due to a proportionately higher number of new-build dwellings. Overall, the energy performance of the total housing stock may be even worse, given that the certificates issued cover all new dwellings and only a certain proportion of second-hand dwellings sold, most of which have been certified in transactions in recent years.[59] **The energy efficiency of residential buildings is particularly important given that they account for a third of final energy consumption in Hungary.**

[59] EBRD(2020): Energy efficiency in Hungary begins at home

Chart 3.4: Number of energy performance certificates issued for residential and accommodation buildings (used and new) by category and by Budapest and rural areas



Source: MNB

Note: For multi-family dwellings, a separate energy certificate is issued for each dwelling. The data include certificates issued before the occupancy permit for newly built properties and certificates issued upon the sale of second-hand dwellings. Source: https://entan.e-epites.hu

Statistical estimates suggest that environmentally sustainable new dwellings in Budapest are 3.5 to 3.7 per cent more expensive, while detached houses with similar characteristics are 13 per cent more expensive. The impact of energy performance certificates on the supply price of new homes was examined by the MNB in its November 2021 Housing Market Report using regression analysis. It used data on new housing projects between Q1 2019 and Q3 2021 to estimate the impact on the average supply price per square metre of projects, describing the impact of different project characteristics.[60] Overall, the use of more environmentally sustainable energy techniques and raw materials makes new homes more expensive on the cost side, and according to our calculations, new homes with more modern energy features are significantly more expensive in new housing supply - in terms of the difference between CC and BB ratings - by around 3.5–3.7 per cent. However, these more energy-efficient homes will be more valuable in the long term due to the possible gradual "green" shift in demand in the future. The impact of a more modern energy rating on the price of detached houses has been studied by Ertl et al (2021). The authors found that detached houses with a higher energy rating were sold at significantly higher prices. Houses with an energy rating of BB or better are about 13 per cent more expensive than those with a CC energy rating.[61]

Several different rating systems have been established to differentiate commercial properties according to sustainability considerations. To slow climate change and reduce greenhouse gas emissions, which are identified as one of the main causes of climate change, environmental and sustainability considerations have

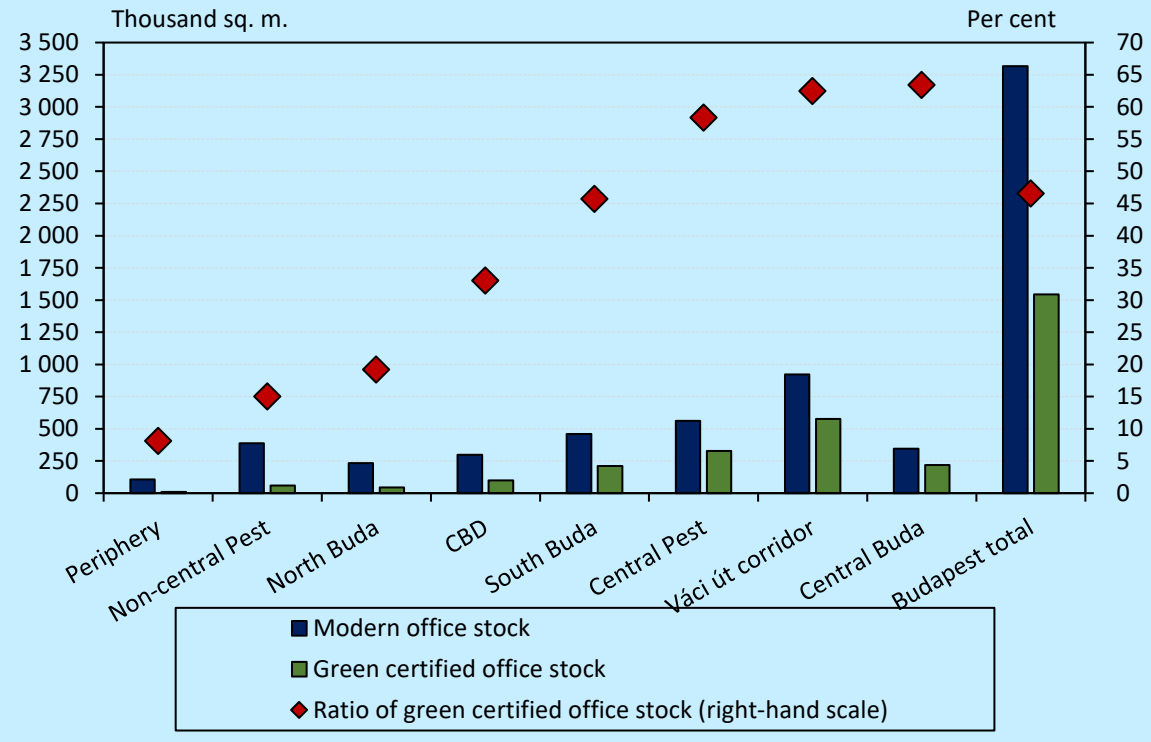
[60] The explanatory variables included in the regression include quarters variable over time, which is intended to capture the housing market price change, the number of apartments in the project, the level of pre-sale, the size of the developer company and the VAT rate, in addition to variables capturing location and energetics. See more details: Magyar Nemzeti Bank: Housing Market Report, November 2021, Box 3.

[61] Ertl, A – Horváth, Á – Mónus, G – Sáfián, F – Székely, J (2021): Az energetikai jellemzők és az ingatlanárak kapcsolata (Relationship between Energy Efficiency Attributes and House Price)

become increasingly important worldwide, but especially in developed countries, and have been taken into account in a wider range of economic and social activities in recent years. Over the past three decades, several rating systems have been developed to differentiate buildings in terms of sustainability, with BREEAM (Building Research Establishment Environmental Assessment Method) and LEED (Leadership in Energy and Environmental Design) accreditations being the most widespread in Europe and worldwide. The former classifies certified buildings on a scale of five (Outstanding - Excellent - Very Good - Good - Pass) and the latter on a scale of four (Platinum - Gold - Silver - Certified). The two green certification systems have some similarities in their technical criteria, while they use a different approach and there are also significant differences in the certification processes.

With the growing focus on sustainability, green rating has now become a requirement on the demand side of the office market across Europe and in Hungary. At the end of June 2021, around half of the modern office stock (3.3 million square metres) in Budapest that was available for rent had a BREEAM or LEED building rating (Chart 3.5). 80 per cent of Budapest office space with a green rating has one of the better, greener categories (BREEAM Excellent or Very Good, or LEED Platinum or Gold) on the rating scales. The share of green office stock in Budapest is steadily increasing, both through the delivery of new green buildings and the rating of existing buildings. Based on the developments under construction, in the next eighteen to twenty-four months 500,000 square metres of new office space will be completed in Budapest, which may lift the ratio of green office spaces close to 60 per cent.

Chart 3.5: Green office space in the Budapest office market by submarkets



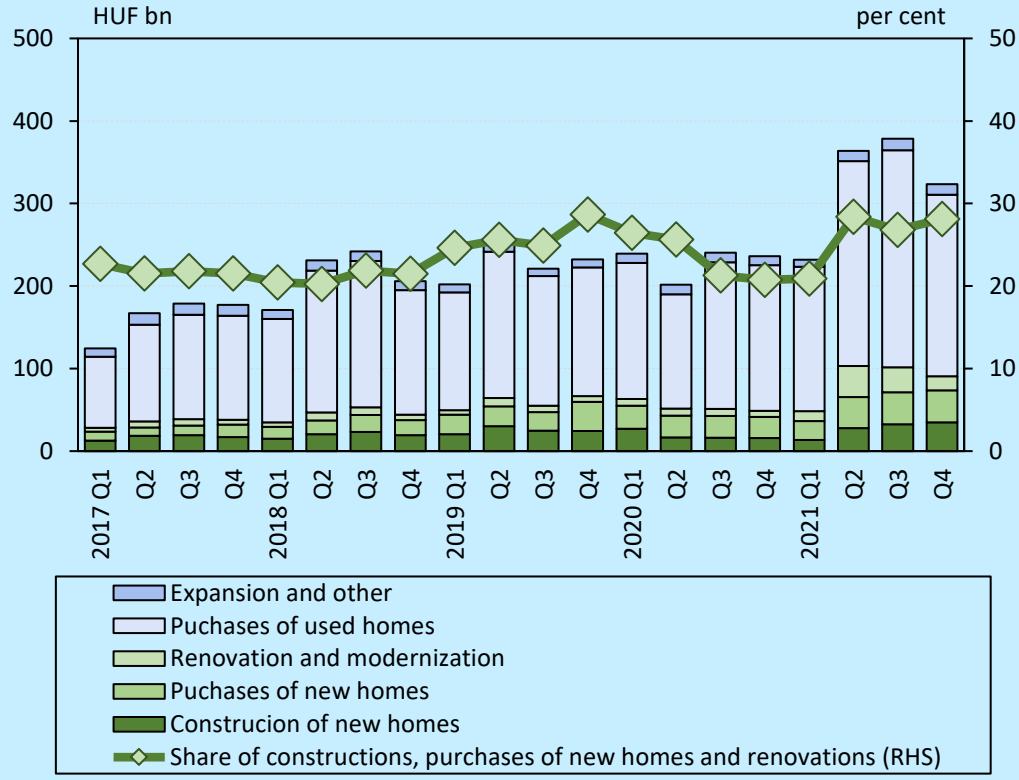
Note: Green office stock includes modern office buildings in Budapest with BREEAM or LEED certification. Based on data from the end-June 2021. Source: CBRE.

International experiences show that the rent and value of office buildings with a green rating typically exceed those of office building without such a rating. Analysis of transaction data from developed office markets by several real estate consultancies has shown that, along with the reduction in carbon emissions, the costs of "greening" can be offset by higher cash flows. More details and availability of the analysis can be found in Box 1 of the MNB's Commercial Real Estate Market Report, October 2021.

Green rated buildings also represent a significant weight in the portfolios of Hungarian public open-end real estate investment funds. These nine domestic real estate funds had a total of HUF 981 billion in real estate assets at the end of September 2021, 46 per cent of which were linked to green rated buildings. The majority of green properties (97 per cent by value) were office buildings, with locations concentrated in Budapest. Looking at the office portfolio of the public open-end real estate funds, three quarters of their office stock by value has a BREEAM or LEED green rating.

There was a significant increase in the share of retail loans aimed at renewing the housing stock in 2021. The volume of housing loan contracts signed in 2021 was 41 per cent higher than that of the previous year, with new housing subsidies[62] coming into force from January 2021 playing a significant role. The purchase of second-hand housing continued to dominate housing loan applications, accounting for 70 per cent of annual housing loan issuance. At the same time, the impact of the subsidies led to a substantial increase in the volume of housing loans requested for the construction and purchase of new homes, with annual growth of 43 per cent for the former and 30 per cent for the latter in 2021 (Chart 3.6). The volume of housing renovation and modernisation loans, which also serve to pre-finance housing renovation subsidies, was three times higher in 2021 than in 2020, due to the impact of borrowing related to subsidies granted under the Home Renovation Programme launched last year. Overall, the share of new retail loans aimed at renewing the housing stock (for the construction or purchase of a new dwelling or for renovation) rose from 21 per cent in Q4 2020 to 28 per cent in Q4 2021.

Chart 3.6: Distribution of new housing loans by loan purpose



Source: MNB

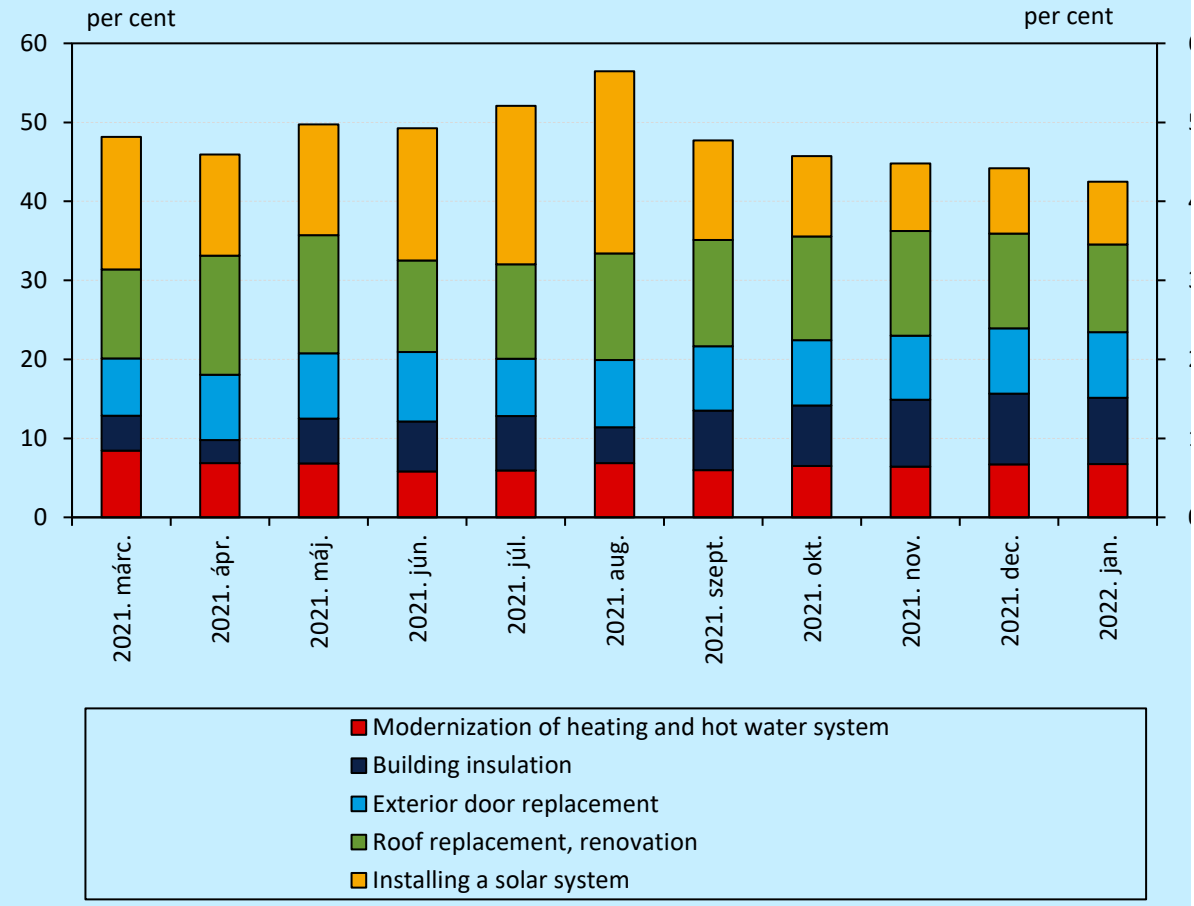
A significant part of the new housing subsidies introduced from 2021 was linked to the Home Purchase Subsidy for Families (HPS), which was also reflected in the volume of HPS subsidies applied for. During 2021, banks signed 30,000 grant contracts with families under the HPS, worth around HUF 70 billion. 61 per cent of the

[62] Reduction of VAT to 5 per cent for new homes, VAT exemption of new properties purchased using the Home Purchase Subsidy Scheme for Families (HPS), exemption from duty for homes purchased using the HPS, multigenerational HPS, home renovation subsidy, subsidised housing loan for home renovation.

contracted amount was disbursed for the construction or purchase of new housing. The volume of housing loans applicable in parallel with HPS accounted for 29 per cent of annual housing loan originations, around HUF 374 billion, half of which were state-subsidised loans linked to HPS. Within the HPS loans disbursed with state interest rate subsidies, banks disbursed almost half of the total amount of HPS loans for the purchase or construction of new homes, amounting to HUF 64 billion in 2021.

Nearly half of the home renovation subsidies are claimed to improve the energy efficiency of properties. There is a sustained high demand for the home renovation subsidies introduced from February 2021. The total amount of claims for home renovation subsidies received by the Treasury – not only those financed by loans – amounted to HUF 185 billion up until January 2022, of which HUF 159 billion in state subsidies have already been disbursed. Nearly half of home renovation grants are used by households for renovation purposes that improve the energy efficiency of their property: in the last nearly one year, the largest share of applications was for the installation of solar panels, and slightly related to this, an average of 13 per cent of grants was used for roof renovation and replacement. Façade insulation and replacement of external windows to reduce the heat transmission coefficient (U-value) of buildings are also popular renovation purposes, accounting for between 7 and 8 per cent of public subsidy on average, while modernisation of heating and hot water systems accounted for 7 per cent of applications.

Chart 3.7: Utilization rate of home renovation subsidy by energy purposes



Source: Hungarian State Treasury

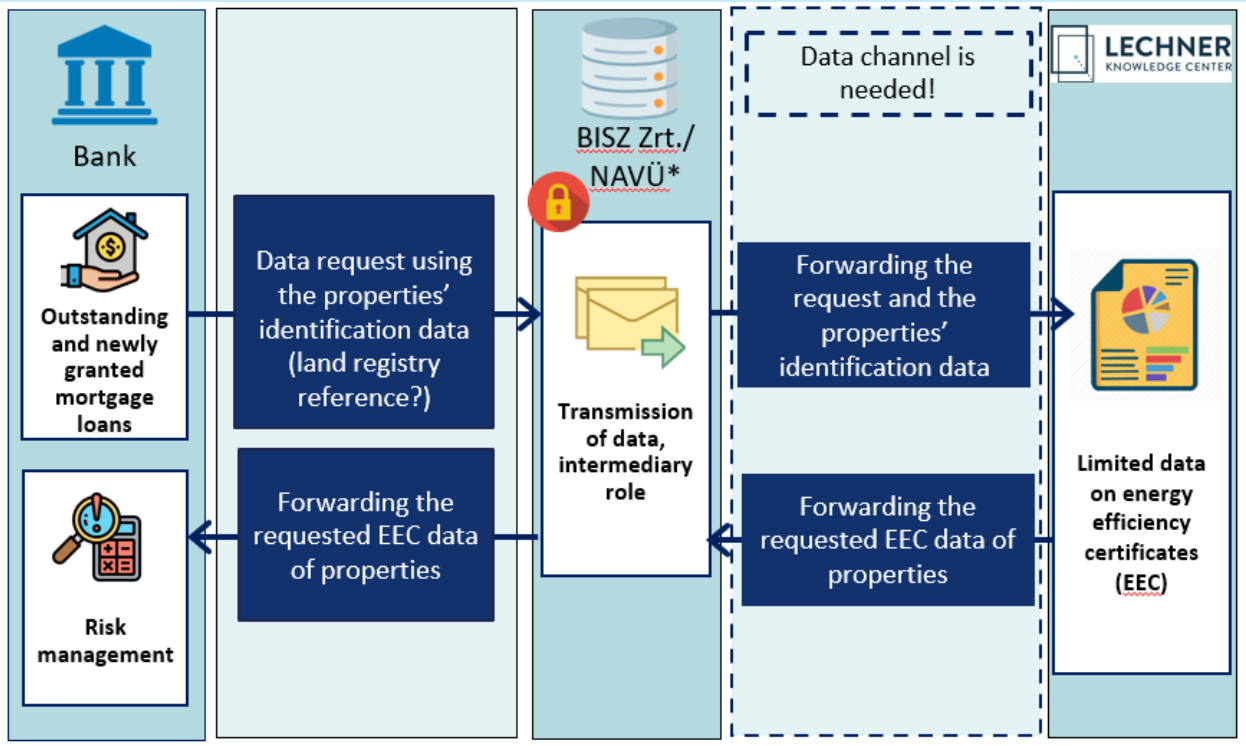
BOX 4: Bank access to energy data of the collateral property

For the green transition in lending and the effective implementation of the green programmes of the central bank and the government, it is essential for credit institutions to have information on the key energy characteristics of properties. In order to ensure the access to this information, it is necessary to remove legal obstacles to the collection, management and use of data by banks and to reduce the administrative barriers and costs involved. It is also necessary to ensure this for individual queries on new loans and for batch queries on the existing stock. The information thus obtained would support banks' green product development, risk management and the success of central bank and government programmes for green objectives, including the issuance of green mortgage bonds. The proposed content of the disclosure standards being developed by the EBA also points to the importance of banks being able to query energy certificates. There is also a broad consensus among the relevant domestic credit institutions to ensure access to the data.

Without a change in the regulatory environment, a significant part of the green mortgage portfolio will not be identifiable, which will limit proper risk assessment and the achievement of green regulatory objectives. In the current situation, the only solution for banks is to query data based on individual client consent or to ask the client. The consequence is that identifying green features is essentially only feasible for new loans, which may make risk assessment by banks difficult and, for example, the build-up of green mortgage bonds using them as collateral may be much slower and smaller in volume.

Access to government-managed data would be an effective way to support the uptake of green lending. Mass data queries from a database of energy certificates managed by the Lechner Knowledge Centre would be an appropriate alternative to the collection of individual contributions, but currently neither the technical nor the legal conditions are given. In order to make the certificates available in this way, it is necessary to create the legal basis for data management by amending Act CCXXXVII of 2013 on Credit Institutions and Financial Enterprises and to ensure the legal conditions for the technical transfer by means of Government Decree 313/2012 (XI. 8.) on the Building Documentation and Information Centre and the National Building Register. In the event of these legal changes, the MNB could, in its own legislative powers, require credit institutions to take into account the main energy characteristics of properties in their lending activities, in the context of the assessment of collateral and creditworthiness in view of the fact that the energy efficiency of collateral has an impact on risk. By providing for the legal conditions, the energy data of properties could be accessed by credit institutions (data requester), for example through BISZ Zrt. or even the National Data Assets Agency (NAVÜ) (data provider), from the Lechner Knowledge Centre (data controller) database, in a cost-effective and fast way, without the need for individual consent of the clients, for both existing and newly disbursed loan portfolios.

One possible process for querying energy certification data from the Lechner Knowledge Centre

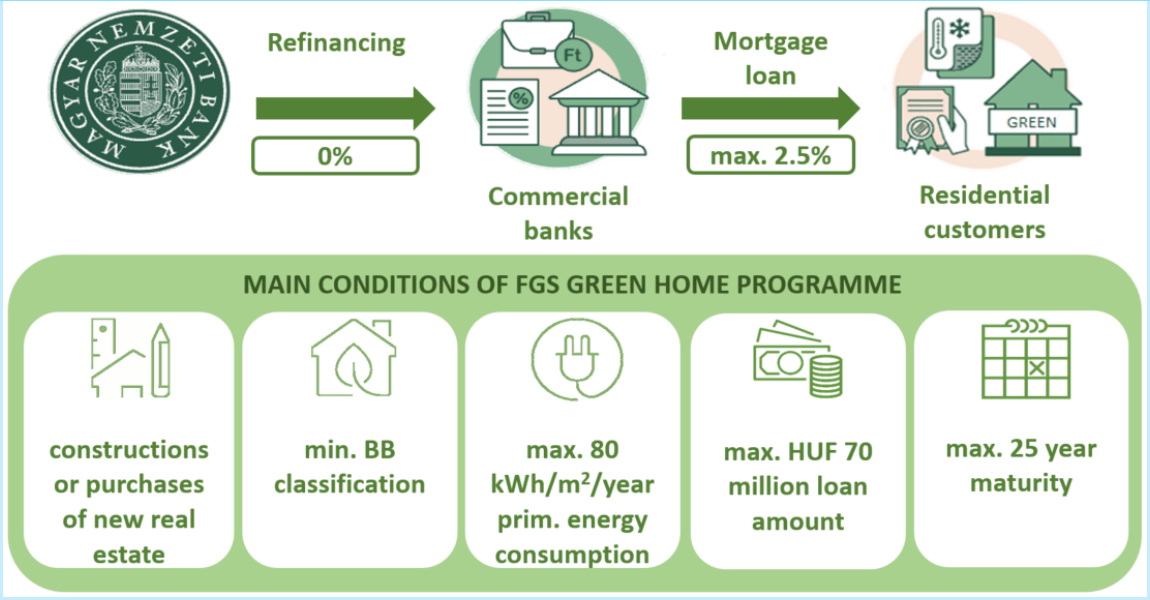


Source: MNB
NAVÜ: National Data Asset Management Agency

In addition to the housing subsidies launched in 2021, the Green Home Programme (GHP) of the MNB, launched in October 2021 with a financial envelope of HUF 200 billion, will also support the renewal of the housing stock. The GHP promotes the creation of a green housing credit market and the mainstreaming of environmental sustainability in the domestic housing market. The GHP supports the purchase and construction of new energy efficient housing by providing low-cost loans with predictable interest rates fixed until the end of the loan term, thus indirectly encouraging the real estate development sector to build energy efficient housing. As in the previous phases of the FGS, which supported access to finance for the SME sector, the central bank will provide refinancing funds to credit institutions at 0 per cent interest, which will be extended to retail clients at a maximum interest rate of 2.5 per cent (Chart 3.8). The loan is therefore available only to natural persons for the purchase or construction of new energy-efficient dwellings (with an energy rating of at least BB and, under the conditions in force until mid-April, a maximum primary energy consumption of 90 kWh/m^2/year) for owner-occupation. The maximum loan amount is HUF 70 million and the maximum maturity is 25 years. In view of the lengthy construction periods, there is a 4-year grace period for the final drawdown, but the first disbursement (full disbursement in case of a lump sum) must be made within 3 years of signing the contract. In the context of housing purpose, the debtor(s) who also become owner(s) must undertake to reside in the residential property for at least 10 years (not all co-debtors must become owner(s) and register in the property).

As in the case of the Certified Consumer-Friendly Housing Loan, a number of consumer-friendly conditions have been introduced in the case of GHP for the benefit of borrowers. In addition to the requirements on client information and the maximum assessment period, the range and level of charges that banks can levy are limited. In addition to the interest, only disbursement fees (up to 0.75 per cent of the loan amount, but not more than HUF 100,000), early repayment fees (up to 1 per cent of the amount prepaid, but not more than HUF 30,000 per contract and per occasion) and third party costs (e.g. notary fees, valuation fees) can be charged.

Chart 3.8: How the FGS Green Home Programme works, main parameters



Source: MNB

The rising interest rate and inflation environment has played a significant role in the substantial increase in demand for Green Home Loans and a surge in loan applications in the first months of 2022. Given that the volume of loan applications received by banks, including those already contracted, could reach the full amount of the scheme by the end of March, several banks stopped accepting loan applications (some of them temporarily). The higher than previously expected interest in the preferential loan under the GHP scheme is partly due to the fact that the gap between the Green Home Loan and market interest rates has been widening since the launch of the scheme, and partly to the fact that the significantly lower repayment rate may encourage households to buy new energy-efficient housing rather than second-hand. In addition, rising inflation and a more uncertain environment due to the war have led more and more retail clients to opt for property rather than other forms of savings, and the fear of exhaustion of the envelope and possible cancellation of the scheme has led many to bring forward their housing purchases and loan applications.

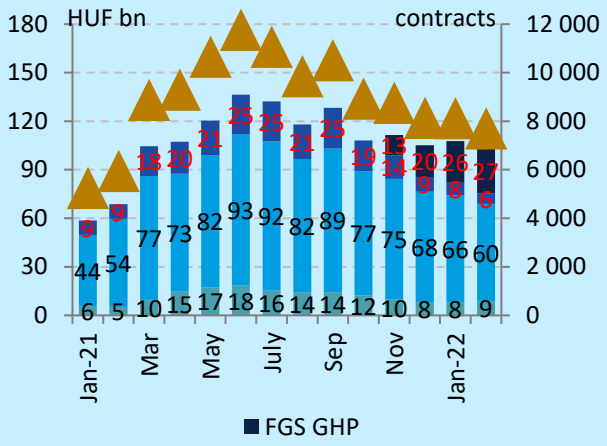
In view of the strong demand for Green Home Loans and the importance of sustainability considerations, the Monetary Council increased the financial envelope of the programme by HUF 100 billion to HUF 300 billion at its meeting on 5 April 2022. At the same time, the energy requirements for eligible properties have been tightened to encourage the purchase and construction of even greener dwellings and houses. In addition to the unchanged requirement for category BB, the upper limit for the primary energy use of a property has been reduced to 80 kWh/m^2/year instead of the previously required 90 kWh/m^2/year.[63] By the end of April, the volume of loan applications received by most credit institutions had reached the new limit available to them, and they stopped accepting loan applications. In line with the green toolkit strategy adopted last July, the central bank also intends to support the renewal of the domestic housing stock in the long term and is examining the conditions under which it can support the green transition in a sustainable way once the HUF 300 billion envelope is exhausted.

Since November 2021, the GHP has already contributed to higher volumes of new housing loans, with significant interest from retail clients since its launch. While in October last year, there were no contracts signed under the GHP due to the protracted product development and time-consuming loan approvals at some banks, in November 47 per cent of the loan volume issued for the purchase or construction of new housing, in December it was 68 per cent, and in January and February this year it accounted for almost 80 per cent of the total volume of

[63] As of 19 April 2022, only housing loan contracts that meet the stricter energy requirements will be eligible under the scheme.

loans issued for the purchase or construction of new housing, amounting to a total of HUF 86 billion (Chart 3.9). The reduction in the volume of loans for the purchase of second-hand dwellings since October may also have been driven by the fact that the significantly lower repayment rate available for the Green Home Loan could encourage households to buy a new, energy-efficient dwelling instead of a second-hand dwelling, even if they took out a higher loan than originally planned.

Chart 3.9: New household home loan contracts of credit institutions



Source: MNB

The average loan amount of contracts signed under the GHP is higher than the average loan amount of contracts signed under the market schemes for the purchase and construction of new housing. Excluding loan contracts with state support (HPS), the average loan amount under the GHP was HUF 26 million in the period from November to February, while the average loan amount for loans under the market scheme was around HUF 17 million. The median loan amount was HUF 22 million for the GHP and HUF 13 million for the market scheme. Taking into account transactions with state subsidies, the average loan amount in the GHP was HUF 32 million. There is also a difference in terms of maturity between the central bank and market loan contracts. The average maturity of Green Home Loans was around 22.3 years from the date of contracting, while the average maturity of new home loans contracted on market terms was 19.1 years for the period between November and February.

The overall loan-to-value ratio of loans under the GHP is significantly lower than that of market schemes, thanks to the fact that credit institutions can pass on the funds requested under the scheme to retail clients at an interest rate of maximum 2.5 per cent, which is fixed until the end of the term, and the charges that can be levied are also limited. The loan amount-weighted average APR for market loans taken out for the purchase and construction of new housing without state subsidy was 4.65 per cent in the November-February period, while the average APR for contracts under the GHP (excluding state-subsidised loan contracts) was 2.63 per cent[64]. Although, based on our experience, the rise in long-term benchmark rates due to the monetary tightening cycle is followed only with a lag by market mortgage rates, a growing share of banks are, and will continue to be, increasingly factoring rising funding costs into their interest rate conditions, and, looking ahead, we expect the gap between the GHP and market APRs to further widen.

By 1 April 2022, credit institutions participating in the programme had reported 4,189 transactions to the MNB, amounting to HUF 135 billion.[65] In the case of 60 per cent of the contracts, the borrowers also benefited from state interest subsidies (green HPS). The actual outstanding stock as of 4 April 2022 - i.e. already drawn but not repaid - was HUF 36 billion, almost 30 per cent of the contracted amount, as most of the contracts are related to pre-construction/under-construction properties, thus (also) involving a later drawdown.

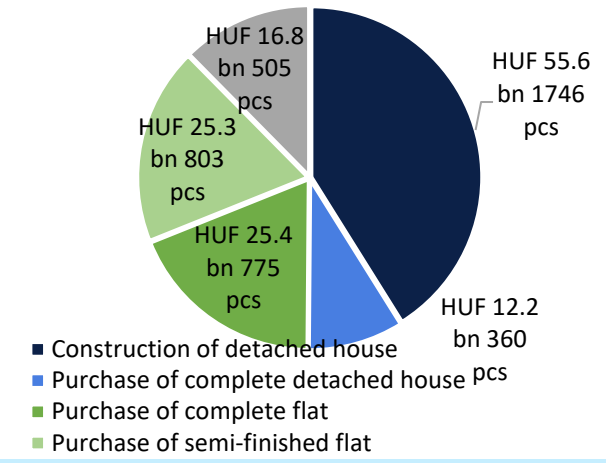
Half of the contracted volume, totalling nearly HUF 68 billion so far, has been taken out for the construction or purchase of detached houses (Chart 3.10). More than 80 per cent of this volume has been used to finance the construction of detached houses, 60 per cent of which are in rural areas, with an average loan amount of HUF 29 million. More than a third of the loans were for dwellings, with almost half of the loans for dwellings under construction and half for ready-made dwellings. More than four-fifths of the latter loans flowed to the Central Hungary region (and more than 60 per cent were directly linked to Budapest). The average amount of loans taken out for the purchase of ready-made dwellings in the capital exceeded HUF 35 million. The purchase of semi-

64 The APR may exceed the maximum interest rate of 2.5 per cent stipulated under the scheme, including the fees associated with the loan.

65 Contracted volume reported to the MNB by 28 January 2022, as part of the AL12 reporting. The volume/number of contracts actually concluded may exceed this, as credit institutions only need to report transactions before disbursement.

finished housing probably does not represent a higher share because under current mortgage lending practices, banks only enter into a loan contract with the client once a sales contract is concluded, while some real estate developers only conclude a pre-sales contract with the buyer at an early stage of construction.

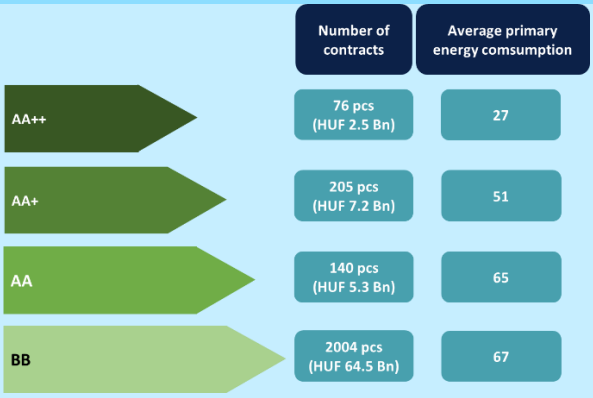
Chart 3.10: Breakdown of the volume of GHP contracts by loan purpose



Source: MNB

The energy rating of 60 per cent of the properties financed under the GHP so far is already known, of which 83 per cent have an energy rating of BB and 17 per cent have an energy rating higher than BB (Chart 3.11). The average primary energy consumption is significantly lower than the current maximum of 90 kWh/m^2/year required by the programme (from 19 April 2022 it will be 80 kWh/m^2/year) for properties with a BB energy certificate, at around 66 kWh per square metre per year – thus meeting essentially even the criteria for the overall energy performance indicator of the AA class – while for properties with the best energy rating of AA++ it is only 27 kWh/m^2/year.

Chart 3.11: Distribution by energy class of properties financed under the GHP

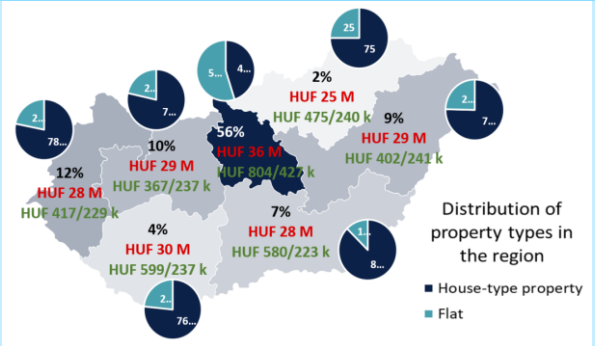


Source: MNB

Note: Participating banks only need to report the energy rating of the property after the completion of the energy certification of the property. Source: MNB

Half of the volume of contracts signed relates to properties under construction or already built in the Central Hungary region, and in relative terms 46 per cent of the loans were used in this region (Chart 3.12). Here, the average loan amount is HUF 34.3 million, which exceeds the average loan amount of HUF 30.6 million for the entire portfolio. In terms of maturity, the average maturity of loans in Central Hungary, weighted by loan amount, only slightly exceeds the average of 20.8 years for the overall GHP portfolio.

Chart 3.12: Territorial distribution by volume of contracts concluded under the GHP



Note: black indicates the spatial distribution of volume, red the average loan amount in a given region and green the average price per square metre per type of property, given by the bank as the ratio of the market value to the useful floor area. Source: MNB

In 2022, the MNB extended the green preferential capital requirement for corporates and municipalities to cover bank exposures to the real estate sector. The activity criteria for the preferential treatment are based

on the technical screening criteria[66] for climate change mitigation activities set out in Annex I of the EU Taxonomy Climate Delegated Act[67]. The criteria set by EU Taxonomy are very favourable and ambitious from a sustainability point of view, but they also include a number of conditions that are difficult to meet in current Hungarian construction practice. Taking this into account, in cooperation with the Hungarian Green Building Council (HUGBC), the green preferential capital requirement for corporates and municipalities have been complemented by a set of conditions that, while maintaining ambitious sustainability targets, are adapted to Hungarian real estate market practice. This set of criteria can be met on the basis of a refined set of criteria, sometimes different from the EU Taxonomy criteria, or on the basis of an international building rating[68] that meets the rating levels required by the Preferential Capital Requirement scheme. The MNB aims to encourage members of the financial intermediary system to achieve the most ambitious sustainable financing targets possible, and therefore a 7 per cent capital relief may be applied to exposures related to buildings that strictly comply with the EU Taxonomy criteria, while exposures related to buildings that meet criteria aligned with Hungarian real estate market practice may benefit from a lower capital relief of 5 per cent.

3.1.2. Significant opportunities for financing sustainable agriculture

In Hungary, the most valuable and conditionally renewable natural resource is arable land. 54 per cent of Hungary's land area is agricultural land, which – based on 2021 data – has increased by one percentage point compared to 2020. Within the agricultural area, the share of arable land stands out with 82 per cent, followed by grassland with 14.9 per cent.

Despite the significant and still good quality of agricultural land, sustainability considerations are less prevalent. The country has basically good agro-ecological conditions and overall soil conditions are ideal, but land use, species selection and intensity of cultivation do not go hand in hand with the close adaptation to the effects of climate change and environmental impacts, leading to continued soil degradation.[69] For the design of the National Biodiversity Strategy 2030, research was also available from the Environmental and Energy Efficiency Operational Programme (EEEOP) call for proposals "Strategic studies for the conservation of biodiversity, natural and landscape values". For the largest agricultural land type, for example, it was found that there is little arable land of good condition in terms of biodiversity in our country.[70] Another important indicator is the proportion of land under organic farming. This is increasing, albeit slowly, but is still well below the EU target of 25 per cent by 2030. The proportion of organic land has increased from 3.5 per cent in 2016 to 6.1 per cent in 2020.

The ecological backlog in the agricultural sector has been recognised also by the Government, which has set a number of strategic plans to restore the degraded ecosystem. The Common Agricultural Policy Strategic Plan[71], submitted by the Ministry of Agriculture at the end of 2021, also gives priority to the promotion of organic farming in the light of the objectives of the Biodiversity Strategy and the Farm to Fork Strategy. It aims, *inter alia*, to increase sustainable production practices, produce healthier food, reduce GHG and ammonia emissions, reduce the use of fertilisers and pesticides and increase the share of organically farmed land to 15 per cent. The draft Renewable National Biodiversity Strategy 2030 sets targets that are in line with these objectives, such as restoring more than 200,000 hectares of degraded ecosystems, reducing invasive species, improving pollinator habitats, promoting agroecological farming practices and promoting sustainable water management and retention.[72]

In August 2021, the MNB's Green Preferential Capital Requirement Programme for corporates and municipalities was extended to include measures to support the greening of agriculture. The starting point for these measures was to define sustainable agriculture and to ensure coherence with the renewed Common Agricultural Policy and the national and EU Biodiversity Strategies. The sustainable agriculture: "The management and conservation of the natural resource base and the management of technological and

[66] „technical screening criteria"
[67] EC(2021): Taxonomy Climate Delegated Act
[68] LEED/BREEAM/DGNB
[69] Csaba Vaszkó (2021): Fenntartható Agrárium (Sustainable Agriculture)
[70] Ministry of Agriculture (2021): results of the mapping of general ecosystem status indicators
[71] Ministry of Agriculture (2021): Social consultation on the new CAP
[72] Levente Kőrösi (2021): Presentation of the draft National Biodiversity Strategy 2030, professional forum, 20.10.2021

institutional change in such a way that the needs of humankind are met in a sustainable way for present and future generations. Conserves and improves the condition of land and water resources. Conserves and enhances biodiversity, including genetic diversity, species richness and ecosystem diversity. Reduces material use, energy use and waste. It adapts to the landscape and production site and avoids further damage and degradation of all environmental factors."[73]

In August 2021, recognising the sustainability challenges of the sector, we extended the Green Preferential Capital Requirement Programme for Corporates and Municipalities to include this sector. In the agricultural segment, the preferential capital requirement may be applied by the bank to loans to clients with at least 50 per cent Natura 2000 grassland[74] maintenance obligations or participating in an AKG[75], ÖKO[76] support programme. A higher rate of the capital discount may be applied if this area ratio is higher or if the proportion of eco-areas is higher within the total eligible area of the client. On the other hand, exposures of livestock farmers and food processors with organic certification are also eligible for capital discount. Investments in renewable energy production and energy efficiency in the agricultural sector are also eligible for the preferential programme. The other elements of the preferential scheme are mainly targeted at improving ecosystem services and biodiversity, such as exposures for the development of the beekeeping sector and non-productive investments for habitat improvement. The agricultural sector faces a major challenge to achieve an environmentally optimal implementation of precision improvements linked to the digital transition, and therefore exposures to finance these instruments are also eligible for preferential programme, provided that they are accompanied by environmental objectives.

In addition to greenhouse gas reduction, the MNB's programme also takes into account other environmentally relevant aspects such as efficient water management or biodiversity enhancement. The elements of the list of environmental objectives are designed to improve the basic condition of Hungarian agriculture, to mitigate environmental and climate change and increase its resilience to change, to ensure the sustainability of long-term stable productivity and ultimately to produce food with higher nutritional value. These environmental objectives for arable land and grassland fall into five categories: carbon sequestration and reducing greenhouse gas emissions; protecting soils, reducing soil erosion; increasing the organic matter content of soils; improving the quantity and quality of water, with a focus on water retention; and improving and protecting biodiversity and ecosystems.

As the addition of agriculture to the programme started a year and a half later, the credit institutions are in the process of joining the programme. Since the green corporate and municipal preferential capital requirements started for agriculture at the end of August 2021, no green lending has been done in this segment so far, based on the final data for 2021. However, the stock of loans to domestic companies in the agricultural sector[77] increased from HUF 431.8 billion at 31.12.2020 to HUF 503.9 billion at the end of 2021, giving the sector a share of 4 per cent of total corporate loans. The preferential capital requirement will reduce the cost of debt financing, allowing clients to obtain more favourable financing for greening the agricultural sector.

3.1.3. Renewable energy production in lending

The key sector for achieving the 2050 climate neutrality target is the energy sector, which also requires the most financing investments. In recent years, several sustainability strategies, regulations and directives have been adopted in the European Union and in Hungary, several of which incorporate the objectives of clean, affordable energy supply and energy independence[78]. These strategies include increasingly ambitious targets for greening the energy sector. The National Clean Development Strategy, published in September 2021, identified the largest GHG reduction potential to be found in the energy sector, further increasing the scale of improvements. For example, the strategy sets a target of 65 GW of electricity generation capacity to reach the 2050 climate neutrality target, 78 per cent of which would be provided by solar energy under the Early Action

[73] Csaba Vaszkó (2021): Fenntartható Agrárium (Sustainable Agriculture)

[74] compensatory payments for Natura 2000 agricultural areas VP4-12.1.1-16 (Natura 2000 grassland)

[75] Agri-environmental management payment VP4-10.1.1-21 (AKG)

[76] Transition to organic farming, maintenance of organic farming VP4-11.1.1.-11.2.1.-21 (ÖKO)

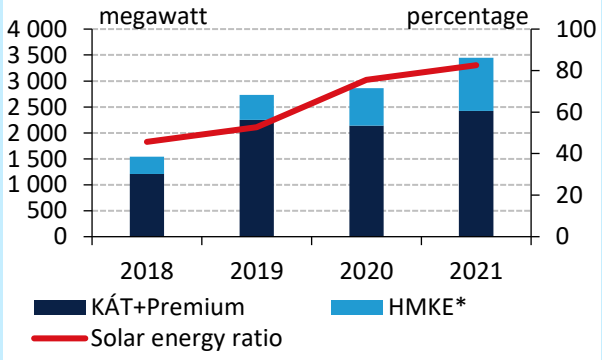
[77] TEÁOR (NACE) sector "A": agriculture, hunting, forestry and fishing

[78] Bálint, M – Jókuthy, L – Pintér, V A – Sándor, N A (2022): Garanciák szerepe a zöld gazdasági átállásban – nemzetközi körkép (The role of guarantees in the green economy transition – international overview)

Scenario[79]. In terms of financing, it concludes that the climate neutral transition by 2050 will require additional investment of HUF 24,709 billion, 91 per cent of which will be in the energy sector.

The share of renewables in the sector increased dynamically in 2021, with solar energy as the main source. The role of renewables is more visible when looking at the electricity sector. The launch of the feed-in tariff scheme (KÁT) and the Renewable Energy Support System (METÁR) provided a solid basis for supporting renewable energy investments and lending activity in the market has also become increasingly buoyant[80]. Renewable capacity installed in the electricity sector increased by 20 per cent within 1 year by the end of 2021, reaching around 3,500 MW of renewable capacity.[81] This dynamic growth was driven by investments in solar energy, with the share of solar power increasing from 76 per cent to 83 per cent in 2021.

Chart 3.13: Installed renewable energy capacity in the electricity sector in Hungary

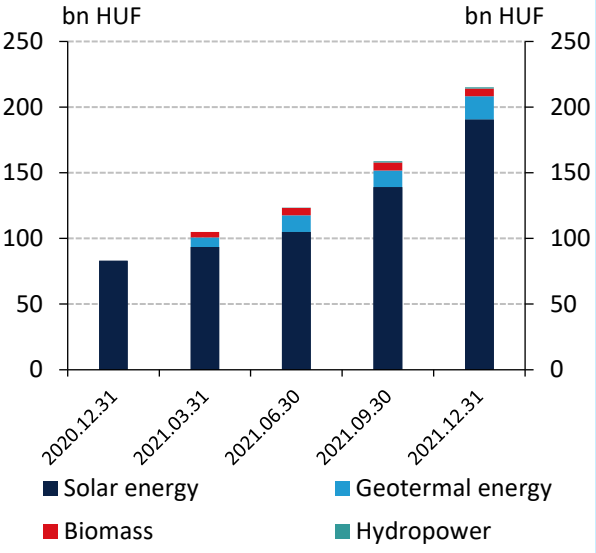


Source: MEKH, MAVIR

**In 2021, Q3 2021 is the most recent data*

Among the targets included in the Green Preferential Capital Requirement Program for corporates and municipalities, the exposure-based share of renewable energy sector investments was over 94 per cent. In addition to support schemes, there is an undeniable role for financier activity, which the MNB's Green Preferential Capital Requirement Programme for Corporates and Municipalities and the Infrastructure Supporting Factor have also been designed to stimulate. Investment or project loan contracts or bond exposures entered into by banks after January 1 2020 that finance renewable energy production in the corporate or municipal sector are eligible for a Pillar II capital discount of 5 or 7 per cent, subject to the fulfilment of the conditions. The evolution of the exposures eligible for the capital discount is shown in the graph below, which clearly shows that green lending in the renewable energy sector, especially in the solar sector, has reached a high level of activity. By the end of 2021, the stock of green loans eligible for the preferential programme more than doubled in one year to HUF 191 billion in the solar segment. In the renewable energy sector, the share of solar energy in green lending remains extremely high, at 89 per cent at the end of last year. Overall, the volume of green lending in renewable energy financing increased by almost two and a half times, from HUF 83 billion to HUF 215 billion, reflecting the strong demand from banks for the green preferential capital requirement program.

Chart 3.14: Gross exposures of bank loans with green capital discount for corporates and municipalities in the renewable energy sector



Source: MNB

Investments in renewable energy generation are also included in the Green Preferential Capital Requirement Programme for Housing. Exposure for the installation of solar panels, solar collectors, wind turbines, heat pumps is eligible for the capital discounts if the conditions are met. Institutions have not yet made use of the Green Preferential Capital Requirement Programme for Housing to finance such equipment.

3.1.4. Promoting the sustainability of electromobility

[79] ITM (2021): National Clean Development Strategy

[80] MNB (2020): Financing domestic renewable energy production

[81] This figure does not yet include data for small household-sized power plants for Q4 2021.

The spread of electromobility ("e-mobility") is supported by both technological developments and financing trends. It is a new form of transport using vehicles that derive all (electric vehicles) or part (plug-in hybrid vehicles) of their energy from electricity. The use of electricity as a source of energy helps to reduce the use of fossil fuels. The uptake of electric and plug-in hybrid vehicles leads to a marked reduction in CO_2 emissions, thus making a valuable and sustainable contribution to climate protection. Their use reduces fine particle and noise pollution, especially in cities. E-mobility is currently supported by a number of incentives: state subsidies for the purchase of electric cars, vehicle tax exemptions, company car tax exemptions, registration tax exemptions, transfer tax exemptions or free parking with green plates. Although currently the more sustainable transport and economic transition is facilitated by hybrid vehicles, this is only temporary, in the long term the operation of pure electric vehicles with zero CO_2 emissions can become rational not only from a sustainability point of view, but also from a financing and economic point of view.

The number of electric cars is growing dynamically also in Hungary. According to the Future Mobility Association[82], the number of electric cars in Hungary increased by about 50 per cent to 18,800 in the first 10 months of 2021, and is predicted to rise to 30,000 by the end of 2022, 75,000 in 2024 and 125,000 by the end of 2026. Despite the promising growth, 52 per cent of the population still use conventional internal combustion passenger vehicles, meaning that only 48 per cent of the population use public transport, bicycles or electric transport. The table below (Table 4) illustrates that in terms of sustainability, passenger car use in Hungary is in the middle of the European average, although the share of petrol is higher, but the share of electric and hybrid is in line with the EU average.

The market for electric cars is still evolving and consumer choices may be influenced by a number of factors. The main barriers to the uptake of electric passenger cars are higher purchase prices and lower range compared to conventional combustion cars, therefore the number of electric passenger cars in Hungary has taken off mainly due to the state subsidies introduced in 2016. However, the differences in running costs between the different types of powertrains (petrol, diesel, hybrid, plug-in hybrid, pure electric) are less well known, and in many cases the lack of information makes car purchase decisions difficult.

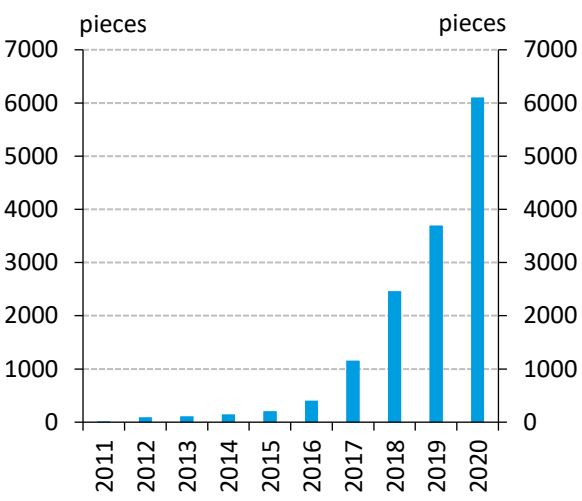
Table 4: Share of passenger cars in use by propulsion technology (2019)

Passenger car stock 2019	*Petrol*	*Diesel*	*Electrical*	*Hybrid*	*CNG/LNG*	*LPG*	*Other*	*Unknown*
Hungary	66.40%	31.50%	0.20%	1.20%	0.10%	0.70%	0.00%	0.00%
Austria	43.20%	55.00%	0.60%	1.00%	0.10%	0.10%	0.00%	0.00%
Czech Republic	62.80%	35.90%	0.00%	0.30%	0.20%	0.10%	0.10%	0.60%
Slovakia	51.70%	44.30%	0.10%	0.40%	0.10%	2.00%	0.00%	1.40%
Romania	55.30%	43.30%	0.00%	0.20%	0.00%	0.10%	0.00%	1.10%
EU	52.90%	42.30%	0.20%	1.00%	0.50%	2.70%	0.10%	0.20%

Source: European Automobile Manufacturers Association (ACEA)

[82] Future Mobility Association (2021): Research on electric vehicles

Chart 3.15: Number of electric passenger cars in use (2008–2019)



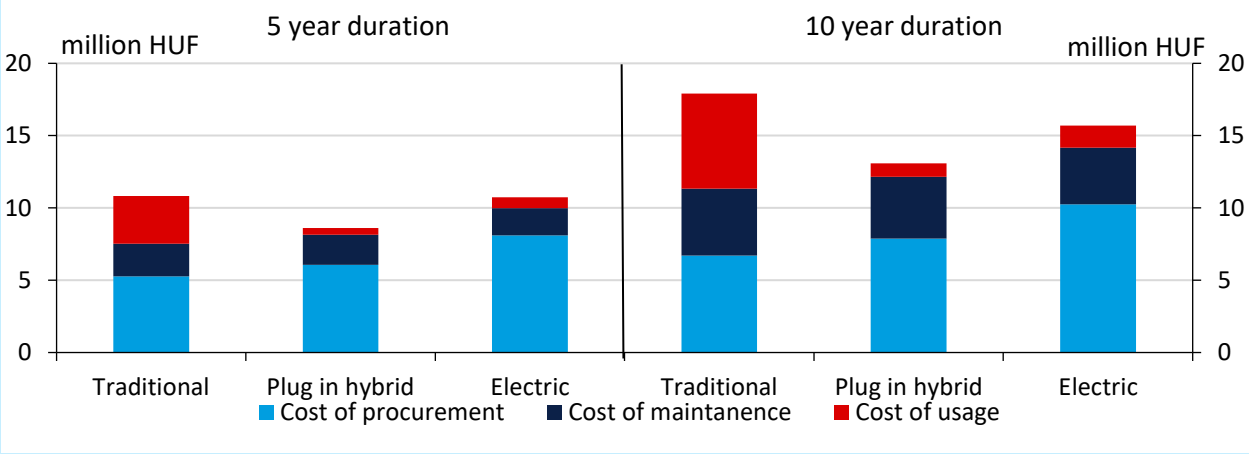
Source: European Alternative Fuels Observatory (EAFO)

It is also worth taking a new approach to the purchase of an electric car as a consumer durable and considering not only the financing costs of the whole life cycle when making a decision. The Department of Transport Technology and Transport Economics of the Faculty of Transportation Engineering and Vehicle Engineering of the Budapest University of Technology and Economics, in cooperation with the Sustainable Finance Department of the MNB, has developed an electric car calculator application to address the above problem. Its special feature is that, in addition to comparing the purchase price and charging costs of passenger cars with different propulsion technologies, it also takes into account the different maintenance, servicing and financing costs of the vehicles. These costs can be significantly lower for pure electric vehicles compared to vehicles with conventional propulsion. In addition, the calculator takes into account the user's travel habits, which is important because the length and regularity of the journeys made and the duration of the vehicle's use (years of planned use) have a major influence on the economics of each type of propulsion.

The results of the calculations are strongly influenced by the vehicle usage profile. For predominantly urban use, a pure electric vehicle is typically the most cost-effective, for regular commuting a plug-in hybrid, while for long distance journeys conventional internal combustion vehicles are typically the most financially efficient. Based on the calculator's calculations, comparing three mid-range vehicles with an agglomeration commuter[83] vehicle usage profile and home electric car charging, the purchase of a plug-in hybrid is the financially rational choice. This is primarily due to the cost of vehicle use: these types of cars are able to optimise the use of combustion and electric propulsion depending on the parameters of the journey, and therefore this technology performs best in terms of fuel costs. The cost of purchasing a vehicle has increased moderately compared to conventional combustion vehicles, which also represents an advantage over pure electric vehicles over a 5-10 year time horizon. The calculator does not take into account the impact of government subsidies that may be available from time to time, which could tip the balance in favour of electric vehicles. This is particularly true for the 10-year lifetime, where the benefits of green cars compared to conventional combustion cars are more pronounced in vehicle maintenance and operating costs, and where it clearly becomes more cost-effective to maintain plug-in hybrids and electric cars

[83] 19,000km/year of vehicle use, of which 25-25 per cent motorway and road use, 50 per cent urban use

Chart 3.16: Change in total cost of vehicle ownership and use



Source: Csonka et al. (2021): Development of a costing methodology and application to support the procurement of electric road vehicles[84]

Although there is currently a shortage of affordable financing products available for electric car purchases in the Hungarian market, a further reduction in the maintenance costs of pure electric vehicles could be facilitated by more favourable financing costs in the future. The EU Taxonomy Regulation and the planned new CRR rules[85] will require ESG considerations and related disclosure requirements for credit institutions and financial enterprises, which is expected to strengthen the need for financiers to build sustainable portfolios in the coming years. The automotive industry accounts for more than 7 per cent of the EU's GDP and more than a quarter of Hungarian industrial production, and is undeniably a significant sector in the economy and in banking, finance and financing portfolios. The ESG risks of this important sector can be easily offset by portfolios dedicated to financing electromobility, which could generate increased competition and differentiated treatment in the future in the market for financing pure electric vehicles.

The favourable financing of electromobility is also encouraged by the green preferential capital requirements for corporates and municipalities introduced by the MNB. In 2021, it was extended to loan and lease exposures financing electromobility, including loan and finance lease exposures for the purchase of electric vehicles, loans financing electric vehicle fleets and inventories, and loan exposures financing investments in electric charging infrastructure. The new incentive was initially used for bank exposures financing electromobility worth nearly HUF 3 billion until the end of 2021. The exposures typically cover leasing arrangements for the purchase of 1-3 vehicles with a maturity of 3-7 years. The exposures are built up in the corporate client segment, with the borrowers' activities spread across a diverse range of industrial segments. In line with the MNB' preferential capital requirement, only the financing of zero CO_2-emission passenger cars will be considered sustainable from 2026 onwards under the EU Taxonomy Climate Delegated Act[86] , which foresees a mid- to long-term uptake of favourable sustainable financing products in the market for pure electric vehicles.

In addition to sustainability initiatives, there may also be economical arguments for the development of financial products beneficial to electromobility. The collection of data on the long-term use, maintenance and battery performance of vehicles with electric propulsion would allow comparisons between electric vehicles and vehicles with conventional internal combustion engines in terms of residual value calculation, which could also have a positive impact on the financing of leasing of electric vehicles and on the insurance conditions of compulsory motor liability and casco insurance.

[84] Csonka et al. (2021): Development of a costing methodology and application to support the procurement of electric road vehicles

[85] Regulation (EU) No 575/2013 of the European Parliament and of the Council on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 ('CRR')

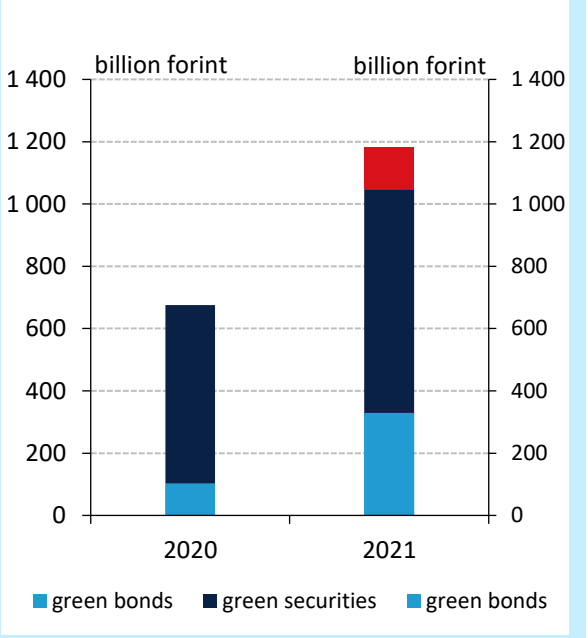
[86] EC(2021): Taxonomy Climate Delegated Act

3.2. Green capital market

In 2021, the Hungarian green capital market showed signs of development alongside the expansion of green lending (Chart 3.17). Starting from a low base two years ago, this is now the second year of growth in this segment. The benefits of green capital market financing and investment are increasingly recognised by market participants, both on the issuer and investor side. The active role of the MNB and the domestic impact of global market developments, such as the rise and regulatory support for ESG investments, are key drivers of this development. Sustaining this trend is key, as the capital market can play a major role in the implementation of domestic green investments and thus in the green transition of the Hungarian economy.

The MNB is committed to the development of the Hungarian green capital market, and has already taken several steps to ensure that the capital market can better support the environmental sustainability of our country. The Bond Funding for Growth Scheme (BGS), launched in 2019, was primarily aimed at increasing liquidity in the corporate bond market to help diversify the external resources of domestic companies. The programme also played a key role in launching green bond issuance. Under the BGS, 13 series of green bonds were issued, of which the MNB has purchased close to HUF 189 billion in nominal value until the end of 2021. In addition to promoting green lending, the MNB introduced a preferential capital requirement programme at the end of 2020 to further green the bond market, including for corporate green bond purchases by commercial banks. By the end of 2021, banks participating in the programme had applied for preferential treatment for HUF 69 billion of placements, bringing the total stock of green bonds to HUF 328.5 billion. Furthermore, the MNB also announced a Green Mortgage Bond Purchase Programme in autumn 2021 as part of the Green Monetary Policy Toolkit strategy to create a domestic green mortgage bond market, complemented by a preferential treatment in the Mortgage Funding Adequacy Ratio. Since the launch of the programme, the central bank has already completed more than HUF 51 billion worth of green mortgage bond purchases by the end of December 2021. In addition to the central bank measures, the stock of debt securities issued by the central government has also changed compared to 2020, with an additional HUF 145 billion of issuance in the domestic green government bond market. Finally, the volume of ESG investment funds increased. A steady development can be observed not only globally and in the European capital markets, but also in Hungary. The emergence of investment funds with an environmental and social sustainability focus is also supported by EU regulations on sustainable finance, which also provide a guideline for the creation of sustainability-oriented funds. As a result, by the end of 2021, the value of assets under management in ESG funds in Hungary increased to HUF 158 billion. In addition, sustainability thinking has also penetrated the market for other investments such as unit-linked asset funds, pension fund portfolios, private and venture capital funds and equities, and this area of the capital market is also showing signs of development.

Chart 3.17: Green capital market assets at the end of 2020 and 2021



Source: MNB, GOVERNMENT DEBT MANAGEMENT AGENCY

In addition to the market developments, it is worth noting that the work in 2020 and 2021 resulted in the recommendations underpinning Hungary's Sustainable Capital Market Strategy and Action Plan.[87] The European

[87] MNB (2022): Strategic proposals to "green" the domestic capital market have been adopted

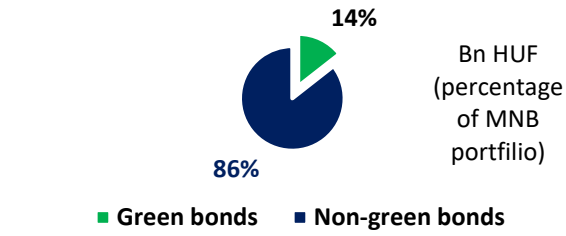
Bank for Reconstruction and Development (EBRD) and Deloitte, as a professional advisor, actively contributed to the development of the document, involving investment service providers and other market and government actors. The recommendations, which are also addressed to the MNB, aim to develop a Sustainable Capital Market Strategy with concrete actions to facilitate and support the further development of the domestic sustainable capital market and green finance. The recommendations cover, *inter alia*, the collection and disclosure of non-financial corporate data, the quantitative and qualitative development of domestic ESG investment funds and the further strengthening of the green bond and mortgage bond segments. Based on the proposals, the MNB will work with the Budapest Stock Exchange and its government partners towards developing a strategy and concrete measures to this end.

The MNB has also awarded Green Investment Fund Manager and Green Insurance and Pension Fund Awards in 2021 to symbolically encourage the greening of the capital market. The main criterion for the awards was the actual green activity of the institutions, measured by the central bank on the basis of pre-defined green KPIs (e.g. green bond holdings, number of sustainability products). In this context, Union Vienna Insurance Group Biztosító Zrt. was awarded the Green Insurance and Pension Fund Award, while Erste Alapkezelő Zrt. won the Green Investment Fund Manager Award. The awards were conferred in December 2021 at the Central European Green Finance Conference, part of the Planet Budapest Sustainability Expo and World Summit.

3.2.1. Green corporate bonds within BGS

The BGS was instrumental in kick-starting the domestic green bond market. The MNB has also purchased green corporate bonds under the BGS, the first of which was issued by CPI, a real estate development company, in August 2020. The central bank has purchased 13 tranches of green bonds up to 31 December 2021, raising the share of green bonds in the total BGS portfolio to over 14 percent. In the Hungarian green bond market as a whole, more than two-thirds of issuance was made by companies in the real estate sector (35%) and the financial sector (30%), followed by manufacturing (17%), construction (11%), agriculture (4%) and retail and wholesale (2%).[88] By contrast, the structure of the EU green bond market is slightly different, with issuance from the financial sector (38%) accounting for the largest slice of the pie, followed by the energy sector (30%), real estate development (15%) and last but not least manufacturing (11%).[89]

Chart 3.18: Share of green bonds in the BGS portfolio, 2021



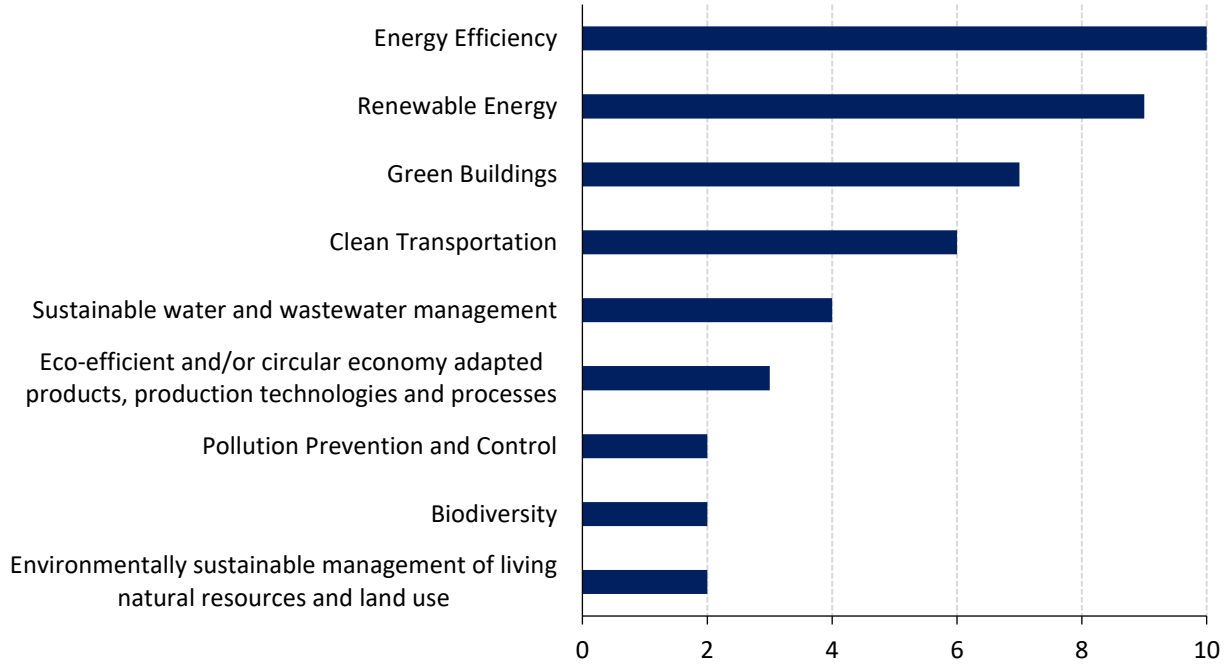
Source: MNB

The issuers of green corporate bonds issued under the BGS have established a Green Bond Framework applicable to themselves, which has been externally reviewed by an independent third party, i.e. can be called green bonds in line with international standards. The Frameworks support categories of projects that comply with the Green Bond Principles (GBP) using funds raised from Green Bond issuance. Ten of the Green Bond Framework Schemes in the BGS portfolio support energy efficiency, nine support renewable energy and seven support green building categories. It should be noted, however, that a framework can support more than one category, i.e. it can support the transition to a net-zero emissions economy in a number of ways.

[88] These numbers include 2022 issuances and bonds outside the BGS as well.

[89] Bécsi, Attila – Varga, Márton – Lóga, Máté – Kolozsi, Péter Pál (2022): First steps – the nascent green bond ecosystem in Hungary

Chart 3.19: Project categories supported by the green bond frameworks of the BGS portfolio, 2021



Source: MNB

Based on the objectives set out in the Green Bond Frameworks, the companies and the external review also identify which UN Sustainable Development Goals (SDGs) the financed green projects can contribute most to. In the case of green bonds under the BGS, support for the following SDGs is particularly strong:

- **SDG 7:** Ensure access to affordable, reliable, sustainable and modern energy for all;
- **SDG 11:** Make cities and human settlements inclusive, safe, resilient and sustainable

SDG 12: Ensure sustainable consumption and production patterns.

Although the MNB Monetary Council decided to close the BGS at its December 2021 meeting, the intention of the MNB is to enable further issuance in the corporate green bond market at a later stage. Once the ongoing negotiations with issuers have been realised, up to the maximum envelope of the programme, the central bank will no longer purchase new corporate bonds. However, the MNB's preferential capital requirement will continue to apply and the central bank assisted issuers also by publishing an issuance guide.[90]

Table 5: Collection of domestic corporate green bonds issued

Security ISIN	Issuer short name	Total issued value (HUF billions)	Date of issue	Maturity date	Economic sector
HU0000360102	GTC Magyarország Zrt.	39.6	07.12.2020	07.12.2030	Construction industry
HU0000360284	GTC Magyarország Zrt.	19.8	17.03.2021	17.03.2031	Construction industry
HU0000360474	VAJDA-PAPÍR Kft.	9.9	17.05.2021	17.05.2031	Manufacturing
HU0000360722	HELL ENERGY Magyarország Kft.	67	28.07.2021	28.07.2031	Manufacturing

[90] MNB(2022): Green Bond Issuance Guide

HU0000361332	DELTAPLAST Zrt.	3.3	09.02.2022	15.02.2032	Manufacturing
HU0000359898	CPI Hungary Investments Kft.	30	07.08.2020	07.08.2030	Real estate
HU0000360201	SkyGreen Buildings Kft.	32	29.12.2020	29.12.2030	Real estate
HU0000360268	Futureal Develop. Hold. If. Kft	63.05	23.03.2021	23.03.2031	Real estate
HU0000360649	SunDell Estate Nyrt.	5.5	09.07.2021	09.07.2031	Real estate
HU0000360805	WINGHOLDING Zrt.	25.3	22.09.2021	22.09.2031	Real estate
HU0000361308	Kopaszi Gát Kft.	34.45	19.01.2022	31.01.2032	Real estate
HU0000360714	STAVMAT Zrt.	5	20.07.2021	20.07.2031	Trade and repair of vehicles
HU0000361241	VÖRÖSKŐ Kft.	7	25.01.2022	25.01.2032	Trade and repair of vehicles
HU0000360706	Baromfi-Coop Kft.	23	19.07.2021	19.07.2031	Agriculture, forestry and fishing
HU0000360664	AutoWallis Nyrt.	6.6	27.07.2021	27.07.2031	Professional, scientific and technical activities
HU0000360789	LP Portfolió Kft.	–1.8	21.09.2021	23.09.2031	Professional, scientific and technical activities

Source: MNB

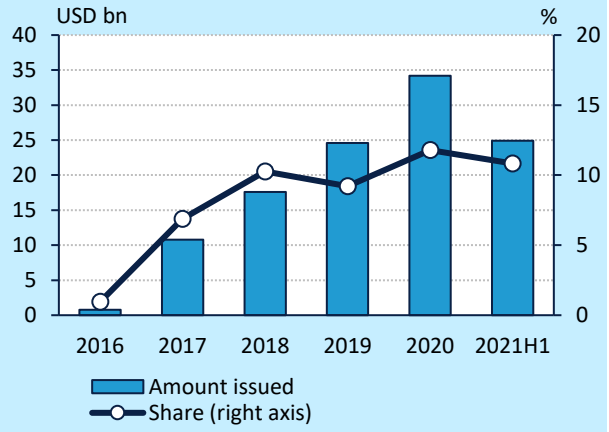
3.2.2. Green Government Bonds

The issuance of green bonds brings benefits also to governments. States have an important role to play in protecting environmental sustainability and in combating climate change and biodiversity loss, for which they typically have commitments in the form of international agreements (e.g. the Paris Agreement). Raising funds for dedicated purposes contributes to meeting sustainability objectives and has the added benefit of broadening the funding base of the state with investors that are susceptible to green objectives and have a demand for such investment opportunities. In addition, the green pricing premium, the "greenium" on the issuer side of green bonds reduces the government's interest expenditure. Therefore, it may be appropriate to finance green expenditures in the form of green-labelled securities rather than the usual external source of funds – considering the costs associated with establishing the framework, external green rating, administration of reporting on the use restricted to green spending.**On the issuer side of the green capital market, governments are increasingly active players.** According to the data of Climate Bonds Initiative, the stock of green bonds issued by sovereigns has been growing steeply since 2016, reaching over USD 34 billion in 2020 and accounting for over 10 per cent of total annual green bond issuance (Chart 3.20). 73 per cent of 2020 issuance has already been realised in the first half of 2021, and further growth is expected in the sovereign green bond market as following the lead of developed markets more and more emerging economies become issuers. In September 2021, the European Union announced the world's largest ever green bond programme (EUR 250 billion)[91], which will be implemented alongside each Member State's own

[91] EC (2022): NextGenerationEU Green Bonds

green bond issuance. In October 2021, the EU completed the largest ever green bond transaction under the programme, successfully issuing EUR 12 billion of green bonds, with an oversubscription of eleven times, and raising a further EUR 2.5 billion in January 2022.

Chart 3.20: Development of the volume of green bonds issued by sovereigns and their share in total annual green bond issuance



Source: Climate Bonds Initiative

In May 2020, Hungary's Green Bond Framework[92] was published, within which HUF 718 billion of green bonds were issued until the end of 2021. This corresponds to 1.8 per cent of government debt at the end of 2021 and 6.5 per cent of net issuance in 2020 and 2021. The amounts corresponding to the net proceeds of the bonds issued within the Framework must be used for expenditures in Hungary's central budget, meeting the criteria and definition of so-called Eligible Green Expenditure. Eligible Green Expenditures include expenditures:

(i) incurred in the two fiscal years preceding the year of issuance,

(ii) incurred in the same year as the issuance; and/or

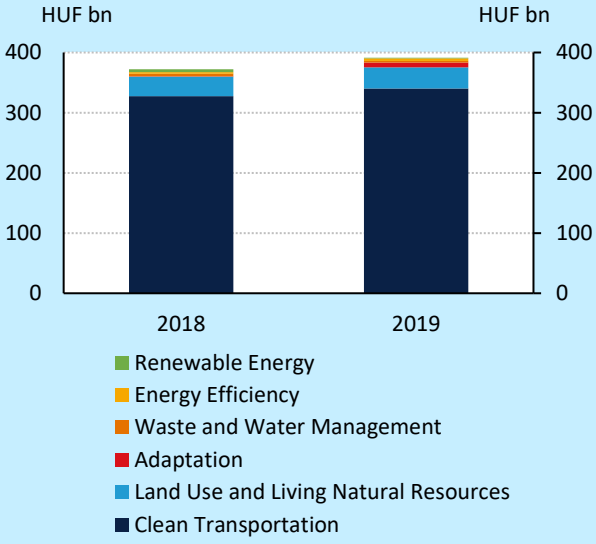
(iii) future budget expenditure.

Eligible Green Expenditures are selected annually and the allocation of the proceeds of the Green Bonds is also made on an annual basis, which is reported to investors annually. The report is published on the website of the Government Debt Management Agency ("ÁKK").

Based on the 2020 allocation report[93], HUF 574 billion of Eligible Green Expenditure, corresponding to the amount raised so far, has been allocated by the end of 2020. This means that allocation has been made to the entire 2018 Eligible Green Expenditure (HUF 372 billion) and to part of the 2019 expenditures (HUF 202 billion) , thus proceeds from green bond issuance after 2020 can be allocated to the remaining part of the 2019 expenditures and the Eligible Green Expenditures to be incurred in later years. Eligible Green Expenditures can be divided into 6 green sectors and can be used for investment, intervention, tax or operating expenditures. Of the 6 green sectors, "Clean Transportation" accounted for nearly 90 per cent of Eligible Green Expenditures in 2018-19, mostly through support and development expenditure on rail transport (Chart 3.21). In addition, the category "Land Use and Living Natural Resources" (mainly supporting sustainable agriculture and financing operating expenditure in national parks and forestry) accounted for a share of close to 10 per cent.

Chart 3.21

Breakdown of Eligible Green Expenditures by green sectors in 2018-19



Source: HUNGARY Green Bond Allocation Report 2020

By the end of 2021, 87 per cent of Green Bond issuances were in foreign currency (Error! Reference source not found..22). The first Green Bond issue was launched in June 2020, raising EUR 1.5 billion (HUF 517 billion) with a

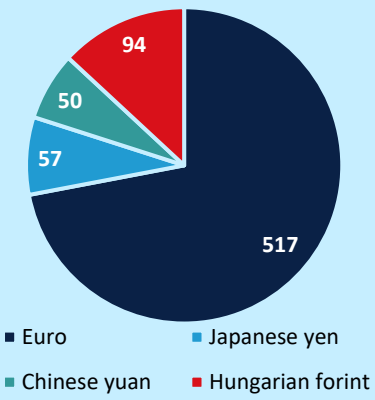
[92] ÁKK (2020): Hungary Green Bond Framework

[93] ÁKK (2021): HUNGARY Green Bond Allocation Report 2020

15-year maturity[94]. This was followed in September 2020 by two series of Japanese yen ("samurai") Green Bonds with 7 and 10-year maturities for a total of JPY 20 billion (HUF 57 billion)[95], and at the end of 2021 Hungary also entered the Chinese market with a 3-year ("panda") Green Bond, of which CNY 1 billion (HUF 50 billion) was sold[96].

Following the successful foreign currency issuances in 2020, sales of HUF Green Bonds started in 2021. ÁKK issued its new forint Green Bond on 22 April 2021, timed to coincide with Earth Day, in the same way as the forint bonds available to institutional investors. Bids of HUF 30 billion were accepted in the first auction of the new 30-year series 2051/G, and by the end of the year a total of nearly HUF 94 billion 2051/G were sold. ÁKK will continue to issue 2051/G in 2022 and has also launched a new series of 10-year Green Bonds (2032/G), with monthly auctions. According to the financing plan of the ÁKK, it will issue HUF 40 billion of 2051/G and HUF 240 billion of 2032/G in 2022[97]. In addition, the plan includes the issuance of Japanese yen-denominated Green Bonds, in line with which funds of JPY 59.3 billion (approximately HUF 160 billion) were raised on 18 February 2022[98].

Chart 3.22: Hungarian Green Bonds issued by end-2021 by currency (HUF billion)



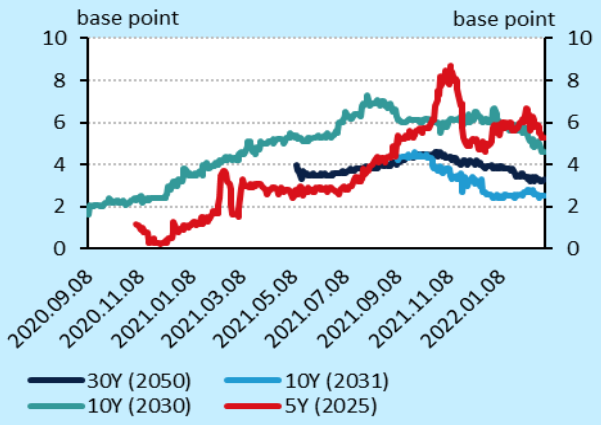
Source: ÁKK

In addition to sustainability objectives, the issuance of forint Green Bonds contributes to increasing the average maturity of debt and, together with the diversification of the investor base, improves the debt profile. The 30-year maturity of 2051/G is 10 years longer than the previous longest maturity government bond, while the 10-year maturity of 2032/G also exceeds the average remaining maturity of total debt, and the 10-year segment may see even higher market demand, including domestic demand. With the introduction of the 30-year 2051/G, the yield curve in the government bond market has been extended from the previous 20 years to 30 years, providing a benchmark for other institutional investments and contributing to an even more efficient management of long-dated institutional investments. Given the positive impact on the debt profile, the MNB has supported the issuance of HUF Green Bonds from the outset. Prior to the first auction of 2051/G on 22 April 2021, the MNB communicated its support accordingly and made clear that the MNB's government bond purchase programme would also cover the newly issued Green Bond[99]. The MNB's communication also played a role in the success of the first auction of 2051/G, which attracted bids seven times the announced volume and the ÁKK increased the acceptance volume by one and a half times.

The greenium rate can be well measured for German green bonds but has not yet reached a stable level. One of the simplest and most obvious ways of measuring greenium, the yield advantage of green bonds, is when a country has issued both a "conventional" and a "green" bond with the same characteristics (currency, maturity, amortisation, coupon payment, nominal interest rate, etc.), thus, the yield difference between the two papers can be used to clearly measure greenium. An example is the case of Germany, where, in addition to linking all green bonds to a conventional bond ("twin bonds"), a full green bond yield curve is planned to be built up over the years, which could serve as a benchmark for European green capital markets[100]. So far, 5, 10 and 30-year green bonds have been issued, and based on their yields, the average greenium of German green bonds can be between 2 and 6 basis points (Chart 3.23).

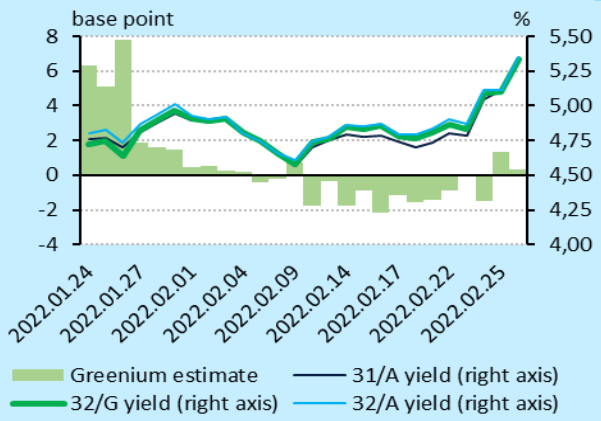
[94] ÁKK (2020): Press release of ÁKK Zrt. of 2 June 2020
[95] ÁKK (2020): Press release of ÁKK Zrt. of 15 September 2020
[96] ÁKK (2021): Press release of ÁKK Zrt. of 15 December 2021
[97] ÁKK (2021): ÁKK: Zrt. Annual funding bulletin 2022
[98] ÁKK (2022): Press release of ÁKK Zrt. of 18 February 2022 Another successful Japanese yen bond issue in Hungary
[99] Portfolio.hu (2021): MNB to buy new green bond arriving next week
[100] Bundesrepublik Deutschland, Finanzagentur Gmbh (2022): The Bund's green twins - Green Federal securities

Chart 3.23: Development of the yield spread (greenium) between German conventional bonds and their green counterparts



Source: Bloomberg

Chart 3.24: Development of the yields of 2032/G and Hungarian government bonds that are close in maturity and the difference between former and the average of latter (estimated greenium)



Source: Bloomberg

It is more difficult to measure the exact rate of greenium on Hungarian sovereign green bonds. Unlike German green bonds, there is no comparable conventional bond alternative to the HUF 2051/G Green Bond, moreover, its maturity is 10 years longer than that of the next longest 2041/A bond. Therefore, the uncertainty in the estimation of the greenium is quite high and the result of the estimation depends on the yield curve model applied and the methodology used to remove other distorting effects. In any case, between the end of August and mid-November 2021, the yield of 2051/G did not reach the yield of 2041/A, which has a maturity of 10 years less (although the difference in duration of the two bonds is smaller than the difference in maturity). There is no conventional counterpart for 2032/G either, but in terms of maturity, the 2031/A and 2032/A bonds are close. From the issuance of 2032/G on 26 January 2022 until the end of February 2022, the difference between the average yield of the two closely matched bonds and the yield of 2032/G was around 5-8 basis points in the days following the issuance, a difference that subsequently essentially disappeared, and the pricing of 2032/G was close to the average of the two government bonds with close maturities. (Chart 3.24). Both 2032/A and 2032/G attracted strong interest in government bond auctions in January-February 2022, with an average of HUF 45 billion bids received in the four auctions of the 10-year benchmark 2032/A, compared to an average of HUF 49 billion bids received in the two auctions of 2032/G. While there is no significant difference in pricing between the two, investor interest in the green bond is stronger.

3.2.3. Green mortgage bond issuances

The issuance of mortgage-backed green bonds, i.e. green mortgage bonds, is becoming increasingly popular worldwide and in the region. Although the overall share of green mortgage bonds in the world is still low, the growth is dynamic. Developed European countries (Germany, Norway, Sweden, Denmark, France) are typically stronger in this respect, but Poland, for example, is also a leading issuer in the region.

Green mortgage bonds represent a targeted, secure source of funding for banks to finance the construction and purchase of energy-efficient buildings through mortgage loans, thus contributing to the energy modernisation of the building stock. In the case of green mortgage bonds, the issuer undertakes to hold over the life of the bond at least the same amount of mortgage loans secured by green, i.e. energy efficient real estate in the loan portfolio used as collateral for the mortgage bonds as the amount of funds raised. This could encourage banks to prioritise such mortgages, which could translate into more favourable interest rates through the lower credit risks of these loans and more favourable cost of the funds involved.

Green mortgage bonds can support the achievement of climate strategy goals, while the emergence and development of the asset class can also be beneficial from a financial stability perspective. These securities could play an important role in financing energy efficiency improvements in the domestic building stock

that is considered obsolete. They also encourage an increase in the share of green mortgages, which, according to the "green hypothesis", may have more favourable credit risk characteristics. Furthermore, the emergence of green mortgage bonds is expected to have a market-building effect on the mortgage bond market, mainly through the emergence of new investors, including foreign ones, which would also have a positive impact on the financing structure of banks. Although the development of internal banking processes and the external certification of green mortgage bonds entails additional costs on the side of issuers and refinanced institutions, the permanent integration of green aspects into the operations of institutions will support the achievement of sustainability goals and the mitigation of the financial stability risks of climate change in the long run.

The emergence of green mortgage bonds could also have a tangible positive impact on households. The proliferation of green mortgage bonds, which offer the issuers a favourable access to funds and lower credit risk for investors, not only benefits financial stability, but can also serve households' access to credit on more favourable terms.

The Green Monetary Policy Toolkit Strategy of the MNB has played a key role in the emergence of mortgage bonds that also take into account environmental sustainability aspects. On 6 July 2021, the Monetary Council decided to adopt a new Green Monetary Policy Toolkit Strategy for the central bank. The strategy is a framework for the long-term operation of the central bank's toolkit, which describes how environmental sustainability can be reflected in the MNB's monetary policy toolkit. According to the MNB's vision, Hungary's sustainable convergence can only be ensured through the green transition of the economy, which requires the development of a financial intermediation system that takes into account and effectively mainstreams environmental considerations.

In line with its Green Monetary Policy Toolkit Strategy, the MNB launched its Green Mortgage Bond Purchase Programme in August 2021. The aim of the programme is to create a domestic green mortgage bond market and to promote best practices and support the spread of green mortgages through targeted purchases. Through the programme, the MNB is taking meaningful steps towards renewing the domestic housing stock and improving its energy efficiency. In addition to an ageing housing stock with high energy needs, the central bank's intervention was also justified by the failure of commercial banks to take into account the energy performance of properties in their mortgage lending practices.

The Green Mortgage Bond Purchase Programme indirectly supports the green mortgage lending developments. Banks can issue green mortgage bonds for mortgage loans whose underlying properties have adequate energy efficiency indicators. Participation in the MNB's programme is conditional on obtaining one of two internationally recognised green standards - the Climate Bonds Standard developed by the Climate Bonds Initiative (CBI) or the International Capital Market Association (ICMA) Green Bond Principles. In addition, the issuance must be certified by an independent third party that must be also accepted by the MNB.

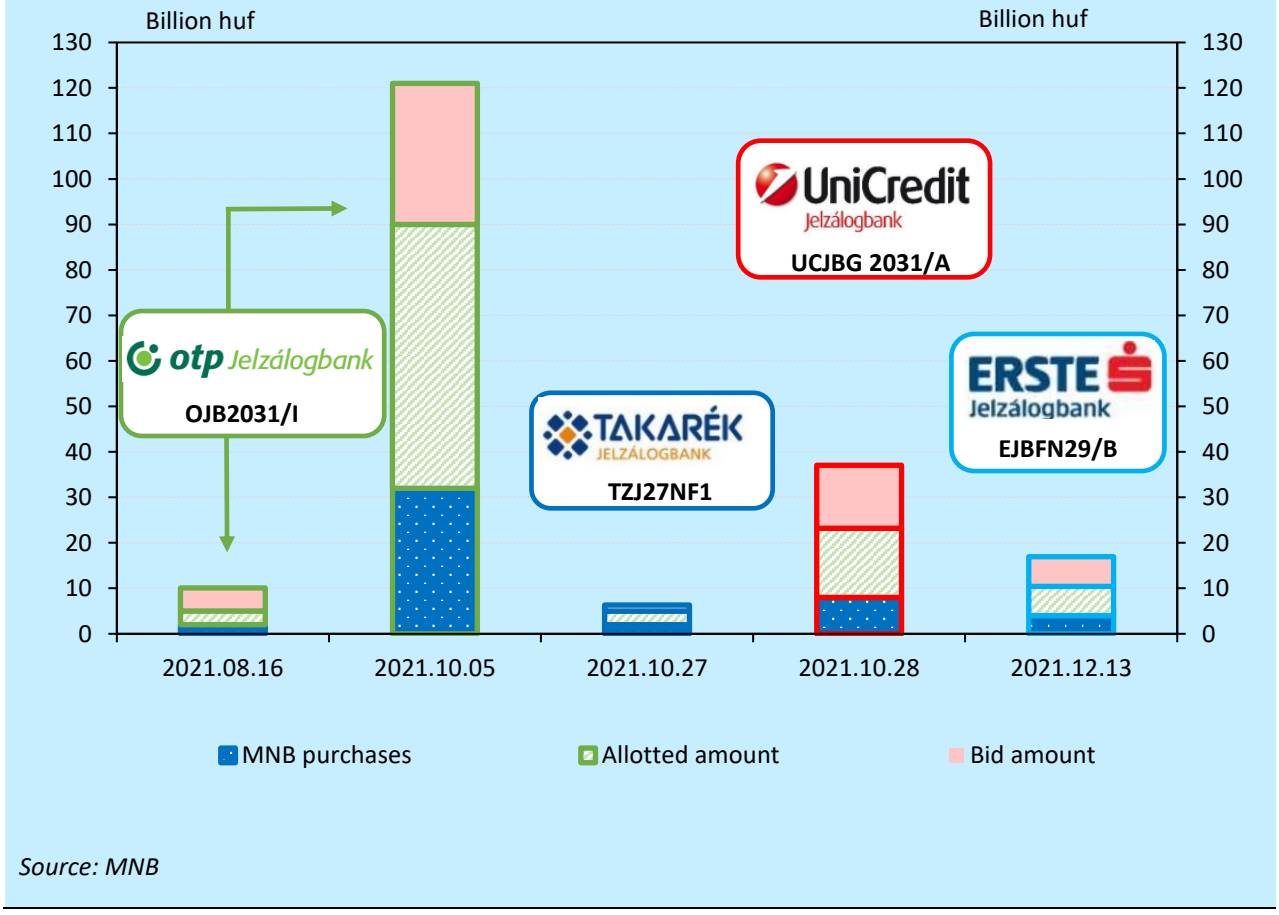
In addition to the requirements focusing on environmental sustainability, the MNB has also set conditions to enhance market stability and transparency. The issuer must undertake to present in a public report the characteristics of the green mortgage bonds issued under the Programme and of the real estate that serves as collateral for the mortgage loans backing them. The mortgage banks must publish an updated version of the report annually after the publication of the first public report. Moreover, the issuer undertakes to communicate to its relevant clients the contribution of consumer mortgages to environmental sustainability objectives and related aspects. These conditions can effectively contribute to the achievement of the green objectives of the Programme, the development of the domestic green mortgage bond market and the spread of mortgage lending practices that promote environmental sustainability and energy efficiency. The conditions of being listed on the Budapest Stock Exchange and bilateral market quotation will facilitate and strengthen the transparency and liquidity of the Hungarian mortgage bond market.

In order to favour green mortgage bonds, the MNB has amended one of its macroprudential funding requirements, the Mortgage Funding Adequacy Ratio (MFAR). Under the MFAR requirement, banks must finance a certain proportion – currently 25 per cent – of their retail forint mortgage loan portfolio with long term forint liabilities backed by retail mortgage loans, mortgage bonds or refinancing loans from mortgage banks in order to reduce the maturity mismatch between

assets and liabilities. The MNB amended the regulation as of 1 July 2021, allowing green mortgage-backed funds with original maturities of over 5 years to be included in the calculation of the ratio with a higher weight of 1.5 times. This could drive issuance towards green mortgage bonds, supporting the greening of the mortgage loan portfolios serving as cover assets. When assessing mortgage bonds as green, the MNB expects compliance with internationally widely accepted and used standards as regards the MFAR regulation too, in line with the criteria set out in the framework of the purchase programme, to support bank adaptation and investor orientation.

As a result of targeted central bank measures, the first green mortgage bond issuances had taken place in Hungary and the green mortgage bond market was born. After the entry into force of the central bank tools, the first Hungarian green mortgage bond was issued in August 2021, and in the second half of 2021, four out of five Hungarian mortgage banks issued green mortgage bonds. The volume issued in 2021 exceeded HUF 130 billion. Three of the mortgage banks have developed a framework in line with the International Capital Market Association (ICMA) Green Bond Principles, while ERSTE Mortgage Bank has chosen the Climate Bonds Initiative (CBI) Climate Bonds Standard, which has a more stringent criteria system. However, the ERSTE Group is using the ICMA framework, so in alignment with the Group, the 2022 issuances will now be made under the Green Bond Principles. In 2021, the MNB purchased a total of around HUF 51 billion of green mortgage bonds, of which HUF 48 billion were purchased on the primary market and a further HUF 3 billion on the secondary market. With the MFAR amendment and the mortgage bond purchases made, the central bank has been able to indirectly support the green mortgage lending processes, the development of the Hungarian green mortgage bond market and the establishment of best related practices.

Chart 3.25: Most important details of the 2021 green mortgage bond auctions



Source: MNB

The MNB closely monitors market developments to ensure the effective integration of green monetary policy considerations. The central bank constantly monitors and analyses developments in standards and best practices related to environmental sustainability at both domestic and international level. Through this, the MNB aims to maximise the integration of environmental sustainability into its monetary policy instruments, including the Green Mortgage Bond Purchase Programme, in line with the objectives set out in the Green Monetary Policy Toolkit Strategy.

3.2.4. Equity market and stock exchange

Unlike loans and bonds, where the green feature is usually provided by the financing objective, shares are considered green if the core business of the company issuing the share serves environmental sustainability. According to the current practice, shares of companies operating in certain green industries (e.g., "cleantech") and shares of issuers included in some kind of sustainability stock index are considered green shares. In Hungary, a negligible number of the 50 companies listed on the Budapest Stock Exchange (BSE) can be said to be predominantly engaged in core activities that can be considered green, but there are also some that are showing an improving environmental performance, due to their own commitment or market factors.

The Budapest Stock Exchange is committed to promoting sustainable goals: it has developed its own ESG strategy and is a member of the international Sustainable Stock Exchanges Initiative. Currently, the main focus is on strengthening the sustainability information and information flow. During 2021, BSE published and launched its ESG Reporting Guidelines to promote ESG disclosures by listed companies. The way forward in this area is to promote ESG certification of issuers. With its governance and coordination role, BSE is also active in the field of education and awareness-raising.

The stock exchange does not currently have dedicated green products or green market segments. To promote these, the BSE has launched a development in 2021 which will enable it to distinguish the green products launched on its website in a way that is easy for investors to find. The development is expected to be launched in the first half of 2022. It is worth noting that 20 green securities worth more than HUF 500 billion have been listed on the Hungarian stock exchange in the bond section.

BOX 5: Green FinTech and digital solutions for sustainability goals

Sustainability has become a top priority by the 2020 decade, and the link between green and digital solutions is now increasingly emerging. The need for collaboration between regulators and market players will be a key element of innovation and sustainability in the future. In this context, innovation in the financial system is of utmost importance, a prerequisite for which is an optimal combination of growth and sustainability. As a solution, smart green growth has already been discussed by Christine Lagarde, President of the European Central Bank, in March 2021.[101]

Sustainable development is also becoming increasingly important in the financial services market, in addition to digitalisation, and the banking sector is now increasingly taking this into account alongside FinTech companies. Even the early FinTech initiatives had a significant impact on the entire financial services value chain and even indirectly on reducing the environmental burden, although few solutions at that time had a dedicated focus on sustainability. Typical examples include the reduction in the amount of paper, the reduction in energy use and emissions by not moving and storing it, or even the potential for digital solutions to save emissions, mainly from transport.

Green FinTech solutions are digitally-enabled innovations that make traditional financial processes and products more sustainable. The Green Digital Finance Alliance (GDFA) pre-conceived Green FinTech taxonomy includes seven Green FinTech categories: (1) Green digital payment and account solutions; (2) Green digital investment solutions; (3) Solutions based on digital ESG data and analytics; (4) Crowdfunding solutions focused on Green digital solutions; (5) Green digital risk analytics and InsurTech solutions; (6) Green digital deposit collection and lending services; (7) Green digital asset management solutions.[102]

Table 6: The seven green FinTech categories of the green FinTech taxonomy and their already existing examples

	Seven Green FinTech categories of the Green FinTech taxonomy established by the Green Digital Finance Alliance	Examples
1	**Green digital payment and account solutions**	transaction data driven carbon calculators
2	**Green digital investment solutions**	Algorithm-managed green retail investments; automated green investment advice; automated green portfolio design and management
3	**Solutions based on digital ESG data and analytics**	credit scoring algorithms that incorporate green data for credit ratings; automated ESG rating for companies and investment funds
4	**Crowdfunding solutions focusing on green digital solutions**	green lending, green equity financing and green fundraising through community financing
5	**Green digital risk analytics and InsurTech solutions**	automated risk assessment and automated monitoring tools for dynamic pricing and underwriting of digital green insurance and various green assets
6	**Green digital deposit and lending services**	green digital lending and green digital mortgage credit granting
7	**Green digital asset management solutions**	green utility tokens to reduce carbon emissions; green cryptocurrencies to be used exclusively for green products

Source: Green Digital Finance Alliance: A Green Fintech Taxonomy and Data Landscaping (2021).

In addition to the overall commitment, leading FinTech companies can contribute to green and sustainability goals in four key areas with the digital solutions they create. These are mainly (i) quantifying the ecological footprint of the consumer as an individual from their lifestyle, (ii) measuring the emissions of greenhouse gases and other harmful substances related to different activities through the use of assets using IoT (Internet of Things) technologies, (iii) measuring the share of each investment portfolio supporting green goals, and (iv) active investment management based on investor targets.[103]

In many cases, green FinTech players seek to cover so-called niche areas and look for opportunities to distinguish themselves positively. Differentiation from incumbent players has led to a growing range of neobanks not only generally labelled as green, but also of neobank green products and services. As a positive outcome of this trend, the global FinTech market is witnessing a growing number of online green cashback schemes and educational content on sustainability topics, in addition to various digital carbon calculators. Green digital account packages have emerged that offer pricing incentives to encourage environmentally (financially) conscious behaviour, by avoiding paper-based communication and document handling, and by offering gifts, credits or discounts for certain transactions. Several innovative players have also integrated into their business model the automatic financial support of carbon neutralisation projects linked to the number or value of transactions. In addition, the use of payment cards made from a high percentage of recycled PVC is becoming more widespread, as is the promise of future use of degradable or recyclable bank cards.[104] The use of digital carbon calculators and the associated carbon neutralisation options can be used by consumers and businesses to support projects that directly undertake carbon neutralisation programmes (e.g. tree planting and subsequent maintenance, litter removal from open waters). The initiatives that are emerging in the market and their use suggest that society is already open, but their widespread uptake and significant and frequent use may require further high levels of education and even proactive, encouraging government involvement

3.2.5. Investment funds

With regard to global trends, so-called ESG investment funds, which promote environmental or social sustainability or good corporate governance practices, have seen very dynamic growth in recent years. The Green Finance Report 2020 also reported on the emergence of ESG funds in the Hungarian market. As a result of this dynamic development, the investment practices of ESG funds show a very diverse picture. From an investor, regulatory and other perspective, the identification and typing of ESG funds worldwide, the difficult transparency of the information they provide and the investment methodologies they follow, is a major challenge. For example, the data reported in last year's Green Finance Report only presented statistics on investment funds that were identified using a keyword search and were deemed sustainable. The European Union's Sustainable Finance Disclosure Regulation (SFDR) for financial services sector (see in more detail chapter 5.2), which came into force in March 2021, was a watershed for European markets. According to the Regulation, European investment funds can fall into three categories from an ESG perspective: 1) traditional investment funds that do not have a sustainability objective 2) ESG investment funds that aim to promote environmental and social characteristics ("light green") 3) sustainable investment funds that contribute to a social or environmental objective ("dark green").

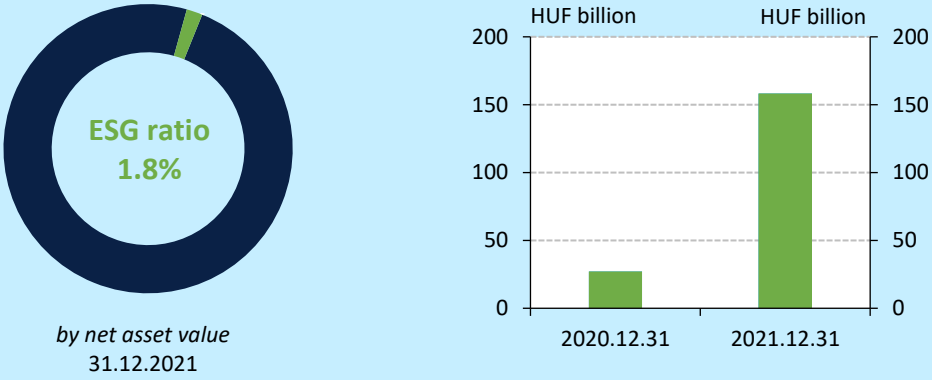
With the entry into force of the Regulation, the European market has seen many funds already actively operating have qualified as ESG or sustainable funds under the SFDR. In addition, a large number of new funds have been launched with an environmental and social focus. As a result, by the end of 2021, a total of 42 per cent of all investment funds marketed in the EU could be considered ESG or sustainable funds under the SFDR

[101] Christine Lagarde (2021): How can innovation support sustainable growth? (BIS Innovation Summit 2021)
[102] Green Digital Finance Alliance (2021): A Green Fintech Taxonomy and Data Landscaping
[103] Gomedici (2021): ESG meets FinTech: A strategic analysis
[104] Mastercard Newsroom (2021): Mastercard empowers consumers to choose a sustainable future with eco-friendly cards

Regulation by net asset value, amounting to a total of EUR 4,050 billion.[105]

In this comparison, the share of ESG investment funds in Hungary remains low. The aggregate net asset value of these funds represents 1.8 per cent of the total market (HUF 8,830 billion). In terms of the number of funds, 21 out of 704 domestic investment funds take ESG aspects into account. On a positive note, the amount of assets managed in portfolios counted as domestic ESG funds increased from HUF 27 billion in 2020 to HUF 158 billion by the end of 2021 (Chart 3.26). This represents a more than five-fold increase in the net asset value of sustainability-targeted funds in one year. It is important to highlight that one of the reasons for this is that a number of existing traditional investment funds have changed their investment policy to commit to sustainability issues and 7 completely new ESG funds have been set up since the entry into force of the Regulation.

Chart 3.26:
Share and volume of Hungarian ESG funds by net asset value



Source: MNB

Sustainable investments can vary according to their objectives. As listed above, a distinction is made between investment funds that promote environmental and/or social characteristics (e.g. a fund that invests in green companies) and funds that pursue sustainable investment (e.g. a fund that achieves a specific environmental objective). While for the former the primary objective remains capital growth, as for "traditional" investment funds, for the latter the objective of achieving sustainable investment is on a par with maximising returns. In Hungary, unlike in other EU Member States, no investment fund implementing sustainable investment, also known as "dark green", had been established by the time of publication of this Report (only 4.7 per cent of investment funds in the EU are considered dark green). In contrast, however, dozens of investment funds promoting environmental and/or social characteristics, also known as ESG, often referred to as "light green", have appeared on the domestic capital market, applying a variety of sustainability strategies, and therefore, in the following, the sustainability strategies of ESG funds will be examined.

Sustainable funds are required by EU law to have, *inter alia*, a transparent sustainability strategy, which must be integrated into the investment decision-making process. The strategy provides investors with information on how the fund intends to promote environmental and social characteristics. Based on market experience, the most common strategies include negative screening, positive screening, ESG integration, but there are also examples of investment funds that use a so-called ESG index as a benchmark. The strategies listed can be described as follows:

Negative screening: Also known as exclusion policy, this strategy focuses mainly on avoiding issuers or industries based on certain business activities and operations.

[105] Morningstar (2022): SFDR Article 8 and Article 9 Funds: 2021 in Review

Exclusions are typically based on environmental and social standards or opinions.

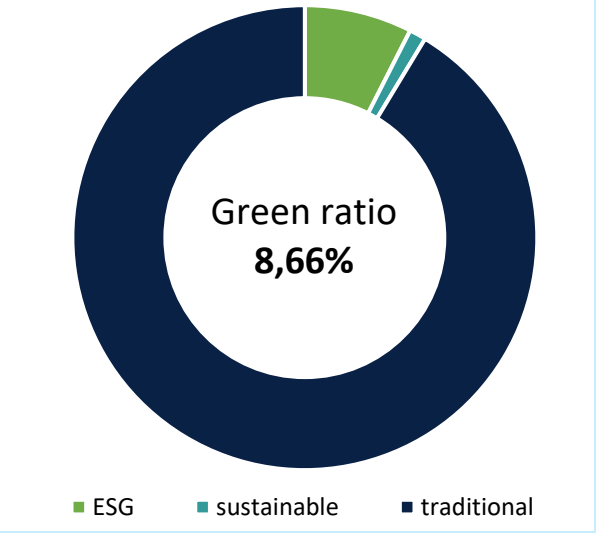
- *Positive screening:* Essentially, companies with a reputation for socially and environmentally responsible operations are given preference in investment decision-making.
- *ESG integration:* The incorporation of ESG considerations into decision-making processes and analyses. The fund manager also takes into account the ESG performance of companies, for which data is typically obtained from external providers. The ESG scoring methodology conducted by service providers assesses the extent to which companies mainstream environmental (e.g. CO_2 emissions, waste management), social (e.g. employee rights) and good corporate governance (e.g. business ethics) aspects into their operations.
- *ESG/Green index tracking:* typically, but not exclusively, used by passive investment funds, where the index basket contains assets of companies with high ESG performance. The objective of the fund is to fully or partially replicate, or even outperform, the index.

In Hungarian practice, these strategies are usually combined in the fund's investment strategy, which can provide a greater guarantee of contribution to environmental and/or social objectives. For example, it is often the case that positive screening is carried out following ESG integration, with the Fund prioritising companies with the best ESG performance in their industry when selecting investments. This type of approach is referred to in international literature as the "Best-In-Class" method. The methodology is also applied in reverse, and examples can be seen where companies with the worst ESG scores are excluded from the investment universe. However, this does not mean that companies whose core business has a fundamentally negative impact on the environment, for example, are excluded from the investment universe altogether, and they may also have high ESG scores within their industry. The reason for this should be sought in the ESG methodology of external data providers. As there is no uniform regulation and calculation method for determining the ESG performance of companies, it is possible that several different reporting providers may give different ratings to the same entity. It is therefore considered good practice for fund managers to apply an exclusion list in addition to the ESG rating, for example by excluding environmentally harmful industries (e.g. coal, oil) in their entirety, as this minimises the risk of greenwashing. Thus, the combined and deeper application of sustainability strategies can provide greater credibility on the sustainability of investment funds.

3.2.6. Unit-linked insurance and fund portfolios

In the insurance sector, unit-linked asset funds continue to provide an opportunity to serve the investment needs of clients that also take green considerations into account. The aforementioned SFDR Regulation also covers asset funds managed by insurers, so the entry into force of the Regulation in March 2021 in this area has also provided an opportunity to get an accurate understanding of the green rate of investment products. While the MNB was able to identify one or two sustainability-linked asset funds for only a handful of insurers in the previous year, by the end of 2021, 59 insurance-linked asset funds were already available on the market. As with investment funds, we can also distinguish between the degree of sustainability of financial products, as some asset funds only aim at promoting environmental and/or social characteristics, while other insurance-linked funds are committed to actually contributing to a specific sustainability objective, so that in the former case the investment policy also follows a similar sustainability strategy as explained in the previous chapter. In the case of the latter, the objective is to achieve a specific sustainable investment, the progress of which is measured by specific key performance indicators. The value of assets under management in these financial products exceeded HUF 136 billion by the end of 2021, representing 8.6 per cent of the nearly HUF 1,580 billion in assets of unit-linked funds (Chart 3.27). Compared to the 1.7 per cent ratio at the end of 2020, substantial expansion can be observed in green type asset funds, given that the projection base also increased during this period. In terms of the composition of asset funds, it should be noted that they are typically backed by the Hungarian and foreign mutual funds of the related institutions, they do not make individual direct investments. The growth of green insurance asset management is therefore to some extent dependent on the growth of ESG and green investment funds.

Chart 3.27: Share of Hungarian green asset funds by net asset value in 2021



Source: MNB

In the voluntary pension fund market, clients continue to have rather limited opportunities to enforce green considerations in their investment decisions. Currently, the only eligible pension fund portfolio managed on ESG basis was launched after reaching the minimum initial capital of HUF 1 billion, and its value was close to HUF 1.4 billion by the end of 2020. By comparison, by the end of 2021, assets under management reached HUF 5.7 billion, a relatively large jump, and the portfolio represents 3.4 per cent of the total assets managed by the fund. According to the investment policy, long-term sustainability aspects, primarily environmental and social aspects, play a privileged role in investment decisions. In addition, the investment manager makes at least 80 per cent of its investments based on the ESG criteria. Overall, the value of assets managed in a single ESG fund portfolio is very low for the voluntary pension fund market as a whole, at only 0.3 per cent.

3.2.7. Closed-end venture capital and private equity funds

Closed-end funds, like private and venture capital funds, are now taking on climate and environmental considerations. However, in this segment it remains difficult to define which funds can be considered genuinely environmentally sustainable. Private equity and venture capital funds make less use of the SFDR, which allows funds to be legally categorised as sustainable, due to the narrow investor base. Sustainability is mainly reflected in the fact that funds invest in companies whose core business contributes to climate and environmental objectives, for example in the case of organisations involved in water management, waste management, renewable energy. Statistical analysis by the Hungarian Venture Capital Association shows the assets under management of alternative investment funds in Q3 2021. The analysis also looked at the trends in capital investment by industry, showing that in the energy and environment sector, capital invested in the first three quarters of 2021 amounted to HUF 657 million, of which, although not all, a larger part could be considered to support environmental sustainability.[106] However, climate or environmentally friendly investments may also occur in other industries, for example when the portfolio of one of the investment funds of a venture capital fund manager includes a company producing vegan (entirely plant-based) cold cuts, which is likely to be classified as a food industry, making it difficult to determine the proportion of private or venture capital investments that go to companies with a specific climate or environmentally friendly activity. To the MNB's knowledge, there are currently 4 private and venture capital funds in Hungary that have been set up specifically for sustainability purposes. These are Susterra Capital Partners Zrt. Water Impact Fund, two green private equity funds of Impact Ventures, which focuses on social and environmental sustainability, and the Blue Planet Foundation's Climate Change Venture Capital Fund. Although the assets of private and venture capital funds are smaller in scale than those managed by public investment funds, they play an important role in the development of innovative, green start-ups

[106] HVCA (2022): Venture Capital and Private Equity update

4. ACADEMIC ASPECTS OF GREEN FINANCE

Among many other factors, the availability of a sufficient number of highly qualified professionals is essential for the transition of the economy towards sustainable operation. This kind of excellence now requires more than just direct professional expertise. It also involves knowledge and commitment to protect our environment. It is a revolution in thinking that must be reflected in university curricula and academic research. To this end, the MNB maintains active relations with a number of higher education institutions and research and educational centres. The second pillar of the MNB's Green Programme, launched in 2019, aims both to deepen the sustainability context in the minds of future decision-makers through active participation in educational programmes, and to stimulate research results that can lay the foundations for the further spread and success of green solutions. The MNB is convinced that deeper cooperation between economics and natural sciences, the development of new methodologies for data analysis and the development of new policy tools should be part of the current renewal of the financial profession. In this context, it aims to contribute to the development of synergies between academia and the central bank's operations through its sustainability-oriented education and research activities. While the chapters of the Green Finance Report are mainly structured around the themes of financial stability and green finance mobilisation, the MNB considers it important to examine other relevant aspects of green finance science, which may also interact with the former. Examples include the analysis of risk differences between green and other mortgages, the ecological and green financial awareness of the domestic population, and the mapping of the inflationary effects of the transition to a low-carbon economy, which are all briefly summarised in this chapter. In addition to informing the interested public, the MNB aims to facilitate the flow of information between researchers active in the field of green finance in Hungary and to provide inspiration for more outstanding domestic scientific results in the future.

4.1. MNB's green financial education activities

The aim of the educational activities is to provide green finance courses in line with the profile of the training courses in the partner institutions. The active partners include the Budapest University of Technology and Economics (BME), the Neumann János University (NJU), the University of Szeged (SZTE), the University of Debrecen (DE) and the Budapest Institute of Banking (BIB). In addition to MNB experts, the lecturers of the courses include the universities' own lecturers and other internationally renowned experts.

At BME, the collaboration focuses on the financial approach to sustainability. The university is in the process of developing a specialisation in green finance accounting, as well as adding green finance to the education of students who do not choose this specialisation. Additionally, in cooperation with the university's faculty, MNB experts are preparing BME students for their Annual Scientific Student Associations' Conference theses by providing dual topic supervision. The Bank to The Future – Design Sprint study competition for the spring semester 2022 is also based around the theme of green banking. Also in cooperation with BME, the Green Finance and Accounting Workshop at the Liska Tibor College for Advanced Studies was open to students for the first time in spring 2022.

In line with the profile of the NJE, the focus will be on synergies and applied science approaches in the context of sustainability. In the Faculty of Economics, students will be able to take two courses that build on each other: following a introductory course in Sustainable Finance, outstanding students will be offered a workshop-based continuation course in Sustainable Finance 2. During the spring semester of 2022, students also had the opportunity to take part in a learning competition related to the open access search engine for green financial products. Furthermore, a Green Finance course will be added to the course offerings of the newly announced MNB Institute's Master of International Economics and Business in the final semester.

The partnership with the Research Centre of the Faculty of Economics of the University of Szeged and the Institute of Finance and International Economics addresses the economics approach to sustainability. After successfully completing the foundation course Introduction to Sustainable Finance, students can take the small group, intensive and research-focused course entitled Sustainable Finance.

The MNB cooperates with a number of other educational partners, as sustainable finance is not only about transferring knowledge but also about shaping attitudes. The Future of Sustainable Economics course announced at the DE is the fruit of collaboration between several disciplines. The mandatory literature for the course includes the textbook **The Sustainable Economics of the Future**. The BIB is dedicated to the training of experts with significant experience in the financial sector. Their training programme includes the Green Finance Expert I-II and the ESG Consultancy course, which provides an opportunity for experts interested in sustainability to further develop their knowledge.

An interdisciplinary approach is needed to assess the financial and economic risks posed by climate change. For this reason, one of the aims of academic cooperation is to bridge the gap between different disciplines, especially between economics and engineering. One of the overarching characteristics of the courses is therefore interdisciplinarity. While the topics are often focused on economics and, within that, on finance, the study of related subjects cannot be without an understanding of the results of the peer disciplines. Labour market trends clearly show that there is a growing demand for experts with green finance skills. To this end, the MNB is paying particular attention to reinforcing a green approach in the financial literacy of young people through its Green Programme.

4.2. The MNB Green Research Workshop and the Green Finance Scientific Awards

The MNB intends to actively contribute to the academic study of sustainability issues. Environmental sustainability, the behaviour of economic actors and the living conditions available to future generations are a complex decision net in which the role of the financial system and the central bank is a key factor. This recognition encourages the MNB to support research of academic quality and to recognise ground-breaking research results. In the context of the former, it operates a research workshop primarily with BME and has a cooperation agreement with the University of Szeged. Related to the latter are the Green Finance Science Awards, which was launched for the first time in 2021, and the Green Finance Research Initiative. The MNB seeks to develop cooperation that contributes to the development of the relevant field, increases Hungary's competitiveness, and has the overall potential to improve living conditions and make the economy more sustainable. The expected results will therefore have both indirect and direct impacts.

4.2.1. University research collaborations

In its research portfolio in cooperation with BME, MNB focuses on practice-oriented research thanks to the university's network of engineering contacts. In this workshop, scientific background work (policy background, waste management market, characteristics and possible business strategies of the circular economy, cost-benefit analysis) is carried out with the direct aim of deepening the understanding and development of economic aspects. The following are some of the strategic activities of the Green Finance and Green Economy Workshop.

1) Electric car calculator. By modelling the total cost of vehicle ownership, the calculator makes a number of vehicle types and operating base cases comparable in terms of unit and total costs. The vehicle calculator can contribute to the uptake of electric road vehicles by enabling users to make more informed decisions based on transparent information. Financing issues for electromobility are discussed in more detail in sub-section 3.1.4.

2) Smart Map of Hungary. The aim of the sub-workshop on the spatial integration of economic, social and technological data is to integrate time-series data from various sources, linked to the geographical space of Hungary, into a single data system. The resulting quickly accessible and reliable data can provide a solid basis for a wide range of analyses.

3) MNB Solar Energy Forum. Launched in autumn 2021 with the support of the Zero Carbon Centre, the project aims to develop a complex set of indicators to measure the market integration of weather-dependent power generation. It focuses on the potential of private long-term power purchase agreements to expand domestic solar capacity.

4) Promoting green accounting logic and strategy. The sub-workshop explores how to implement and what information is needed to produce sustainability reports for credit institutions, large companies and SMEs. The intended outcome is the production of a corporate compendium for market players.

5) Water management. At the end of the academic year 2020/21, the installation of a Danube floating waste collector was successfully completed, which was added

to an existing boat harbour on the Budapest University of Technology and Economics quay[107]. The MNB, together with other large companies, provided financial and technical support for the project. This is a pioneering experiment as it is the first such installation in a river environment. The associated innovative scientific developments are suitable for testing plastic loading. An innovative technique using artificial intelligence will detect floating plastics from images taken by a camera installed on the floating waste collector, and will in future allow the temporal and spatial dynamics of waste travelling in the river to be studied. Another computer flow simulation model is able to calculate the trajectories of objects travelling near the water surface, thus supporting the design and operation of the waste trap.

A cooperation agreement with the SZTE in 2021 will also provide opportunities for joint research projects.[108] Building on the success of previous educational cooperation, the two institutions decided to formalise the relationship. This agreement stipulates that the MNB and the Research Centre of the Faculty of Economics of the University of Szeged will also cooperate in the preparation of jointly publishable studies. Related research topics at SZTE include the role of sustainability ratings, the role of ESG data in auditing, and the impact of green finance in the energy sector and industrial production. In addition to existing university partnerships, it seeks to maintain active links with other university groups, foreign institutions and researchers.

4.2.2. Scientific awards and research funding

In 2021, the MNB established the Green Finance Scientific Awards and the Green Finance Research Initiative. By establishing the awards, the MNB also aims to facilitate research through its initiative to recognise the work of international and Hungarian researchers with outstanding impact and of promising young talent, and to provide support for new research initiatives. To this end, in 2021, the MNB established the Green Finance Scientific Awards and the Green Finance Research Initiative. As part of the initiative, the MNB has launched 3 award categories and a call for research grants in 2021.

The International Green Finance Lifetime Achievement Scientific Award is open to a non-Hungarian professional who has contributed to the development of the scientific study and implementation of green finance in sustainable management through internationally relevant, globally significant and pioneering research. The first Lifetime Achievement Award was given to Naoyuki Yoshino, Professor Emeritus at Keio University, Tokyo. He earned his PhD at Johns Hopkins University in the US. Previously, he was Dean of the Asian Development Bank Institute (ADBI) and Director of the Financial Research Center (FSA Institute) of the Japan Financial Services Agency's (FSA) Financial Research Center. His work has led to breakthrough achievements in the field of green finance research.

The Green Finance Scientific Grand Award is presented to researchers who have produced significant research, prestigious and mind-shaping publications related to the theme of the prize. The prize is awarded to an outstanding green finance researcher of Hungarian nationality, based on their publication activity in recent years. The 2021 award was presented to Dr. Helena Naffa, whose outstanding publication output is a model for the Hungarian research community in several green finance research areas. She is a popular lecturer in several subjects. Her work embodies a practice-oriented approach based on theoretical foundations, as she has gained considerable experience both in academia and in market decision-making.

The Green Finance Talent Award is presented to an outstanding green finance researcher of Hungarian nationality under the age of 41, based on their publication activity in recent years. The award was presented to Kata Molnár by the decision-making body. One of the special values of her research is her international and project-based approach. Her work on water management and climate adaptation, as well as water risk analysis of investment portfolios and economic sectors, draws attention to one of the most urgent areas of environmental risk.

To be eligible to apply for the Green Finance Research Initiative Award call, applicants had to submit a research proposal with a current research programme of high scientific quality in the field of green finance. The Research Initiative Award was won by the research team of Dr Anett Parádi-Dolgos. The research plan developed by the research group on the topic of green finance

[107] BME (2021): A floating waste collection facility was inaugurated on the quay in front of the main entrance of the University of Technology and Economics

[108] MNB (2021): Commemorative coin issue on the occasion of the centenary of the University of Szeged

solutions adaptable to the challenges of Hungarian agriculture has the potential to have a direct and significant impact on the domestic economy and banking system in terms of sustainability. Other members of the research team are: Prof. Dr Sándor Kerekes, Dr Arnold Csonka, Dr Tibor Bareith and László Vancsura. The decision to award the prizes is always preceded by careful professional processes. The decision to award the Lifetime Achievement Award is taken by the Governor of the MNB after a professional preparation. In the other categories, the Green Finance Academic Council (composed of academics and individual members of the Monetary Council) decides on the awarding of the prizes following an open nomination and the submission of a research plan.

BOX 6: Research careers

The three Hungarian winners of the Green Finance Scientific Awards 2021 are from different fields and follow different career paths.

The Green Finance Scientific Grand Award was awarded to Helena Naffa, whose research analyses ESG risks, with a focus on the impact of climate change on investments. The relevance of this topic has been recognised by the general public in the wake of recent events.

Her work embodies a practice-oriented approach based on theoretical foundations, as she has gained considerable experience both in academia and in market decision-making. Helena is an Associate Professor at the Department of Investments and Corporate Finance, Corvinus University of Budapest, and equity portfolio manager and ESG expert at Aegon Hungary Investment Fund Management Zrt. She is convinced that the 2020s have amplified ESG risks, as we experienced the effects of the climate crisis at the beginning of the decade, from the wildfires in Australia, the California wildfires visible from space, the deforestation of the Amazon, to the Sahara sandstorms already hitting our continent.

In addition to these developments, the pandemic and the war in our neighbourhood have brought social and corporate governance concerns to the fore. This responsibility can be seen directly in supply chains or indirectly through macroeconomic spill-over effects. She sees it as a paradox that environmental and social aspects can be improved at the expense of, rather than in reinforcement of, each other. Investors who wish to invest sustainably and make an impact through their capital invested, in line with ESG objectives, feel under pressure to make a choice, which may temporarily push environmental aspects to the background, to the detriment of social and corporate governance aspects. In addition, the intention to reduce energy dependency from Russia could open up new scenarios compared with previous trends. In Europe, nuclear power plants are being restarted, their lifespan extended and more permissive use of coal-fired power plants is being encouraged. For this reason, she believes that research into sustainable investment could not be more topical today.

Her current research focuses primarily on event-based methods to find out how companies performed during the pandemic and to what extent ESG can be linked to crisis resilience. She also plans to conduct empirical research on greening. She has set up the ESG research group at Corvinus University, which now has one PhD graduate student and two PhD students as supervisors. She is also the acting vice-chair of the Finance Sub-Committee of the Hungarian Academy of Sciences. In her teaching activities she incorporates sustainability issues in finance into the development of teaching materials, and as a lecturer she has been involved in subjects such as student-managed investment funds and applied business valuation.

Kata Molnár, the first Green Finance Talent Award winner, is a researcher whose main research interests are water management and climate adaptation, and the development of non-financial information for investment portfolios and economic sectors, especially water risk analysis methodology. The award was given in recognition of her international research work on topics such as water law frameworks, cooperation mechanisms in transboundary river basins, the environmental and social impacts of Foreign Direct Investment (FDI) in land in sub-Saharan Africa, and water risk management strategies for industries exposed to the “Day Zero” water crisis in South Africa.

Currently, as a water expert in the research division of Sustainalytics, an ESG rating firm affiliated with Morningstar, she is seeing more and more banks, fund managers and investors taking ESG aspects related to water risk factors into account in their decision-making processes. Co-authoring the summary of a project on quantitative methodology development for water risk exposures, published in the winter of 2021, in Morningstar, Does Your Company Face Water-Related Investment Risk, she pointed out that, in addition to environmental and social aspects, assessing the extent of financial risk is a complex task due to the undervaluation of water and the large data gap. In regions with higher risks, targeted programmes with a roadmap and responsible corporate and community water management are needed. Kata is convinced that this is why setting comprehensive and industry-specific standards is so important.

In regions with higher risks, targeted programmes with a roadmap and responsible corporate and community water management are needed. Kata is convinced that this is why setting comprehensive and industry-specific standards is so important. She was determined to share these messages widely when she was invited to join the technical working group responsible for developing the CDSB Water Framework published last year, and organised a session at the Water Pavilion during COP26 in Glasgow specifically on water and ESG data reporting and transparency.

In addition to her research work, Kata also organised an investor roundtable with major international players on 22 March this year, for the World Water Day. She has also given a TedXYouth lecture on the Geography of Hope and is an invited speaker for university courses to raise awareness on the importance of this topic.

The first winner of the Green Finance Research Initiative Award was the research team led by Anett Parádi-Dolgos. The associate professor at the Institute of Agricultural and Food Economics of the Hungarian University of Agricultural and Life Sciences submitted a joint research project by a community of five people. The other members of the research team are Sándor Kerekes, Associate Professor, Arnold Csonka, Tibor Bareith and László Vancsura. Their objective is to develop green finance solutions adaptable to the challenges of Hungarian agriculture.

The starting point for their research is that the research areas of economics are significantly influenced by the often hectic changes in economic forces. Established theories are being challenged by the pace of globalisation, technological progress and the emergence of financial, health and war crises. Through a series of research projects, they search for and analyse financial solutions that can address sustainability, inequality and related financing issues at the local or even national economy level. This is evidenced in their 2017 publication “About Finances in a Different Way – Sustainable and Community Finance”. The book is about the relationship between sustainability and finance, with a focus on alternative and community finance systems, which is also the main financial pillar of their current research.

They argue that the current portfolio of agricultural finance available in Hungary lacks a number of alternative financing instruments that could facilitate the implementation of sustainable and community-oriented development. The expected outcome of the implementation of this plan is to identify how to align current financing schemes with the principles of green finance. Their approach is based on the conviction that one of the elements of sustainable finance is the need to analyse its environmental and economic aspects in parallel.

Sustainable finance issues and solutions are examined primarily from the land-to-table perspective, i.e. from the side of agriculture and food economy. The members of the research team also address issues such as short supply chains and the profit persistence of agricultural sectors. Their work has already won several grants (TÁMOP 2012-2014, EFOP-Intelligent specialisation 2017-2020), EDUAGRI Croatian-Hungarian joint grant (2019-2021), EFOP-3.6.1 “Produce with nature“ (2017-2021), BioeastUP (2021-2022).

4.3. MNB research: Probability of mortgage default by energy label of residential buildings

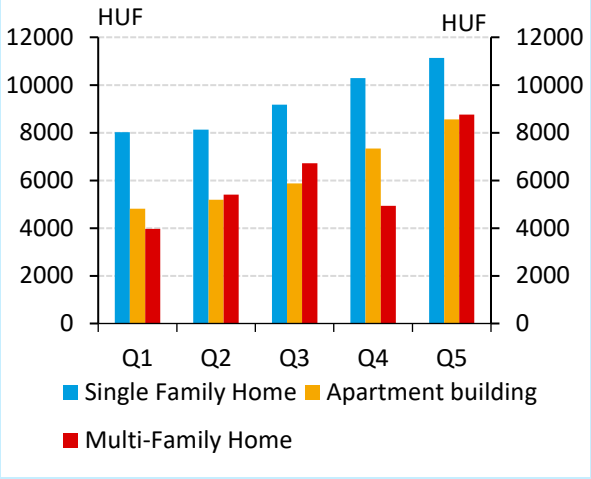
An important question for the revitalisation of the residential green mortgage market is whether there is a risk difference between loans to energy efficient and non-energy efficient households. If the hypothesis, also known as the green hypothesis, is confirmed according to which energy efficient households have a lower probability of default (PD) and lower loss given default (LGD), this could facilitate access to finance. Lower credit risk could result in lower borrowing costs and/or more resources being available for both the purchase and construction of energy-efficient houses and for energy renovations.

International studies[109] on the probability of default on loans for the purchase of energy-efficient housing have concluded for several countries (Italy, the Netherlands, the UK) that higher energy ratings are associated with lower PD. The lower risk may be explained by the lower overheads of energy efficient properties, which in turn may result in higher disposable income for green households. However, there may be also other channels that could have an impact on the risk of bankruptcy, such as the fact that green property buyers make more informed choices or have a more stable financial background.

The energy efficiency of a house can significantly reduce overheads, which can increase disposable income by around 10,000 HUF per month. The energy calculations by BME researchers are based on currently applicable residential prices – but if energy market prices at the beginning of 2022 were applied, the difference in overheads could increase by up to three times. In its analysis, which can be seen as a continuation of this research, the MNB considered energy efficient houses to be those with a minimum CC energy rating, and as an alternative energy criterion, quantified the impact of a 30 percent energy demand reduction for renovations. This criterion typically refers to classifications that are less energy efficient than the CC rating due to the unfavourable conditions of the Hungarian housing stock.

The scale of potential savings can vary significantly for different house types. For a detached house built in the first half of the 20th century, or a condominium with relatively modern energy features built in the 2000s, the expected energy savings are completely different. In Hungary, the proportion of energy-obsolete buildings is high for residential buildings, while the proportion of modern and therefore low-energy buildings is low.

Chart 4.1: Heating cost savings from energy efficiency



Source: BME, HCSO

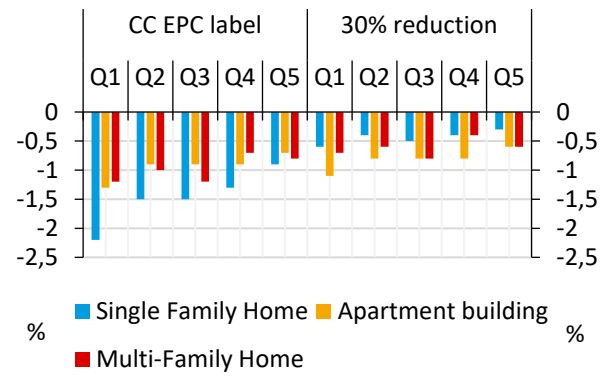
When determining the heating cost reduction arising from energy efficiency, the decision-maker can obtain results closer to the actual reduction by taking into account the rebound effect. This refers to the phenomenon that after an energy renovation, the savings will be lower than expected due to households heating their homes to a higher comfort level than before the renovation. The rebound effect may be particularly strong for households in energy poverty, where the amount spent on heating is determined by the household budget rather than the cost of energy needed to reach the comfort level. For this reason, the MNB has separately modelled the expected savings for several income groups. The magnitude of the rebound effect is also supported by Chart 4.**Error! Reference source not found.**, which shows the expected savings by income group based on the energy characteristics of different building types and their observed heating costs, thus controlling for this rebound effect. It is observed that the expected savings are higher for higher income households and lower for lower income households. This

[109] Billio et al. (2021): Buildings' Energy Efficiency and the Probability of Mortgage Default: The Dutch Case

confirms that the rebound effect is smaller for higher income households.

The savings from lower heating costs are passed through to the credit risk parameters of the borrowers using the debt-service-to-income ratio (DSTI). Using the Supervisory Retail Mortgage PD model, the change in the probability of default was quantified by the change in the DSTI ratios. The results are summarised in Chart 4.2, which shows the change in the relative default risk of an energy efficient household as a proportion of the default probability of a non-energy efficient household. The energy efficiency criterion is the CC energy rating for the left-hand side of the chart, and the alternative criterion, a 30 percent reduction in energy demand, for the right-hand side. In general, the effect shown in this research is several times smaller than the risk difference quantified in foreign studies.

Chart 4.2: Relative PD difference from energy efficiency



Source: MNB, BME, HCSO

The largest relative risk reduction is observed for lower income households for the CC criterion, which is in contrast to the savings reduction. The reason for this is that although lower income households are expected to save less on an energy renovation due to the rebound effect (as they move to a higher comfort level), this saving is still higher as a proportion of their lower income than for an upper income group. However, due to credit constraints, mortgage lending is largely directed towards the top two income quintiles in Hungary. This also implies that the absolute change in the probability of default resulting from the calculation is low, especially in the light of international results. If the residential energy price were to rise to market levels, the relative change in PD could triple, as would the savings.

The relative change in the probability of default is highest for detached houses, due to the high savings potential. The share of detached houses in the Hungarian housing stock is very high, so this may be a relevant result from a policy perspective. By comparing the results of the two criteria, it can be concluded that the CC rating as an energy efficiency criterion causes a relative change almost twice as large as the alternative criterion.

The risk reduction quantified above is only the effect of the additional discretionary income from lower heating costs for energy efficient households. In addition, there could be a number of other effects that could explain the significant risk difference measured in international studies. One such risk-reducing effect could be if families deemed to be more environmentally conscious also better assess their risks when making financial decisions. There may also be a wealth channel, as more affluent households may be more likely to purchase energy efficient properties, and there may be a difference in the value of energy efficient properties. The latter could also affect the banks' loss rate in the event of default, but this could be the subject of further, separate research.

4.4. Green financial attitude

In addition to promoting the supply of green financial products (Green Programme), the MNB considers the stimulation of potential demand an important step. For this reason, the MNB launched a programme called Családi Zöld Pénzügyek (Family Green Finances) in December 2020, which aims to broaden financial education and raise consumer awareness by demonstrating that finance can also serve the environment and sustainable development. To prepare the ground for the development of the programme and to explore the financial decision-making mechanisms of the population, the MNB conducted a representative survey of 1,000 Hungarian residents aged 25-59 with ABC status in the summer of 2021, entitled "Eco-consciousness and finance".

Based on the results, the surveyed population can be divided into four distinct groups according to attitudes towards environmental protection and finances. 17 per cent of the respondents declared themselves to be both environmentally aware and thrifty. Such households consume carefully and strive to leave as small an ecological footprint as possible. Those who responded in this way are admittedly in a good financial position and tend to live in a relationship. A much higher proportion

(33 per cent) are thrifty but less environmentally conscious. They are careful with their spendings, but do not look for environmentally friendly solutions unless they represent a more economical option. On the other hand, 16 per cent of households surveyed (most of them young people starting out in life) are not at all conscious of their finances: the main characteristics are that they are consumption-oriented, easily seduced by a special offer or promotion, and willing to take risks, i.e. they are not deterred by loans or risky investments. This group typically lives month-to-month and does not plan their expenditure and income. The fourth group of households (33 per cent) falls into the indifferent category: they are indifferent to all aspects of environmental protection. This group does not seek to save, but does not seek risk either, showing no interest in green financial products.

The results of the research show that there is no categorical denial of environmental problems among the respondents, but individual responsibility is underestimated: barely a third of the participants think that they could have a significant impact on the environment and sustainability. However, it is encouraging that the vast majority of households, even 77 per cent of the indifferent group, have at least one person in the household who cares about the environment and only 6 per cent of the surveyed population think that environmental problems are just to scare people. 79 per cent of those surveyed were familiar with the concept of ecological footprint, but the majority underestimated the ecological footprint of their own household. Of all the steps to reduce the ecological footprint, generally only those are practiced that promise immediate savings. Although the cost of food accounted for 26.1 per cent of the average Hungarian household's expenditure in 2020, the environmental relevance of this is not yet recognised, meaning that respondents significantly underestimate the importance of food in their ecological footprint. Environmentally conscious choices that involve major sacrifices, lifestyle changes or financial investments are mostly motivated by the long-term financial returns.

Green financial products are well known, but their penetration is still low. The vast majority of respondents (83 per cent) are familiar with at least one of the green financial solutions that have become available in recent years, but 81% have never used one. More than half of the population, 57 per cent, would be open to more information on this topic. When it came to investments, savings were also the primary consideration, with environmental protection not being a priority. However, those who had already invested in green solutions generally saw the two as inseparable.

The research clearly highlighted that there is a correlation between environmental consciousness and the household's attitude towards finances. Financially aware households tend to make more environmentally friendly consumption choices, but mainly for reasons of saving. The environmentally conscious actions taken by the population are those that have tangible financial benefits in the short term. However, openness and hunger for information is clearly emerging among households, so recognition of the link between sustainability and finances will continue to be a key objective of the MNB's CsZP (Family Green Finance Programme).

4.5. Inflationary impacts of the transition to a carbon neutral economy

As climate change progresses, assessing and understanding the associated economic and social impacts has become increasingly important. These impacts may result from the changing climate conditions and phenomena themselves (global warming, natural disasters), from the measures taken by humanity to mitigate climate change and from the transition to a carbon neutral economy. The financial system has an important role to play in promoting the latter process, in particular in facilitating investments to reduce carbon emissions, and to strengthen this the world's central banks and financial supervisors have jointly established the NGFS network, of which the MNB is also a member.

In addition to their impact on economic growth, economic policy measures taken to promote the transition to a green economy, the introduction of new technologies and the diffusion of new consumption patterns can also have a major impact on consumer prices and inflation. As such, they can certainly have an impact on the conduct of monetary policy, and central banks are therefore paying increasing attention to the analysis of these effects. The inflationary impact of the transition to a carbon-neutral economy depends to a large extent on the timing and pace of the transition. In order to forecast the economic and financial effects of the transition in an efficient and comparable way, the NGFS has developed a set of most likely climate scenarios in a scientifically sound and transparent way, on the basis

of which inflationary effects can also be predicted. The network regularly (annually) updates the scenarios and their assumptions, taking into account the latest information and data, and makes the corresponding data publicly available. These scenarios can be and increasingly are used by central banks in their own analyses, but they are also used in other areas, such as academic research.

In its latest analysis (June 2021)[110], the NGFS identifies six scenarios that use different assumptions for climate action, emissions, and temperature trends. They are divided into three groups:

Orderly transition

1) *Net Zero 2050* limits global warming to 1.5°C with stringent climate policies and innovation, leading to net zero CO_2 emissions by 2050, with the more developed regions (US, EU, Japan) reaching net zero emissions for all greenhouse gases.

2) *Below 2°C* progressively tightens climate action, with a 67 per cent chance of keeping global warming below 2°C.

Disorderly transition

1) *Divergent Net Zero* results in net zero CO_2 emissions by 2050, but at a higher cost due to the introduction of different (uncoordinated) measures across economic sectors and a faster phase-out of petroleum use.

2) *Delayed transition* assumes that CO_2 emissions do not start to decline until 2030. Stringent measures are needed to keep warming below 2°C. The amount of CO_2 removed from the atmosphere is not significant.

Hot house world

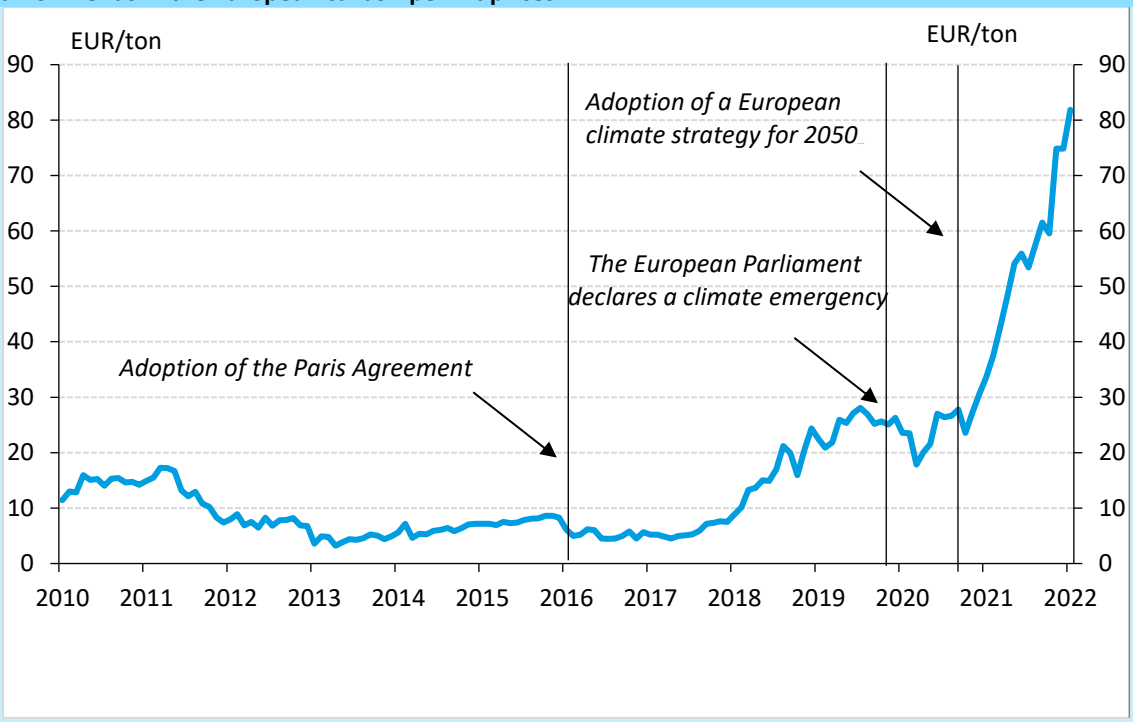
1) *Nationally Determined Contributions (NDCs)* cover actions that countries have undertaken so far, including those that have not yet been implemented. Warming is expected to be around 2.5°C by 2050.

2) *Current Policies* assumes that no new measures other than those already implemented will be implemented. It assumes a temperature rise of around 3°C and that climate change could pose high economic risks.

The main pillars of the transition to a carbon-neutral economy (climate policy and economic regulation, the diffusion of new technologies, and changes in consumer preferences, which also imply the main risks associated with the transition) will have an impact on inflation mainly through demand channels. At the corporate level, increased costs due to, *inter alia*, investment in new technologies and environmental taxes; at the household level, reduced incomes due to changes in the labour market; and at the macroeconomic level, changes in productivity due to a reallocation of investment, labour market restructuring, changes in international trade, interest rates and exchange rates are all factors that can affect inflation in different directions and significantly.

[110] NGFS (2021): Climate Scenarios for central banks and supervisors

Chart 4.3: Trends in the European carbon permit prices



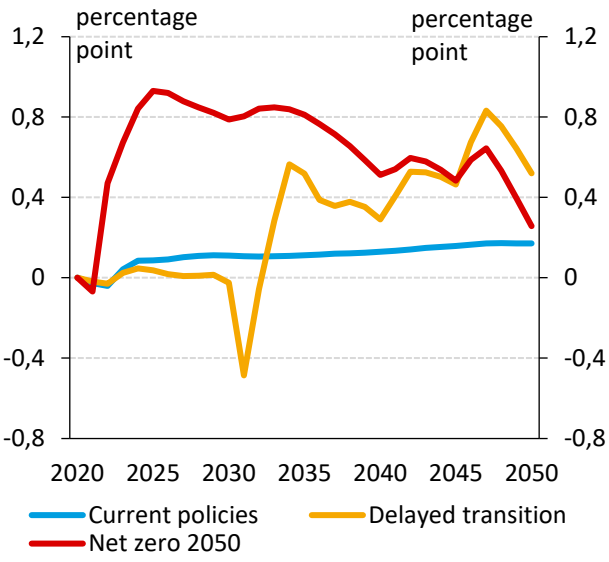
Source: Bloomberg

Government policy on climate change plays a key role in the uptake of green technologies. The European Union encourages economic operators to adopt environmentally friendly technologies through carbon emission quotas. The EU sets a maximum amount of CO_2 that can be emitted, and companies must pay per tonne for the right to emit. The price of carbon permits has risen from the pre-coronavirus EUR 20/ton to nearly EUR 100/ton at the beginning of 2022 (Chart 4.3), which significantly increases the costs for companies that engage in polluting activities, which in turn can increase the prices of certain raw materials (e.g. steel, cement). The increase in the cost of pollution will clearly encourage the development and use of new technologies, which are more expensive than conventional technologies, such as environmentally friendly produced glass and steel, which are currently 20 and 30 per cent more expensive than conventionally produced products. In the short to medium term, therefore, the cost of pollution or the introduction of new technologies may drive up prices for final products, but in the longer term, as technologies become more widespread and continue to develop, costs may also fall. A good example is the solar panel, whose price has fallen by 90 per cent in the last decade. The uptake of new technologies and changes in consumer preferences could drive up the prices of certain raw materials, even in the long term. Copper, for example, is an essential raw material for the green infrastructure of the future and is expected to be in increasing demand for wind and solar power generation equipment and electric vehicles, thanks to its excellent electrical conductivity. Consequently, copper prices could rise by up to 50 per cent by 2025.

The evolution of the inflationary impact of the transition to a green economy will largely depend on whether and in which scenario the CO_2 emission targets (in particular net zero emissions by 2050) are met. The inflation projections of both the NGFS and the central banks and financial supervisors that use the scenarios developed by the network for their analyses differ considerably under the different scenarios. The NGFS' own projections show that in the transition, the increase in carbon permit prices and the introduction of new technologies will raise energy and commodity prices in the short to medium term, leading to a moderate increase in inflation. This leads to a gradual increase in the *Net Zero 2050* scenario of 0.8–1 percentage points of additional inflation across Europe until 2030, after which price increases return to their previous trend and, after a gradual decline, the inflationary pressures from the transition disappear between 2040 and 2050. In the *Delayed transition* scenario, inflationary pressures emerge after the start of the transition, for reasons similar to the previous case, but at a more moderate pace, leading to around 0.5–0.6 percentage points of additional inflation, which rises

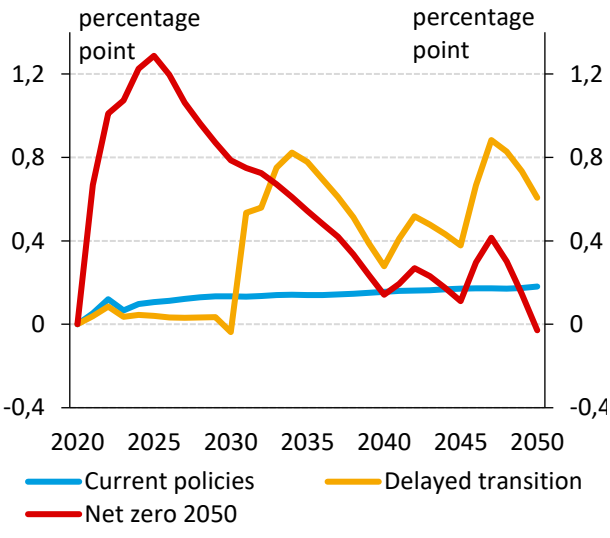
further towards the end of the time horizon before starting to decelerate. In contrast, the *Current Policies* scenario does not result in significant inflationary pressures over the time horizon, which is not surprising in the absence of further measures to achieve the transition (Chart 4.4 and Chart 4.5).

Chart 4.4: Estimated inflationary impact of the transition in Europe



Source: NGFS Scenario Explorer

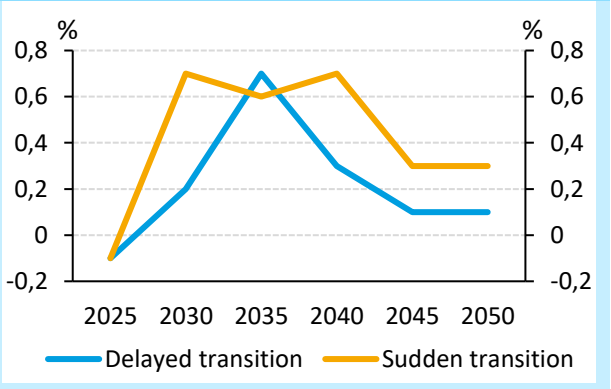
Chart 4.5: Estimated inflationary impact of the transition in the USA



Source: NGFS Scenario Explorer

Using the NGFS scenarios, more than 30 members of the network have conducted or plan to conduct scenario analysis to identify and understand the impacts of climate change and the transition to a green economy on the economy and financial system of a country or region[111]. Among these, the ECB[112] and the Banque de France[113], among other central banks, have already completed such analysis. In addition to the three scenarios mentioned above, these studies also look at a fourth, the *Accelerated* transition scenario, in which the measures needed to reach the target are only put in place after 2025. The inflationary impacts are determined relative to the Net Zero 2050 scenario. The *Accelerated* and *Delayed* transition scenarios result in significantly higher inflation in the medium term compared to the *Net Zero 2050* (around 0.7 percentage points), but also higher inflation in the long term (0.1–0.3 percentage points). The higher inflation effects in the medium term are due to faster carbon permit price increases, which are moderated at the end of the projection horizon as a result of reduced economic activity due to higher energy and commodity prices. (Chart 4.6). In particular, the impact on inflation of the *Accelerated* transition is stronger than that of the *D*elayed transition, due to faster increases in carbon permit prices and lower productivity. It is necessary to note for the interpretation of these results that the simulations incorporate monetary policy rules that allow inflation to deviate from the ECB's inflation target of close to 2 per cent in the long run.

Chart 4.6: Inflation impact of alternative transition paths in the euro area compared to the normal transition



Source: Allen et al. (2020), ECB (2021)

[111] NGFS (2021): Scenarios in Action: A progress report on global supervisory and central bank climate scenario exercises

[112] ECB (2021): Climate change and monetary policy in the euro area

[113] Allen et al. (2020): Climate-related scenarios for financial stability assessment: an application to France

5. REGULATION IN HUNGARY AND EXPECTED CHANGES

Significant legislative changes are taking place at EU and national level in relation to sustainable finance. The new legislative changes affect all financial institutions, setting new requirements, in particular in the area of climate change risk management and disclosure obligations. In response to these accelerating events, the MNB is working to assist in monitoring these changes, including through the development of a green legal directory and a collection of information on green disclosures. The MNB is also seeking to mainstream green considerations in its own legislative processes, which is one of the reasons why it is proposing to change its credit coverage ratio rules, as described in more detail in the box on Green Debt Brake Rules. There has also been a change in legislation affecting the MNB's own operations, in 2021, the MNB became the first European central bank to be given a green mandate, under which the MNB's statutory objective is to support the government's policy on environmental sustainability. A brief summary of the MNB's overall sustainability-related activities is provided in the table outlining MNB actions in line with the NGFS recommendations.

5.1. NGFS recommendations and related measures by the MNB

The MNB's actions are in line with the recommendations of the NGFS, one of the main organisations promoting the greening of central banks. International best practice in the area of green financial regulation can be found in the recommendations of the NGFS report on proposals[114] for action to green the financial system (already explained in chapter 1.1.2). When introducing its measures, the MNB has tailored its programmes to take these into account, and the MNB measures corresponding to the recommendations are shown in the table below (Table 7).

Over the past year, the MNB has made significant progress on several NGFS recommendations. Since the publication of the previous Green Finance Report, significant progress has been made on several NGFS recommendations. Noteworthy is the long-term climate stress test for the domestic banking sector, which provides a detailed picture of the extent of climate risks under several scenarios. In order to maximise the use of the knowledge and competences built up by the MNB during conducting the stress test in the domestic financial system, the MNB has also published a detailed methodology for the stress test, in line with the Recommendation on knowledge sharing presented in Chapter 2.3.

The MNB published its Guide on climate-related and environmental risks for credit institutions during 2021, with an update expected during Q2 2022. An important objective of the Guide is to set out the MNB's expectations for the banking sector in addressing environmental and climate change risks, thereby laying the foundation for integrating environmental risks into the micro-prudential supervisory framework. In this context, the MNB has prepared a collection of resources on data and methodologies for Hungarian credit institutions. An insight into the banks' compliance with the Guide on climate-related and environmental risks is provided in chapter 2.4.

The MNB's Green Central Bank Toolkit Strategy[115] has also been published. By providing a coherent framework, the document sets out possible directions for the central bank to transpose sustainability considerations into its monetary policy toolkit. In line with the strategy, the MNB has launched two programmes to promote green lending for housing, the Green Mortgage Bond Purchase Programme and the Green Home Programme. These programmes are also in line with the NGFS recommendations on monetary policy instruments[116]. The programmes are described in detail in chapters 3.1.1 and 3.2.3.

[114] NGFS (2019: A call for action Climate change as a source of financial risk

[115] MNB (2021): Sustainability and central bank policy – Green aspects of the. Magyar Nemzeti Bank's monetary policy toolkit

[116] NGFS (2021): Adapting central bank operations to a hotter world – See Table 1.

Table 7: NGFS recommendations and MNB measures

#	Proposal	MNB measures
1	Integrating climate change-related risks into macro- and micro-prudential supervision	*Conducting a long-term climate stress test for the domestic banking sector*
		Issuance of the MNB Guide on climate-related and environmental risks laying the groundwork for integrating climate change-related and environmental risks into micro-prudential supervision.
		Conducting an analysis of the entire Hungarian banking sector in the context of compliance with the MNB Guide on climate-related and environmental risks
		Conducting an analysis based on a comparison of banks' exposures to transition risks and individual preparedness levels
		Extension of the preferential green capital requirement programme
2	Integrating sustainability elements into the management of the central bank's own portfolios	Construction of a dedicated green portfolio
3	Overcoming data gaps	Expecting the reporting of green data as part of green preferential capital requirement programmes.
4	Developing awareness and relevant knowledge and encouraging technical assistance and knowledge sharing	*Publication of the methodology for the long-term climate stress test*
		Supporting signature of the UN Principles for Responsible Banking
		Continuation of university education and research programs, banking and capital market courses
		Publication of a green financial reports, articles and studies
		Organisation of international green conference
		As part of the MNB Guide on climate-related and environmental risks, preparation of a collection of resources on data and methodologies for Hungarian credit institutions.
5	Achieving sound disclosures on climate change-related and environmental risks that are in line with the international approach	*Publication of the MNB's Climate-related Financial Disclosure (TCFD report)*
		Issuance of the MNB Guide on climate-related and environmental risks with a chapter formulating disclosure requirements
		Supporting disclosure obligations under the SFDR by means of a management circular
6	Supporting the development of a taxonomy	Simplified application of EU green taxonomy under preferential capital requirement programmes

Note: Items in italics are new measures compared to those in last year's report.

With the TCFD report presented in Box 3, the MNB aims to set an example of good practice in the area of disclosure. A development related to point 5 on the promotion of disclosures in line with international standards is that this year, for the first time, the MNB published its climate-related financial disclosure, which is structured according to the TCFD recommendations. One of the MNB's objectives in preparing this report is to set an example for domestic financial sector actors.

5.2. Hungarian and applicable "green" law and recommendations

5.2.1. Developments in the European Union in 2021

The foundations for the three components of the first Action Plan on Financing Sustainable Growth (*I) EU Taxonomy; II) Disclosures and III) Assets*) announced by the European Commission (Commission) in 2018 are in place since the end of 2021.

I. EU taxonomy

The most significant development of 2021 for the EU taxonomy framework was the adoption and entry into force of the Commission Delegated Regulations to support the application of the Taxonomy Regulation. The Taxonomy Regulation[117], which lays down the EU taxonomy, was adopted by the European Parliament and the Council on 18 June 2020 and its provisions under Article 27(2)(a) shall apply from 1 January 2022 to economic activities that make a significant contribution to mitigating and adapting to climate change. The Commission Delegated Regulations (including the EU Taxonomy Climate Delegated Act[118] and the Disclosures Delegated Act[119]), which facilitate the application of the Taxonomy Regulation, entered into force in December 2021 and shall be applied from 1 January 2022. The EU Taxonomy Climate Delegated Act summarises the technical assessment criteria for economic activities that contribute significantly to climate change mitigation and adaptation. The Disclosures Delegated Act sets out the content of the disclosures under Article 8 of the Taxonomy Regulation for non-financial corporations and financial corporations.

Significant steps have also been taken by the Commission and the Sustainable Finance Platform to further develop and extend the EU taxonomy framework in 2021, notably:

i. the definition of technical assessment criteria for the four remaining economic activities that contribute significantly to the environmental objectives,
ii. to develop the basis for a social taxonomy, and
iii. to extend the EU Taxonomy Climate Delegated Act to activities supporting economic transition.

On 3 August 2021, the Commission initiated a consultation on a draft regulation[120] setting out technical assessment criteria for the remaining four economic activities that contribute significantly to the environmental objectives of the Taxonomy Regulation. The comments received are being processed and a proposal from the Platform on Sustainable Finance (the Platform) is expected to be submitted to the Commission in Q1 2022. In July 2021, the Platform initiated a consultation on two draft reports: social taxonomy and taxonomy extended to activities supporting economic transition[121]. The final report on social taxonomy[122] was published by the Commission on 28 February 2022 and the other report is being finalised and is expected to be published in Q2 2022. On 2 February 2022, the Commission adopted a Regulation on complementing the EU Taxonomy Climate Delegated Act (hereinafter: Complementary Climate Delegated Act[123]), which targets economic activities related to gas and nuclear energy sources as activities to support the transition to a climate neutral economy. The European Parliament and Council may express their objection to the draft adopted by the Commission within 4 months (this period may be extended by a further 2 months at the request of either institution). The Complementary Climate Delegated Act is expected to be applied from 1 January 2023.

II. Disclosures

The most significant step in the development of the disclosure regime in 2021 was the start of the application of the SFDR Regulation by financial market participants and financial advisors. In addition, the development of a draft regulation by the European Supervisory Authorities to facilitate the application of the

[117] Regulation (EU) 2020/852 of the European Parliament and of the Council
[118] Commission Delegated Regulation (EU) 2021/2139
[119] Commission Delegated Regulation (EU) 2021/2178
[120] European Commission (2021): Call for feedback by the Platform on Sustainable Finance on preliminary recommendations for technical screening criteria for the EU taxonomy
[121] European Commission (2021): Call for feedback on the draft reports by the Platform on Sustainable Finance on a social taxonomy and on an extended taxonomy to support economic transition
[122] European Commission (2022): Platform on Sustainable Finance's report on social taxonomy
[123] European Commission (2022): EU taxonomy: Complementary Climate Delegated Act to accelerate decarbonisation

SFDR is a significant step forward. The sustainability related disclosure regime laid down by the EU covers both financial and non-financial undertakings. The scope of the key information on sustainability to be disclosed by undertakings providing services in the financial services sector (financial market participants and financial advisors) is set out in the SFDR Regulation[124], most of whose provisions are applicable from 10 March 2021. The remaining SFDR level requirements must be complied with by financial market participants and financial advisors from 1 January 2022 and 1 January 2023. Final Reports on the draft regulations (detailing the content, methodology and presentation of disclosures) to facilitate the application of the SFDR were published by the ESAs in February[125] and October[126] 2021. The Final Report published on 22 October 2021 covers, *inter alia*, the disclosure requirements for financial products under Articles 5 and 6 of the Taxonomy Regulation. By letters of 9 July 2021 and 25 November 2021, the Commission informed the European Parliament and the Council that it intended to adopt the RTS drafts in a single delegated act, postponing the date of application to 1 January 2023.

Further provisions on sustainability disclosures by financial institutions are contained in Article 8 of the Taxonomy Regulation and Article 449a of the CRR and the relevant implementing technical standard will apply from 28 June 2022. Additional requirements for sustainability disclosures by financial institutions required to make disclosures under Articles 19a or 29a of the NFRD[127] are set out in Article 8 of the Taxonomy Regulation and the Disclosures Delegated Act to facilitate its application. Financial institutions are required to apply the provisions of the legislation from 1 January 2022. On 24 January 2022, the European Banking Authority (EBA) published the final draft implementing technical standard on the content of disclosures about EGS risks under Article 449a of the CRR[128], which is expected to apply from 28 June 2022 (as relevant institutions are required to comply with Article 449a of the CRR from the same date[129].)

In addition to complying with the sustainability disclosures, relevant financial institutions will also be required to integrate sustainability considerations into the process of producing specific products and the advice they provide on those products. They will be required to do so in regulations and directives adopted by the Commission in 2021. In order to maintain high standards of investor protection, the Commission adopted delegated acts[130] in April 2021 to ensure that clients' sustainability preferences are taken into account as early as the production of financial instruments and insurance products and in the investment and insurance advice processes.

The requirements for sustainability disclosures by non-financial undertakings are set out in the Taxonomy Regulation (Article 8) and the Disclosures Delegated Act. Furthermore, the proposal for a Directive on Corporate Sustainability Reporting (CSRD[131]) will elaborate on this. The Commission presented its proposal for the CSRD in April 2021, the provisions of which are drafted to be implemented by 1 December 2022 at the latest and shall apply for all financial years from 1 January 2023 onwards[132]. The CSRD will, *inter alia*, amend the personal scope of Articles 19a and 29a of the NFRD, which also implies an extension of the personal scope of Article 8 of the Taxonomy Regulation. The CSRD significantly expands the content of the sustainability report under Articles 19a and 29a of the NFRD, which will have to be disclosed by the undertakings concerned in accordance with the sustainability reporting standards referred to in Articles 19b or 19c of the NFRD.

The Commission plans to introduce a single platform for sustainability disclosures. On 25 November 2021, the Commission adopted a draft ESAP Regulation, which intends to create a single access point, to be set up by the

[124] Regulation (EU) 2019/2088 of the European Parliament and of the Council

[125] Final Report on draft Regulatory Technical Standards - with regard to the content, methodologies and presentation of disclosures pursuant to Article 2a(3), Article 4(6) and (7), Article 8(3), Article 9(5), Article 10(2) and Article 11(4) of Regulation (EU) 2019/2088

[126] Final Report on draft Regulatory Technical Standards - with regard to the content and presentation of disclosures pursuant to Article 8(4), 9(6) and 11(5) of Regulation (EU) 2019/2088

[127] Directive 2014/95/EU of the European Parliament and of the Council

[128] Regulation (EU) No 575/2013 of the European Parliament and of the Council – ("CRR")

[129] Relevant institutions: large institutions that issue securities that are admitted to trading on a regulated market of a Member State within the meaning of Article 4(1)(21) of Directive 2014/65/EU

[130] Commission Delegated Regulation (EU) 2021/1253 / Commission Delegated Directive (EU) 2021/1269 / Commission Delegated Regulation (EU) 2021/1257

[131] Proposal for a Directive of the European Parliament and of the Council amending Directive 2013/34/EU, Directive 2004/109/EC, Directive 2006/43/EC and Regulation (EU) No 537/2014, as regards corporate sustainability reporting

[132] Detailed summary and current status of the EU legislative process

European Securities and Markets Authority (ESMA), thereby standardising the availability of financial and sustainability data for EU listed companies.

III. Assets

The most significant development in 2021 in the regulatory framework for "green" assets was the Commission's presentation of the draft European Green Bond Regulation. The draft European Green Bond Regulation was presented by the Commission on 6 July 2021[133], which, based on the Taxonomy Regulation, that "lays down uniform set of specific requirements should therefore be laid down for bonds issued by financial or non-financial undertakings or sovereigns that voluntarily wish to use the designation 'European green bond' or 'EuGB' for such bonds"[134]. Furthermore, the Regulation introduces a registration procedure for external auditors and sets out uniform organisational and operational requirements for external auditors, thereby helping to reduce the risk of greenwashing.

A further step forward in promoting the uptake of "green" assets was the preparation of a draft Commission Decision on the conditions of application of the EU Ecolabel label for retail financial instruments. A draft Commission Decision on the EU Ecolabel criteria for retail financial instruments[135] was published on 9 March 2021 and will apply to the financial and investment services related to packaged investment products, insurance-based investment products or deposits made available to retail investors under the PRIIPs Regulation[136], as defined in the draft.

IV. Further developments in the European Union in 2021

In 2021, the EBA published two major documents covering ESG issues: (i) a report on the management and supervision of environmental, social and governance risks[137], and (ii) updated guidelines on internal governance[138]. The ESG Risks Report contains comprehensive proposals on how ESG factors and risks should be integrated into the regulatory framework and supervision of credit institutions and investment firms in the EU. The EBA also makes recommendations to credit institutions and investment firms on (i) incorporating ESG risks into their strategies, objectives and corporate governance systems, and (ii) integrating these risks into their risk appetite setting and internal capital allocation processes. The Guidelines on Internal Governance require the executive board, in carrying out its responsibilities as set out in the Guidelines, to ensure the operation of a business model and a risk management system that covers all risks (including ESG risks).

5.2.2. Hungarian green regulatory measures in 2021

Significant green regulatory measures in 2021 include granting the MNB a green mandate, the publication of the MNB's Guide on climate-related and environmental risks, the introduction of the concept of green mortgage bonds and the expansion of the MNB's existing green finance programmes, as well as the launch of additional programmes to support green finance. The following Hungarian green regulatory changes and (non-binding) supervisory regulatory instruments were published in 2021:

- the amendment of Act CXXXIX of 2013 on the Magyar Nemzeti Bank ("MNBtv."), the introduction of the so-called "green mandate" of the MNB;
- MNB Decree 20/2021 (VI. 23.) on the regulation of the forint maturity matching of credit institutions, which is described in detail in sub-section 3.2.3. of this document;
- MNB Recommendation No 5/2021 (IV.15.) on climate change and environmental risks and the integration of environmental sustainability considerations in the activities of credit institutions, which is described in detail in subsection 2.4 of this document;
- Management Circular on Regulation 2019/2088 on sustainability disclosures in the financial services sector ("SFDR Management Circular")[139];

In 2021, the MNB was granted a statutory "green mandate". Under the MNB Act, from August 2021, 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 environmental sustainability, without compromising its

[133] Detailed summary and current status of the EU legislative process
[134] Proposal for a Regulation of the European Parliament and of the Council on European green bonds
[135] Commission Decision of establishing the EU Ecolabel criteria
[136] Regulation (EU) No 1286/2014 of the European Parliament and of the Council
[137] EBA (2021): Report on management and supervision of ESG risks for credit institutions and investment firms
[138] EBA (2021): Guidelines on internal governance
[139] MNB (2021): Management Circular on Regulation 2019/2088 on sustainability disclosures in the financial services sector

primary objective of achieving and maintaining price stability. The MNB was the first European central bank to obtain this "green mandate". In addition, from 1 January 2022, 6 per cent of the revenues from fines imposed by the MNB can be used to promote and support environmental objectives in order to mitigate the environmental impact of the MNB's activities.

In 2021, the MNB issued a "green" management circular to set out its supervisory position on certain provisions of the SFDR. The SFDR Management Circular sets out the supervisory position and expectations regarding the application of the main provisions of the SFDR from 10 March 2021. To answer further questions on the application of the SFDR and the Taxonomy Regulation, the MNB will develop a Q&A on the topic during Q2 2022 to inform relevant market participants.

In 2021, in addition to the above, in order to encourage green lending in Hungary, the MNB: 1) published the Green Preferential Capital Requirement Programme for Housing with modified terms and conditions 2) extended the Green Preferential Capital Requirement Program for Corporates and Municipalities 3) announced the Green Mortgage Bond Purchase Program 4) launched the FGS Green Home Program. The MNB published the Green Preferential Capital Requirement Programme for Housing[140], announced in early 2020, with amended terms and conditions. According to the amended conditions, the capital relief is available for mortgage loans and personal loans - qualifying as energy-efficient - concluded by Hungarian credit institutions with consumers between 1 January 2020 and 31 December 2024 for the purpose of purchasing, building or modernising residential buildings, and for condominiums or housing cooperatives for the purpose of modernising residential buildings. Under the amended scheme, the loans eligible for the capital relief are those loans for which no disbursement fee is charged and for which the conditions for additional fees under the scheme are the same as those of the FGS Green Housing Programme. The initial results of the scheme are set out in chapter 3.1. In addition, in 2021, the MNB extended the Green Preferential Capital Requirement Programme for Corporates and Municipalities[141] announced at the end of 2020, under which capital relief can be applied to a number of other exposures in addition to loans (or green bond exposures) financing renewable energy production, such as: exposures related to electromobility – meeting the conditions set out in the programme; agricultural; financing energy efficiency; financing the purchase of shares in a business related to green activities; green exposures under a green financing framework laid down by the borrower and a green lending framework laid down by the credit institution. The results achieved so far are set out in chapter 3.1.

In August 2021, the MNB announced the Green Mortgage Bond Purchase Programme to promote green mortgage lending and support the modern housing market, under which the MNB:

- will make an offer, as defined in the Programme, in the public offering of mortgage bonds of mortgage credit institutions established in Hungary that meet the conditions set out in the Programme, and
- purchases specified mortgage bonds issued in Hungary.

The programme is described in detail in sub-section 3.2.3 of this document.

In 2021, the FGS Green Home Programme was launched under the Funding for Growth Programme to promote the creation of a green home loan market. The programme is described in detail in sub-section 3.1.1 of this document.

The MNB intends to help monitor the ever-changing legislation with its Compendium of Green Law and Standards, published in December 2021. The aim of the Compendium of Green Law and Standards is to support market participants' monitoring of EU and national legislative changes relevant to climate change and environmental risks and to help them prepare for expected legislative changes.

[140] MNB (2021): Information on the amended terms of the Green Preferential Capital Requirement Programme for Housing

[141] MNB (2021): Green Preferential Capital Requirement for Corporates and Municipalities

BOX 7: Green borrower-based measures

The energy modernisation and faster renewal of the domestic housing stock, the creation of green homes for young people and greater use of the MNB's other green programmes would all be supported by including green considerations within the borrower-based measures. Residential buildings account for about one third of final energy consumption in Hungary and their renewal rate is low even by regional standards[142]. However, the higher downpayment requirement resulting from the high price premium for energy-efficient, comfortable housing, due to the applicable loan-to-value ratio (LTV) requirement[143], limits access to new, modern housing for typically younger first-time buyers. This in turn pushes young people towards often energy-inefficient but cheaper properties, and the longer savings period required to generate the own funds may also have a negative impact on the achievement of demographic targets. For these reasons, a higher LTV limit, i.e., a lower downpayment requirement, may be justified for clients buying their first, green home. On the borrowers' side, this may be justified by the expected faster income growth of younger age groups and the reduced credit risk due to higher payment discipline resulting from the loan being used for housing, not investment purposes. On the collateral side, risks may be further mitigated by the lower maintenance costs and higher value retention of green residential property. With the introduction of a higher LTV limit, the green properties concerned could be financed in a sustainable manner for a larger proportion of the property value with a lower downpayment requirement proportionate to the lower risk of the associated loans. This could support the achievement of climate goals, youth homemaking and the use of MNB's green programmes together.

5.3. Expected new Hungarian and applicable EU "green" financial provisions

I. Other expected "green" financial provisions coming into force in the coming years

On 6 July 2021, the Commission announced the new phase[144] of the EU Sustainable Finance Strategy, which sets out four main areas: financing the transition of the real economy to sustainability; developing a more inclusive sustainable finance framework; improving the resilience and contribution of the financial sector to sustainability; and global ambitions. In order to improve the resilience of the financial sector and its contribution to sustainability, the Commission has adopted the following draft legal acts in 2021.

On 27 October 2021, the Commission adopted a package of legislation (including CRR and CRD amendments) to revise the rules for EU credit institutions, in which improving the resilience of the financial sector is playing a major role. The proposed amendment to the CRR introduces the concept of ESG risk. According to the draft, the personal scope of the article on ESG risk disclosure (CRR Article 449a) will be extended to all institutions. In addition, institutions will be required to report their ESG risk exposures to their supervisory authorities. The amendments proposed in the context of the CRD[145] aim to integrate ESG risks into institutions' risk management systems and supervision and to lay the foundations for a systemic management of sustainability risks. In addition, the expectations for management bodies are complemented by an understanding of ESG risks and their impact on the institution.

On 22 September 2021, the Commission adopted a draft comprehensive amendment to the Solvency II Directive[146], which, similarly to the CRR and CRD amendments, aims to improve insurers' contribution to sustainability and their resilience. Thus, for example by requiring insurers to take climate change into account when assessing their own risk and solvency capital adequacy and determining their investment strategy. They should assess whether they have material exposure to climate change risks and define a long-term climate change scenario. In addition, the proposal encourages insurers to invest more in long-term investments.

Further legislative changes are expected to achieve the objectives in the areas set out in the new phase of the

[142] MNB (2019): Housing Market Report

[143] The LTV requirement limits the maximum loan amount that can be granted in proportion to the market value of the property

[144] European Commission (2021): Strategy for Financing the Transition to a Sustainable Economy

[145] Directive 2013/36/EU of the European Parliament and of the Council

[146] Directive 2009/138/EU of the European Parliament and of the Council

EU Sustainable Finance Strategy. On the basis of the announced strategy, the Commission plans to amend and draft legislation in the following areas: amending the Prospectus Regulation[147]; developing labels for other bonds, such as those linked to the transition or sustainability; developing a general framework for the labels of financial instruments; amending the CRA Regulation[148]; and reflecting sustainability risks in financial reporting standards and accounting.

II. Upcoming Hungarian "green" financial law developments

In 2022, changes in Hungarian law are expected partly due to the implementation of the provisions of EU directives that will be adopted, such as:

- the Accounting Act, due to the implementation of the CSRD;
- the Investment Firms Act[149], due to the implementation of the Commission Delegated Directive (EU) 2021/1269;
- in the case of the adoption of the CRD, the Credit Institutions Act[150] and the Investment Firms Act;
- the Insurance Act[151], due to the implementation of the Solvency II Directive;
- the Collective Investments Act[152], due to the implementation of the Commission Delegated Directive (EU) 2021/1270;
- and the MNB Act[153] is expected to be amended in the context of the European Green Bond Regulation, *inter alia*, on the basis of the currently known draft, to ensure the compliance of sovereign issuers' green bonds with the Regulation by the MNB.

The set of legislation and supervisory regulatory instruments expected to be issued by the MNB in 2022 are detailed in sub-section 5.5 of this document.

[147] Regulation (EU) 2017/1129 of the European Parliament and of the Council

[148] Regulation (EC) No 1060/2009 of the European Parliament and of the Council

[149] Act CCXXXVIII of 2007 on Investment Firms and Commodity Dealers

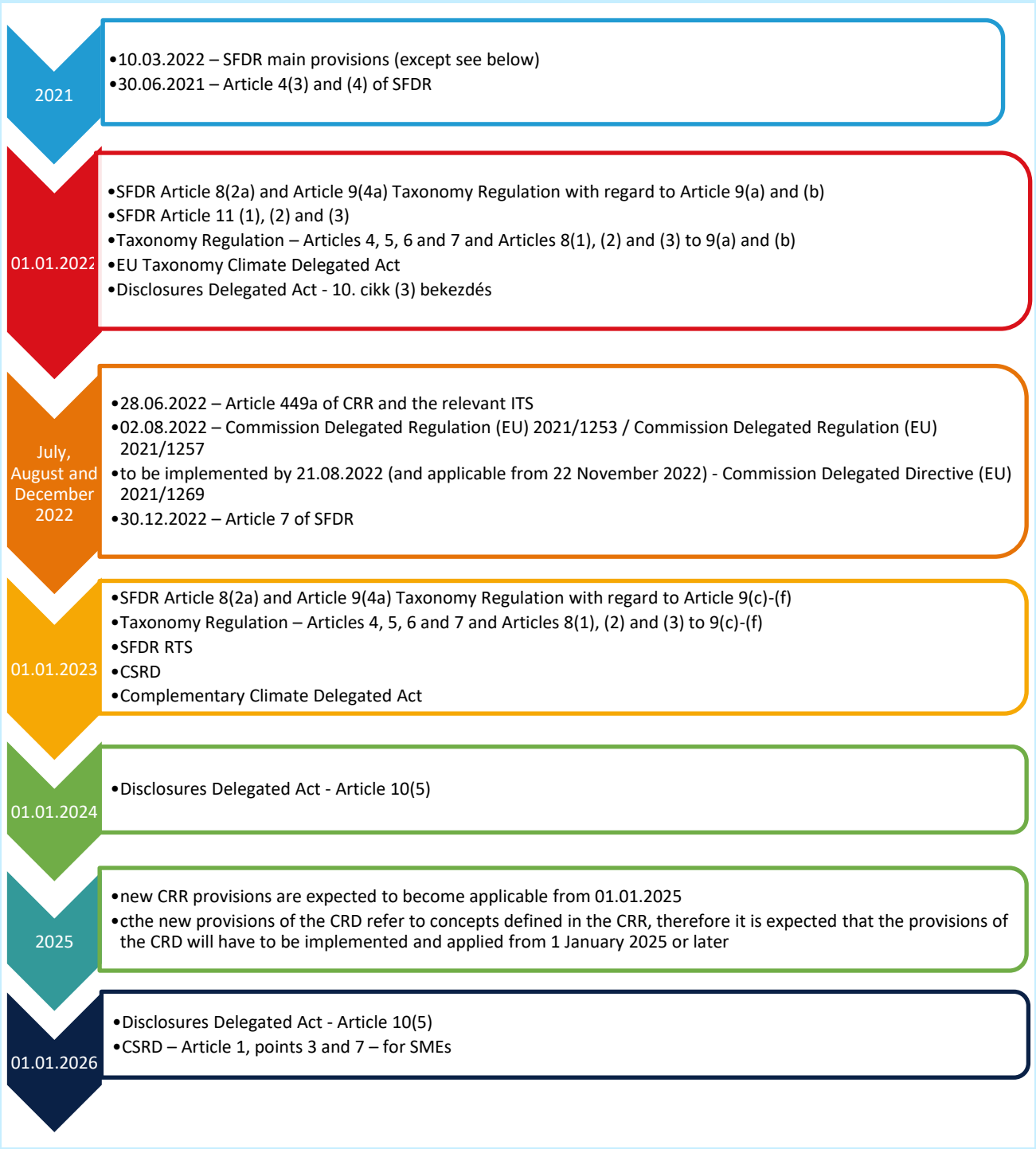
[150] Act CCXXXVII of 2013 on Credit Institutions and Financial Enterprises

[151] Act LXXXVIII of 2014 on the Business of Insurance

[152] ct XVI of 2014 on Collective Investment Trusts and Their Managers, and on the Amendment of Financial Regulations

[153] Act CXX of 2001 on Capital Markets

Chart 5.1: (Expected) starting dates for the application of "green" provisions/draft regulations and certain provisions thereof



Source: MNB

5.4. Expected new disclosure obligations

New disclosure obligations are expected at both European and national level to bridge the data gaps experienced so far. One of the biggest problems in climate change and sustainability research is the very limited amount of data available. Recognising this, the European Union is constantly working to develop new data services, including for the financial sector, which can help to shed light on the green state of the market. The following paragraphs set out the new disclosure requirements currently expected to affect the financial market.

The EU regulation to affect the most market participants is expected to be the disclosure obligation under Article 8 of the Taxonomy Regulation. On 18 June 2020, the Taxonomy Regulation[154] entered into force, and its Article 8 imposes disclosure obligations on non-financial companies, investment fund managers, credit institutions, insurance undertakings and reinsurance undertakings. The Disclosures Delegated Act[155] was adopted in June 2021 and entered into force in December 2021, with effect from 1 January 2022, to define the obligations imposed. The Disclosures Delegated Act sets out the content of the disclosures required under Article 8 of the Taxonomy Regulation, supported by accompanying tables, definitions and descriptions. Detailed rules for entry into force and application are set out in Article 10 of the Disclosure Delegated Act. Until future regulatory action is taken, exposures need only be assessed in relation to the two environmental objectives detailed in the Climate Delegated Act. Under the current regulations, from January 2022, all large companies subject to the NFRD[156] will be required to disclose in their annual report their exposures that can be assessed (aligned to Taxonomy) under the Taxonomy Regulation, for the first time for the year 2021. In 2022, it is not yet necessary to assess the proportion of exposures that are aligned with the Taxonomy Regulation. Financial institutions will be required to disclose Taxonomy-aligned exposures for the first time after 1 January 2024, with stock data for the year 2023, and thus the Green Asset Ratio (GAR) will only be reported for the first time at that time. For non-financial entities subject to the NFRD, the timeline is different, as they will be required to report their alignment to the Taxonomy for the year 2022 after 1 January 2023. This delayed timeline will allow other market participants to include relevant data from their counterparties in their own disclosure documents. The current NFRD Directive on the disclosure of non-financial information will be amended by the CSRD Directive[157] mentioned above and already proposed by the Commission, which will extend the scope of the institutions that will be subject to the disclosure obligations under the Taxonomy Regulation in terms of the scope of persons. Under the draft, all large companies and all listed companies (except micro-entities) will be obliged to disclose the information required by the Taxonomy Regulation.

Credit institutions have an additional disclosure obligation to disclose the information specified under Article 449a of the CRR. The specified disclosures will be required to be included by institutions in their Pillar III reports. The CRR sustainability disclosure obligations currently in force shall apply to all large institutions that issue securities subject to trading on a regulated market in a Member State. It is also worth noting that the new CRR provisions[158] proposed by the Commission in October 2021, which are expected to apply from 1 January 2025, extending the scope of CRR 449a to all institutions subject to CRR. Under the current legislation, institutions are required to report sustainability data first annually and then semi-annually, for the first time in 2023 for the end-2022 stock data. The EBA has developed an ITS[159] on disclosure obligations under CRR 449a, which was adopted by the Board of Supervisors in January 2022. Under the adopted ITS, institutions are required to disclose qualitative information on their management of ESG risks in 3 tables and quantitative information on their exposure to climate change based on 10 tables. Both the

[154] Regulation (EU) 2020/852 of the European Parliament and of the Council

[155] Commission Delegated Regulation (EU) 2021/2178

[156] Directive 2014/95/EU of the European Parliament and of the Council

[157] Proposal for a Directive of the European Parliament and of the Council amending Directive 2013/34/EU, Directive 2004/109/EC, Directive 2006/43/EC and Regulation (EU) No 537/2014, as regards corporate sustainability reporting

[158] Proposal for a Regulation of the European Parliament and of the Council amending Capital Requirements Regulation

[159] EBA: Implementing Technical Standards on prudential disclosures on ESG risks in accordance with Article 449a CRR

ITS and the Taxonomy Regulation include GAR as a mandatory element, however, additional information will have to be reported in Pillar III disclosures, such as the energy performance characteristics of the real estate portfolio included as collateral, the value of exposures to the world's largest polluting companies, and a GAR-like indicator, the Banking Book Taxonomy Alignment Ratio (BTAR), which will now include SME exposures and the exposure amounts of companies not subject to the NFRD.

The EBA will set out simplified disclosure rules for small and non-complex institutions in a separate ITS.

The MNB will strive to support the production of disclosure data by continuously monitoring and communicating current regulatory developments to institutions. More information on reporting requirements is provided in Annex I.[160]

[160] Annex I is only available in Hungarian. If you have any further questions please contact us at zold.penzugyek@mnb.hu.

Chart 5.2: Timeline for information to be disclosed under Article 8 of the Taxonomy Regulation and Article 449a of the CRR

Time

- Personal scope: Financial institutions and non-financial corporations subject to the NFRD
- Applicable: 01.01.2022
- Reference date of first report: 31.12.2021
- Frequency: annual
- Content:
  - non-financial corporations: taxonomy eligible
  - financial institutions: taxonomy eligible

Taxonomy

CRR

- Personal scope: large institutions that issue securities that are admitted to trading on a regulated market of a Member State
- Applicable: 28.06.2022
- Reference date of first report: 31.12.2022
- Frequency: to be published on an annual basis for the first year and every six months thereafter
- Content: qualitative and quantitative information on climate exposures (for more details see annexes)

- Personal scope: financial institutions and non-financial corporations subject to the NFRD
- Applicable: 01.01.2023
- Reference date of first report: 31.12.2022
- Frequency: annual
- Content:
  - non-financial corporations: taxonomy eligible and taxonomy aligned
  - financial institutions: taxonomy eligible

Taxonomy

- Personal scope: financial institutions subject to the NFRD
- Applicable: 01.01.2024
- Reference date of first report: 31.12.2023
- Frequency: annual
- Content: financial institutions: taxonomy eligible and taxonomy aligned (GAR)

Taxonomy

CRR

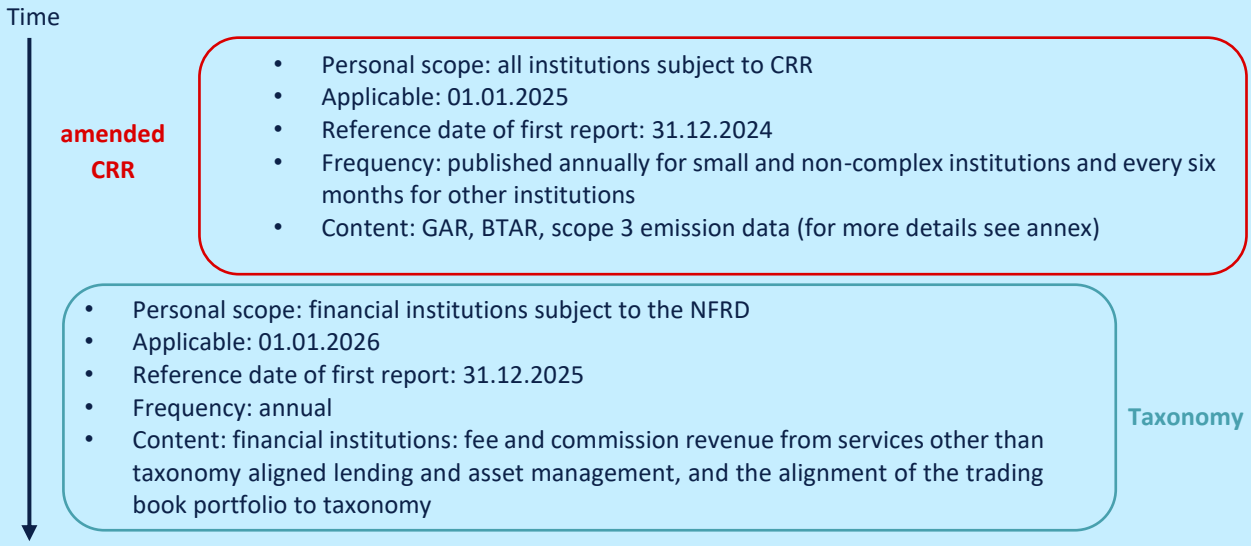
- Personal scope: large institutions that issue securities that are admitted to trading on a regulated market of a Member State
- Applicable: 01.01.2024
- Reference date of first report: 31.12.2023
- Frequency
- Content: GAR

CRR

- Personal scope: large institutions that issue securities that are admitted to trading on a regulated market of a Member State
- Applicable: 30.06.2024
- Reference date of first report: 30.06.2024
- Frequency: every six months
- Content: BTAR, scope 3 emission data

- Personal scope: financial institutions subject to the NFRD
- Applicable: 01.01.2025
- Reference date of first report: 31.12.2024
- Frequency: annual
- Content: financial institutions: examination of DNSH criteria for taxonomy aligned non-NFRD investments

Taxonomy



Source: MNB

5.5. Expected MNB measures in 2022

This year, the MNB will review its measures to date and revise or fine-tune existing programmes as necessary. The biggest green finance achievement in 2021 was the emergence of green products on all fronts and the beginning of the integration of sustainability considerations into the strategic and risk management processes of financial institutions. As the products become more widespread, more data will be available, providing the MNB with the opportunity to measure back its programmes. The MNB will continue to expand its extensive analytical toolkit this year and share its experience with industry players. These experiences are expected to feed into the MNB's risk management and will help institutions to promote their sustainability projects more effectively.

The MNB considers important to give priority to quality over quantity in the further development of the programmes. For both green lending and green bonds, as well as for ESG-oriented investment funds, the creation of the EU Taxonomy brings a new quality standard, the meeting of which is a key strategic objective. It will also be possible to measure back against this objective by developing methodologies for analysing measures and developments to date. It is important for both regulators and the market to invest their resources in those programmes that best promote greening and reduce systemic risk arising from climate risk. Consequently, the possible extension of programmes announced for a limited period, such as green preferential capital requirements, will depend on the effectiveness of the achievement of the targets set and on financial stability considerations.

An important step in measuring the effectiveness of the programmes is to carry out regular or even extraordinary audits by the supervision. To complement the Guide on climate-related and environmental risks published in 2021, the MNB will update the Guide in the summer of this year. During the audits, which are expected to start in the last third of the year, the MNB will pay particular attention to the fulfilment of minimum standards, in the absence of which the institution will not be considered prudent. Replacing the current random checks, the MNB will also carry out more systematic checks on transactions under the Green Capital Requirement programme. Clearly, the MNB does not aim to penalise institutions in either case, but to support the spread of good practices.

However, a breakthrough will only be achieved if green awareness is shared by the general public and also by professionals. Integrating sustainability into business models is not just a matter of regulation, which is why the Central Bank will place a particular emphasis on continuing and expanding its educational activities. Experience so far also shows that internal conviction, rather than external pressure, drives better results. The MNB expects credit institutions, investment service

providers and insurers to come to the market with new products that respond to the challenges posed by climate change.

Product innovation is indispensable, but a prerequisite for it is the establishment of an appropriate framework and the provision of transparent and objective information to clients. As sustainability considerations have become more widespread in recent years in Hungary, the use of certain terms varies. Mainstream measurement and evaluation criteria have not been developed for the main professional organisations either. For this reason, the MNB has developed several sets of definitions for the preferential capital requirements and in the context of the Guide on climate-related and environmental risks and will continue to assist the market with new topics and issues. One example is the assessment of the environmental exposure of small and medium sized enterprises to be financed when making lending decisions (ESG surveys). If significantly different questionnaires would appear across the sector, it would be seen as a kind of market failure and an administrative burden for enterprises, so some standardisation would be needed. However, it is important to strike a balance, as local thinking is also necessary and it would be suppressed by excessive regulation. In a first phase, the MNB's Green Financial Product Finder will support transparency, comparability, retail awareness and, through this, product innovation in the area of investment products.

Even after the phasing out of the Bond Funding for Growth Scheme, it is important that companies continue to issue green bonds. Although the Monetary Council has decided to discontinue the BGS, the use of the Green Bond Framework is still recommended. As institutional investors are increasingly demanding green instruments, green bonds can be a more attractive financing option for issuing companies.

It is important to emphasise that environmental sustainability is not just about reducing GHGs, responsible water and waste management is also necessary and protecting or even enhancing biodiversity is also a priority. In many cases, the fight against climate change is causing carbon blindness, meaning that the sole focus is on GHG reduction. By contrast, from this year onwards, the MNB will give priority to the measurability and monetisation of biodiversity and the assessment of associated financial risks.

MAIN ACRONYMS AND ABBREVIATIONS

BCRI – Bank Carbon Risk Index

COP26 – UN Climate Change Conference

CPRS – Climate Policy Relevant Sectors

CRD – Capital requirements directive

CRR – Capital Requirements Regulation

CSOK – Home Purchase Subsidy

EBA – European Banking Authority

ECB – European Central Bank

UN – United Nations Organisation

ESG – Environment, Social and Governance

ESMA – European Securities and Markets Authority

FSB – Financial Stability Board

IMF – International Monetary Fund

NECP – National Energy and Climate Plan

NFRD – Non-Financial Reporting Directive

NGFS – Network for Greening the Financial System

BGS – Bond Funding for Growth Scheme

NPL – Non-performing loans

OECD – Organisation for Economic Co-operation and Development

SFDR – Sustainable Finance Disclosures Regulation

TCFD – Task Force on Climate-related Financial Disclosures

UNEP FI – Finance Initiative of UN Environment Programme

GHG – Greenhouse gas

WACI – Weighted Average Carbon Intensity

GHP – Green Home Programme

APPENDIX

Appendix No 1: Classification of GHG intensity groups and corporate exposures

GHG group	Entry criterion	Exposure amount (HUF billion)	Distribution (%)
Very low	GHG ≤ P10	2,056.63	20.11
Low	P10 < GHG ≤ Q1	1,391.49	13.61
Medium	Q1 < GHG ≤ Median	1,404.49	13.74
Medium/High	Median < GHG ≤ Q3	3,657.28	35.77
High	Q3 < GHG ≤ P90	1,265.27	12.37
Very high	GHG > P90	450.15	4.40

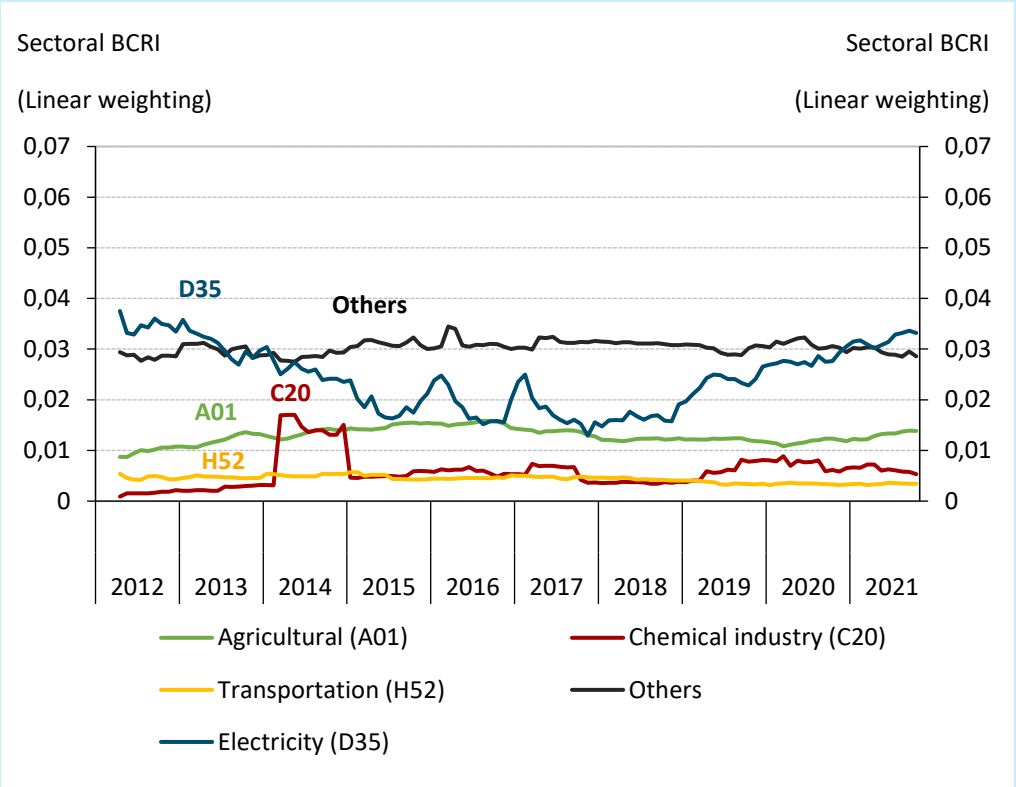
Source: MNB

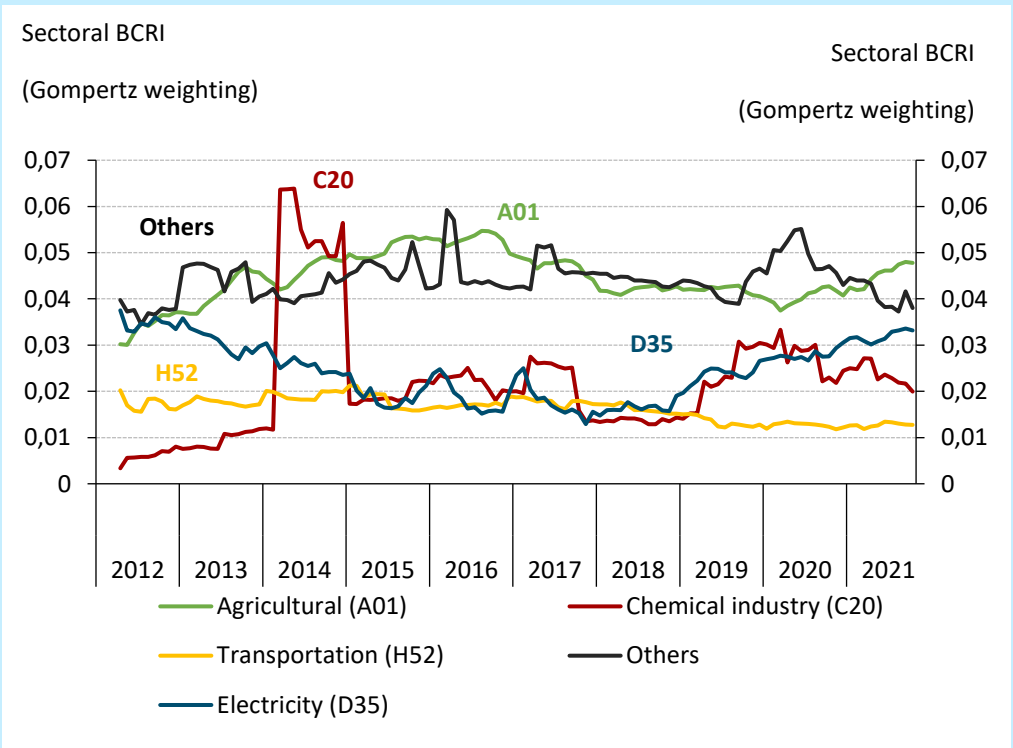
Appendix No 2: Distribution of transition risk groups identified in the Hungarian banking system

Group	Threshold	Distribution of the banking system (by corporate credit exposure, %)	Distribution of the banking system (by balance sheet total, %)
Upper quartile	CPRs 1-6 exposures and GHG exposures above the median >= 75%	0.00	1.16
Upper-middle quartile	CPRs 1-6 exposures and GHG exposures above the median >= 50%	47.50	54.62
Lower-middle quartile	CPRs 1-6 exposures and GHG exposures above the median >= 25%	51.40	40.62
Lower quartile	CPRs 1-6 exposures and GHG exposures above the median < 25%	0.00	0.81
Grey zone	At least one of CPRs 1-6 exposures and GHG exposures above the median > 25%	1.00	2.78

Source: MNB

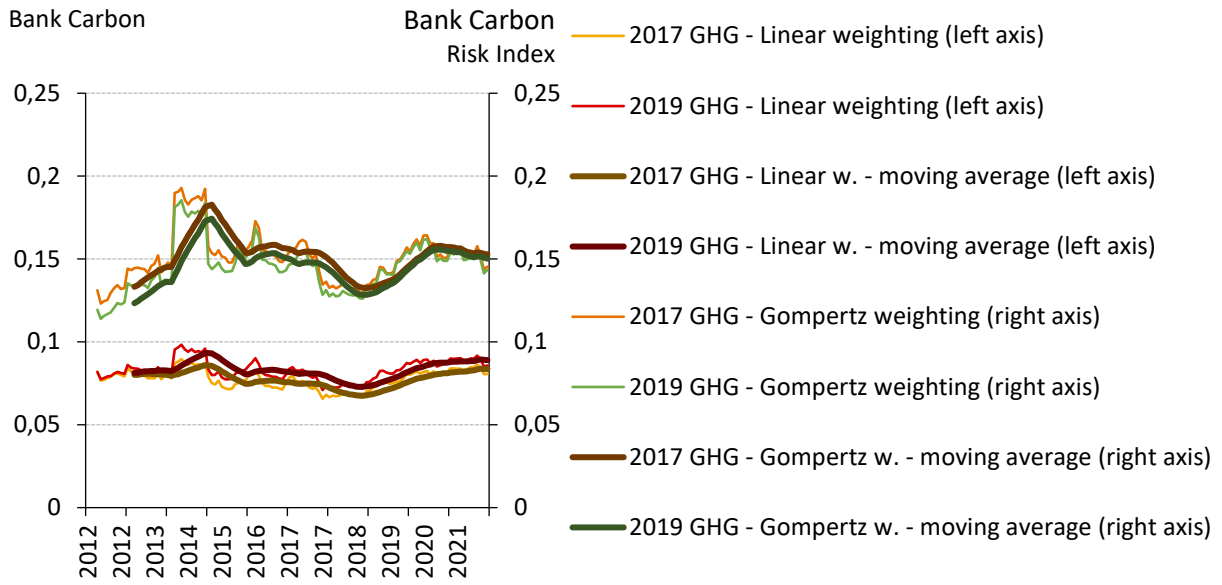
Appendix No 3: Monthly sectoral BCRI values





Source: MNB

Appendix No 4: Evolution of the BCRI using GHG intensity data for 2017 and 2019



Source: MNB

MÁRIA TELKES – THE SUN QUEEN

1900 – 1995

Little known in her native Hungary, she is called the 'Sun Queen' in the United States of America, where she spent most of her life. Perhaps her best-known patent is the first 'solar house' with a solar heating system.

Mária Telkes was born on 12 December 1900 in Budapest. His father was Aladár Telkes, a bank director. She was the eldest of eight siblings. After graduating in mathematics and physics, she worked as an assistant to Professor István Ribáry and obtained her PhD. In 1924, the family was visited by her uncle, Ernő Ludwig, who was the Hungarian consul in Cleveland. This encounter brought a turning point in the life of Mária Telkes, who moved to America at her uncle's invitation. She began her career in 1925 in the research laboratory of the Cleveland Institute of Biophysics. At the institute, they studied the radiation of brain cells. Mária Telkes built an electric camera to measure the infrared radiation of brain cells.

In 1939 she moved to Boston, where she continued her career as a teacher and researcher at the Massachusetts Institute of Technology (MIT). She focused mainly on researching the potential of solar energy. She joined the Solar Energy Research Project with the design of the Dover Sun House funded by the American industrialist Godfrey Lowell Cabot. Six experimental solar houses were built with the 650,000 dollars donated by Cabot. Mária Telkes became the head of the research group in 1940. She is credited with the discovery of a chemical process to store solar energy.

Mária Telkes has filed several patents for the use of solar energy. Her most successful invention was a solar-powered seawater desalination system for the US military. The patent was followed by mass production: in the Second World War, every pilot was equipped with the life-saving device she had developed.

She also designed a solar-powered meat fryer, which became particularly popular in India, where the number of hours of sunshine is high. Again, the success of the invention was guaranteed by the simple operating principle and the low price of the device.

She published more than 100 scientific papers, had 39 patents linked to her name (the last one registered at the age of 90), and received 12 international awards (including that of the US Office of Scientific Research and Development). She also worked as a university lecturer and later as a consultant to large corporations, and was involved in several government-funded naval and space research programmes. Since the oil crisis of the 1970s, the importance of her solar energy research has only increased.

She returned to Hungary in 1995. She died in Budapest in the same year, aged 95. She received a posthumous award: Together with physicist Dennis Gabor, she was inducted into the National Inventors Hall of Fame in 2012.

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