

HUNGARY

Green Bond Impact Report 2020



November 2021





Dear Readers,

As we finalize this inaugural Green Bond Impact Report, Hungary President János Áder joins the world's leaders to pursue the necessary dialogue and agree common actions to transition the world economy to a sustainable future.

In line with EU commitments, Hungary is taking its fair share of the fight against climate change and biodiversity loss, having notably enshrined 2050 Climate Neutrality into national law and endorsed the Glasgow leaders' Declaration on Forests and Land Use. The Hungarian government is implementing wide and overreaching climate, energy and environmental policies to transition the country to a low-carbon and environment-friendly economy.

In this context, the Ministry of Finance has taken the mission of finding ways to integrate climate, energy and environmental policies into our financial system. In that respect, Hungary's inaugural Green Bond has been a key milestone in its Sustainable Finance journey and helped raise awareness on Hungary's environmental challenges and objectives. The Green Bonds proceeds from several international and domestic capital markets transactions have also contributed to raise a part of the necessary funding and diversify Hungary's international investor base.

As we committed to provide investors with regular and transparent information on the use of Hungary's Green Bonds proceeds, we published, as a first step, the inaugural Allocation Report in March 2020. The present Green Bond Impact Report now provides additional and relevant information with regards to the environmental impact and outcomes of our green budget expenditures. We hope that investors and readers will find concrete and interesting information about government environmental policies and actions.

We would like to thank the numerous people who have contributed to this Impact Report, which was prepared by the Ministry of Innovation and Technology and the Green Bond Inter-Governmental Working Group members, coordinated by



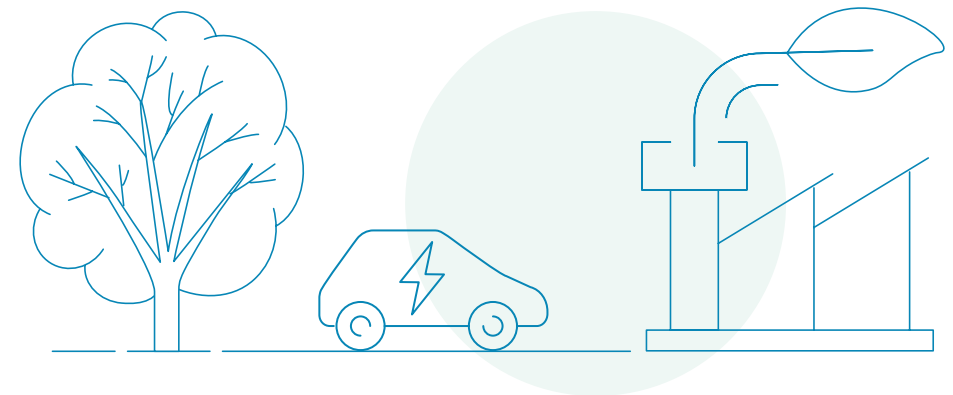
the Government Debt Agency of Hungary ("ÁKK"). We will continue to invest time and effort in the development of our Green Bonds platform and annual reports. We hope you enjoy reading our inaugural impact report, and your feedback is particularly important to our future progress.

Gábor Gion

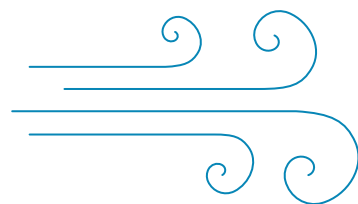
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Content

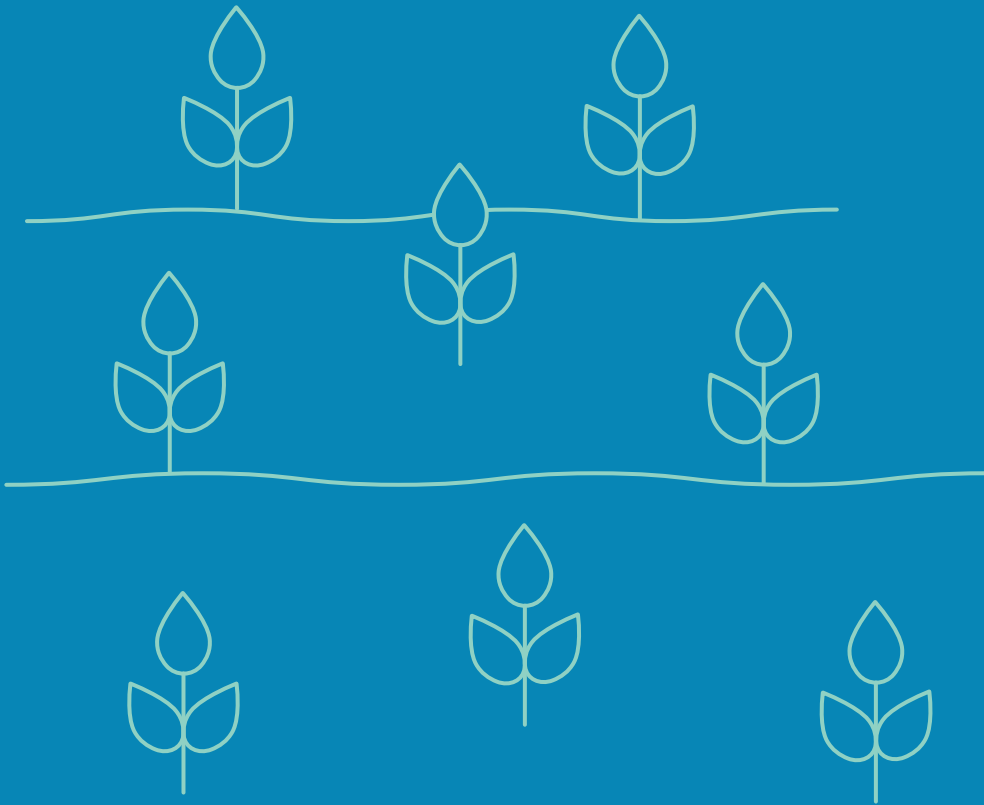


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I. Introduction

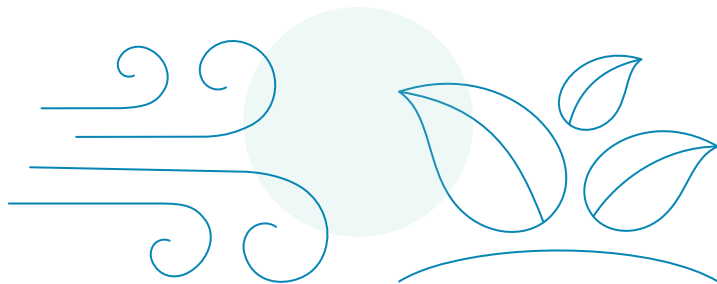


1. Main Goal of the Green Bond

Hungary is committed to take part in fighting against climate change and biodiversity loss and support areas that are actively involved in this matter. In June 2020, Hungary issued its first Green Bond in line with the voluntary guidelines of the Green Bond Principles (2018 edition) published by the International Capital Markets Association ("ICMA"). Hungary's Green Bond supports the country's climate change and environmental commitments with proceeds dedicated to six eligible green expenditure categories:

1. **Clean Transportation**
2. **Land Use and Living Natural Resources**
3. **Waste and Water Management**
4. **Renewable Energy**
5. **Adaptation**
6. **Energy Efficiency**

The issuance is closely linked to ambitious national objectives while in line with international efforts and sustainable goals. In addition to supporting the EU climate neutrality target, the Green Bond is devoted to the Hungarian Energy and Climate Plans and National Clean Development Strategy (2050) aiming at transitioning the country to a low-carbon and environmental-friendly economy. Notwithstanding the potential positive impacts of the environmental objectives, the Green Bond also aims to foster the development of a sustainable domestic capital market.



Aerial view of Danube river near Visegrad

2. Green Bond Allocations

The Green Bond Allocation Report 2020 was published in March 2021 by the Ministry of Finance of Hungary under the supervision of the Green Bond Steering Committee. The Allocation Report disclosed information about the eligible green expenditures for budget years 2018 and 2019. Allocated Green Bond proceeds amount to HUF 573.68 billion (EUR 1,658 million equivalent) with a strong emphasis on the Clean Transportation category (87.6% of the eligible green expenditures were distributed in this category).



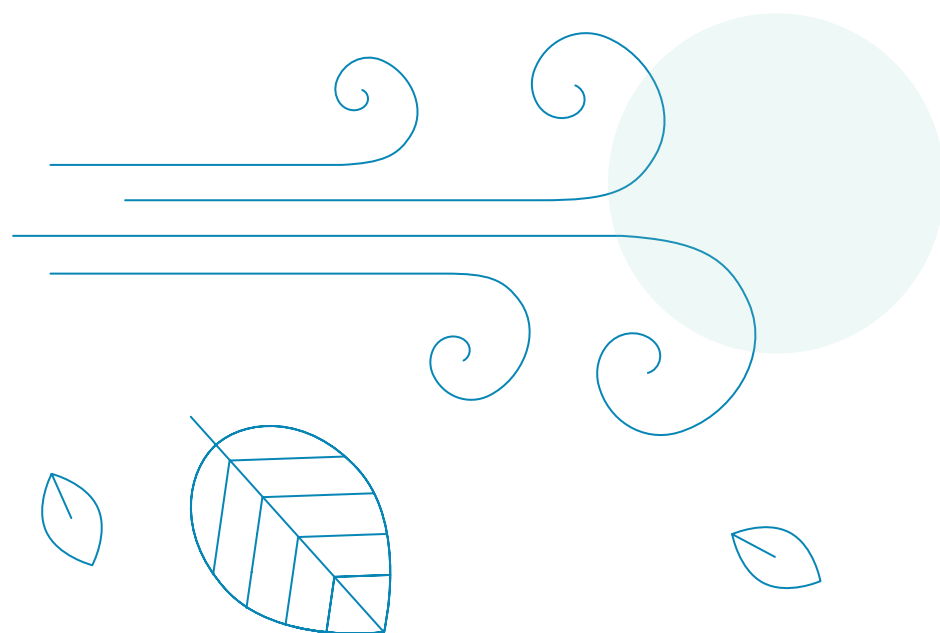
Green Bond Allocation table¹

By Sector	Green Expenditures (in HUF bn)		Total
	2018	2019	
Clean Transportation	327.36	175.38	502.74
Land Use and Living Natural Resources	32.58	18.20	50.78
Waste and Water Management	4.36	1.37	5.73
Renewable Energy	4.86	0.43	5.29
Adaptation	0.67	3.92	4.59
Energy Efficiency	2.24	2.31	4.55
Total	372.07	201.61	573.68
Share of annual Eligible Green Expenditures	100%	52%	

¹ The Green Bond proceeds were fully allocated for 2018 and partially for 2019. The impact assessment relies on the actual allocation presented in this table.

3. Impact Indicators

This impact report summarizes multiple social and environmental benefits linked to the six expenditure categories or parts thereof. The indicators are used to present the impact assessment and the progress towards the UN Sustainable Development Goals. This report provides information on 33 sector-specific core and other indicators in line with the core principles of the Harmonized Framework for Impact Reporting Handbook (June 2021 edition) published by ICMA. The indicators used in this report were selected based on a comprehensive methodology focusing on both qualitative and quantitative performance measures assessed through a scorecard method. The scorecards aimed to assess the importance of the indicator and the data quality in light of the eligible green expenditures. For the purpose of reporting, the project-by-project approach has been used. Given that impacts cannot be fully measured in the year(s) of allocation, this impact assessment covers the results of the 2018, 2019, and 2020 budget years.



Aerial View of Lakes Divided By Road And Trees, Délegyháza

II. Main Impact Results



1. Executive Summary

Hungary's Green Bond Allocation Report 2020 covers the Green Bonds issued in 2020 (i.e the inaugural EUR1.5 billion Green Bond in June 2020 and two tranches of Samurai Green Bonds in Yen in September 2020). The Eligible Green Expenditures for 2018 and 2019 amounted to HUF 763.20 billion (EUR 2,368.97 million equivalent). Therefore, according to the Green Bond Framework allocation principles, the 2020 Green Bond proceeds amounting to HUF 573.68 billion (EUR 1,658 million equivalent²) were allocated to all of the 2018, and part of the 2019 Eligible Green Expenditures, in six different eligibility categories that target climate-related projects having direct and indirect environmental impact.

The Green Bond Impact Report 2020 covers the allocation of budget years 2018 and 2019 and the key environmental and social impacts resulting in budget years 2018, 2019, and 2020. The assessment of environmental impacts of Green Bonds was based on, the recommendations of the ICMA Harmonized Framework for Impact Reporting Handbook (June 2021 edition). The report summarizes the indicators on a project-by-project basis, in Hungarian forint (HUF). The report covers 33 sector-specific core and other indicators achieved by the end of the budget year 2020³. The expenditures supported a variety of project types across the eligible categories and this report highlights the most notable impacts for each project.

87.6% of the Green Bond proceeds were allocated to the Clean Transportation category. The promotion of rail transportation as the backbone of sustainable mobility had a key role in the allocation to achieve decarbonisation objectives and strengthen its role in the fight against climate change. Due to the implemented measures in the area of Clean Transportation, inter alia, supporting rail transportation and environmentally-friendly vehicles, 1,106.3 kt CO₂eq GHG emissions were avoided.

For expenditures related to Land Use and Living Natural Resources the projects supported were in the area of nature protection and biodiversity, preservation of natural ecosystems, education and awareness-raising, promotion of sustainable, low-carbon and resilient-agriculture, remediation measures, and noise reduction actions plans. As a result, the improvement of the conservation status of species and habitats will continue to improve. Numerous sustainable agriculture projects were also supported that affected 794,438 hectares.

Water management tasks are mainly related to the process of planning, developing, managing, and distributing water resources, as well as the disposal and treatment of wastewater. Thanks to the support of the Rolling Development Plan, the length of the sewage system increased to 761 metres per kilometres of the drinking water system by the end of 2019. Also, additional territories were connected to drinking water and sewage systems.

The subsidized loans for renewable energy contributed to the expansion of renewable capacity among micro, small and medium-sized enterprises resulting in 8.1 MW new installed renewable capacity and associated 8.2 kt CO₂eq GHG emission avoidance. In addition, the energy efficiency grant schemes supported the promotion of energy efficiency initiatives; for example, the relaunch of the Warm Home Programme fostered GHG emission reductions of 445.5 in tonnes of CO₂eq between 2019–2020. Other energy efficiency projects advanced the investment in emission reduction and energy efficiency, enhancing renovation projects that allowed taxpayers to receive tax allowances. To enhance the energy efficiency of the agricultural sector, proceeds from the Green Bonds were aimed to improve the energy efficiency of livestock farming. The focus area financed increased the efficiency of energy use by the agriculture and food processing industry leading to 12,247 MWh energy savings between 2018–2020 and 17,508 MWh energy production using renewable energy sources.

² Using the yearly EUR/HUF average exchange rate, as published by the Hungarian National Bank for the relevant year.

³ Reporting on impacts ends on December 31, 2020.

1. Executive Summary II.

Adaptation projects supported activities related to the anticipation of the adverse effects of climate-related hazards and natural disasters with four adaptation projects. The related expenditures supported the implementation of the Water Framework Directive, rehabilitation of the Mosoni-Danube river side, reduction of certain air pollutants and particulate matters, and the activities of the Hungarian Meteorological Services. As a result, the emission of all air

pollutants decreased which helped increase air quality and eliminate the associated negative effects of air pollution. One of the projects focused on particulate matter (PM₁₀) emission reduction which resulted in a 1.8% decrease from 2018 to 2019 achieving a 16.7% reduction compared to the 2005 basis. This initiative increases air quality and has a positive effect on the environment and public health.

Key Impacts results by Eligible Green Categories

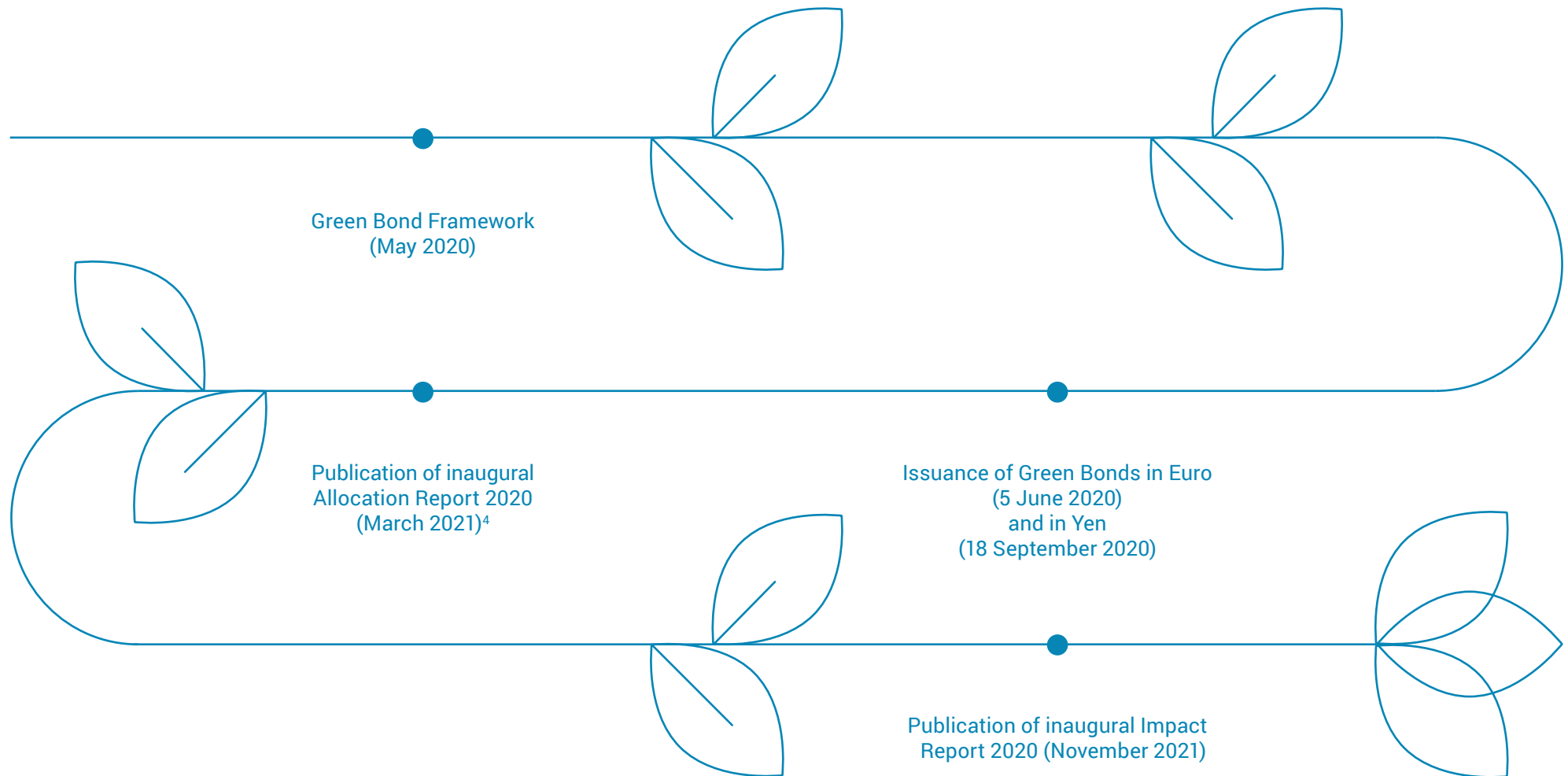
Clean Transportation	Land Use and Living Natural Resources	Waste and Water Management	Renewable Energy	Adaptation	Energy Efficiency
1,106.3 kt CO ₂ eq GHG emissions avoided.	More than 120,000 projects supporting sustainable agricultural areas of 794,438 hectares.	The length of sewage system per kilometres of the drinking water system increased to 761 metres.	8.2 kt CO ₂ eq GHG emissions avoided.	1.8% decrease in air pollutant particulate matter (PM ₁₀) between 2018–2019.	49.5 kt CO ₂ eq GHG emission avoided.



With the allocated Green Bond proceeds, the progress towards the UN Sustainable Development Goals #6 on Clean Water and Sanitation, #7 on Affordable and Clean

Energy, #11 on Sustainable Cities and Communities, #13 on Climate Action and #15 on Life on Land were further strengthened.

2. Timing and Scope of Reporting



⁴ 2020 allocation was reported in March, 2021. For the bonds issued in 2021 there will be an annual reporting on the allocation of expenditures and their impact in Q4 2022.

3. Impact Methodology

To assess the impact of the eligible green expenditures, several methodologies and guidelines were taken into account. The assessment was particularly based on the Harmonized Framework for Impact Reporting (June 2021 edition) published by the ICMA. Where information was available, the potential energy-saving and greenhouse gas (GHG) emission avoidance amounts have been estimated.

To illustrate the environmental and sustainability benefits of clean transportation projects, the GHG emission avoidance calculation relied on the methodology applied by the main national railway company. The methodology was focused on the projection of the carbon emissions avoided by choosing rail transport instead of passenger vehicles. Accordingly, the difference of GHG emission on a passenger journey (in terms of passenger kilometres) when using rail transport instead of using a passenger car, was determined⁵. The calculation provides the value of saved emissions in CO₂ equivalent (CO₂eq), as a converted indicator of the considered greenhouse gases (CO₂ – carbon dioxide, CH₄ – methane, N₂O – dinitrogen monoxide). Thus, the final results were summarized in emission savings (in CO₂eq) by passenger/km in case of travelling by railway instead of a car. For calculating the impact of fuels used by rail and cars, the internationally accepted WTW (Well-To-Wheel) methodology was applied, which only takes into consideration direct GHG emissions of fuel production and vehicle operation.

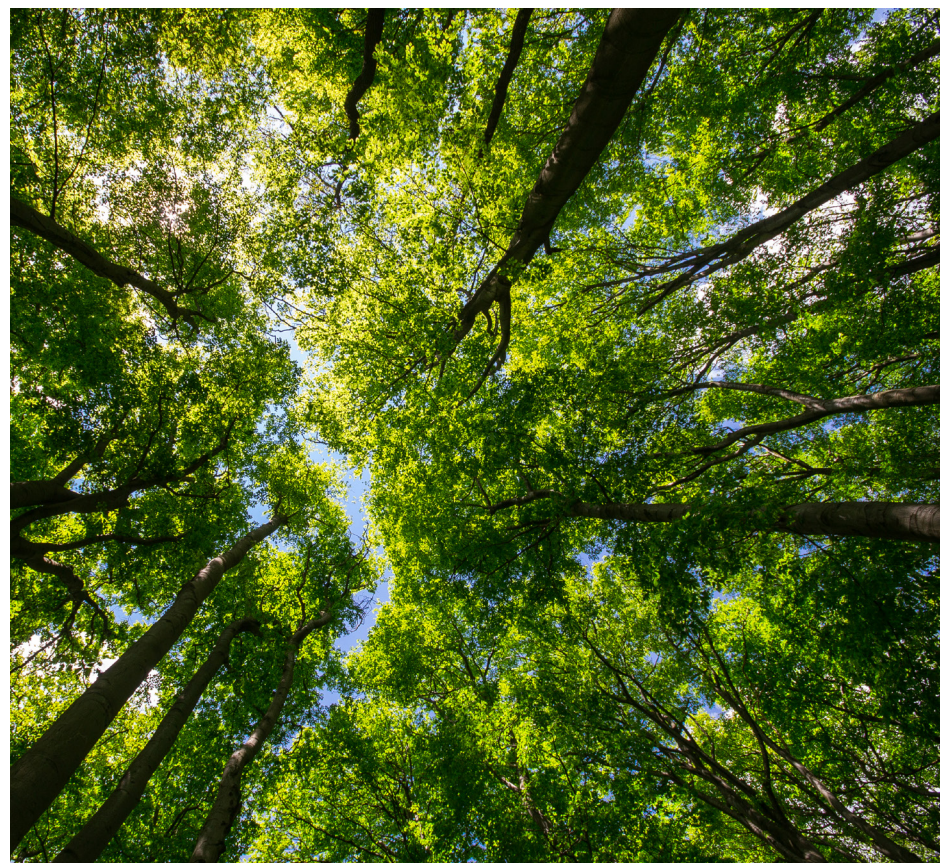
For the tax exemptions of environmentally friendly vehicles, another approach was used for calculating GHG emissions⁶. Based on the estimation methodology of the Ministry of Finance (MoF), the baseline emissions rely on the yearly petrol sale data, the number of passenger cars, and their mileage in the 2018–2020 period. The emissions were determined according to the European Environmental Agency

⁵ The emissions are determined on the average of the past 5 years (i.e. 2016–2020).

⁶ In 2021, the experts of the Ministry of Finance published an analysis about the Hungarian passenger vehicles and their tax treatment:

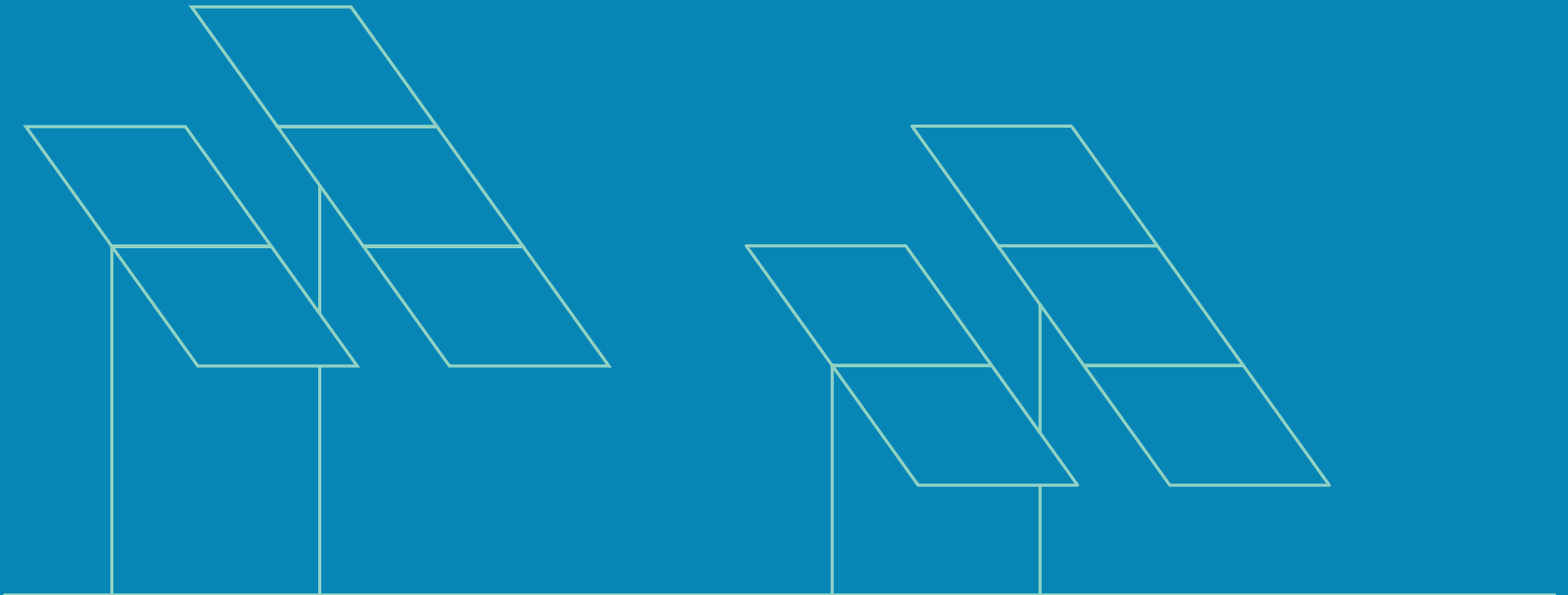
https://ngmszakmaiteruletek.kormany.hu/download/7/f8/c2000/gepjarmu_elemzes_210604.pdf

(EEA) estimation for GHG emissions for electricity production and electric and petrol/diesel consumption. The calculation follows the Worldwide Harmonized Light-Duty Vehicles Test Procedure (WLTP) standards and was based on the number and mileage of environmentally friendly vehicles.



In the middle of the forest

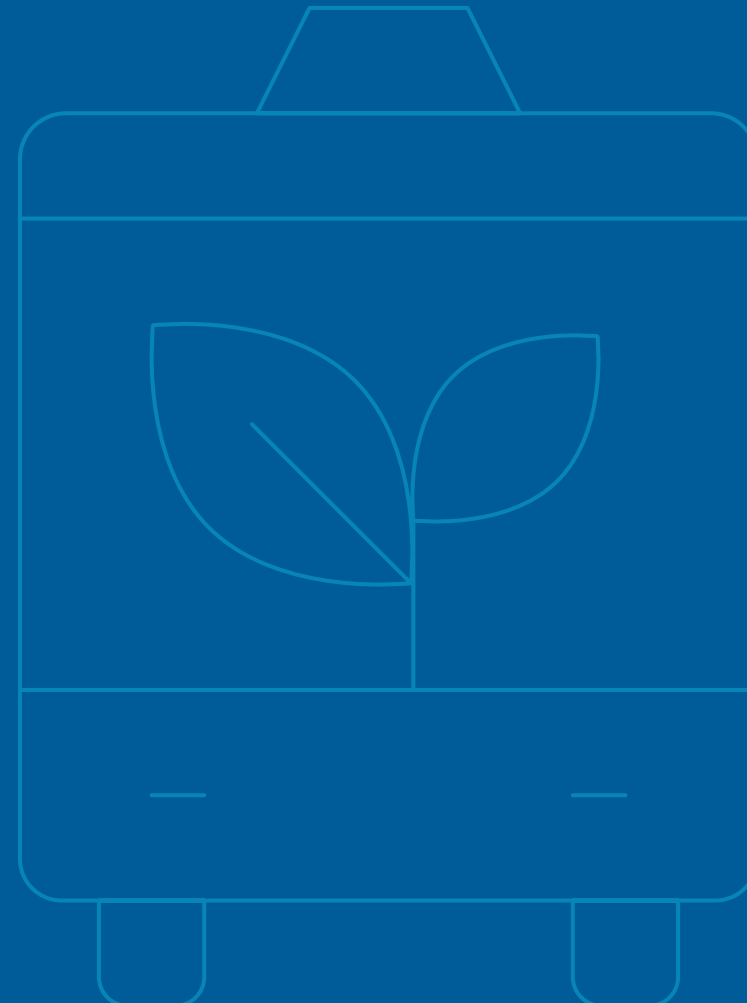
III. Impact of the Financed Projects



1. Clean Transportation

Rail transportation plays an important role in the development of sustainable and low-carbon emission public transportation. 87.6% of the Green Bond proceeds were used to finance or re-finance clean transportation projects with a strong emphasis on rail mode. The main goals of the clean transportation expenditures are to make public transportation more attractive, more efficient, and modernized to ensure that people choose it over passenger cars. The rail transportation mode is a key element of promoting low-carbon public transportation and reducing GHG emissions. Through investments in infrastructure and optimization of operations, railway operators are making progress to reduce their pollution impact of their operations.

For measuring impacts, indirect effects such as emissions avoided when a passenger uses rail instead of using a passenger vehicle were the basis of the GHG emissions calculation.



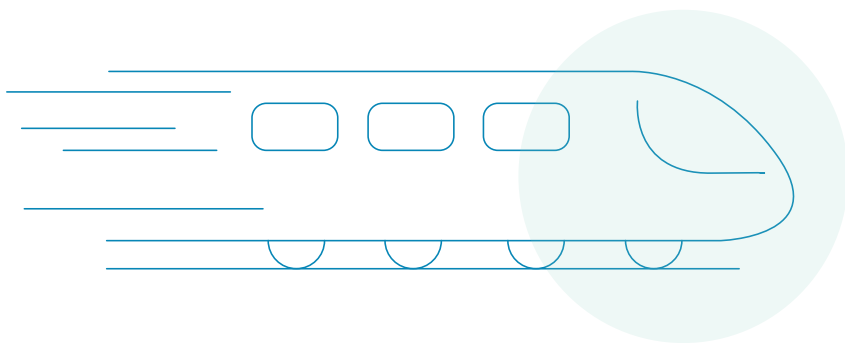
13 CLIMATE ACTION



1.1. Reimbursement of the Operation of the Railway Network

The costs related to the reimbursement of the operation of the railway network aim to increase the efficiency of public transport and to enhance railway transport of goods and passengers. The Green Bond expenditures cover several operating costs inter alia buying devices to enhance the comfort of wagons, auxiliary devices, procurement of special services, and personnel costs of railway infrastructure companies.⁷

To measure outputs of expenditures the length of railway lines and rolling stock of public railways were used. The indicators show the length of operated lines on greater region level as well as the adjustments of rolling stock of public railways⁸. The extension of the railway network as well as the rolling stock remained steady between 2018–2020. The development of the railway network is important to ensure the accessibility and interoperability of the railway system. Tracking railway fleet is also significant to identify development areas and modernise rolling stock and remove outdated rail assets.



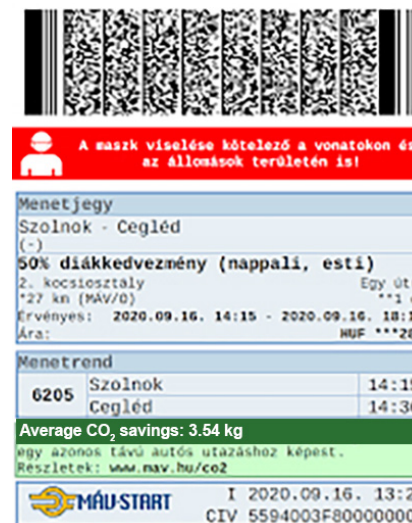
⁷ The expenditures do not contain cost-elements related to fossil fuels like buying oil for maintenance machines and units.

⁸ Data source: Hungarian Central Statistical Office (Rolling stock of public railway; Length of railway lines by count and region)

⁹ Preliminary data.

Length of railway lines by greater regions in Hungary

level/kilometres	2018	2019	2020 ⁹
Central Hungary	679	679	679
Transdanubia	3,113	3,113	3,113
Great Plains and North	3,649	3,651	3,649
Country, total	7,441	7,443	7,441

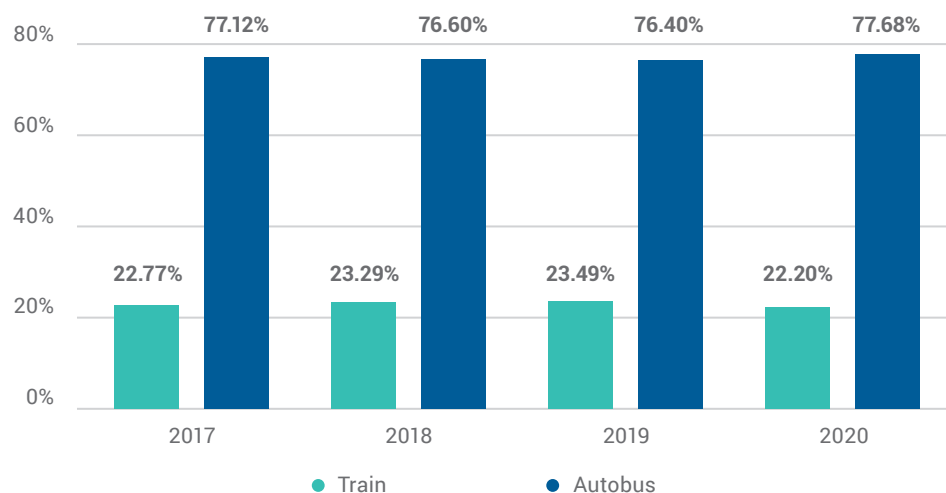


Woman checking mobile application before boarding a modern European train

1.2. Reimbursement of Uncovered Costs of Railway Passenger Traffic

Passenger transportation in Hungary was mainly (more than 70%) associated with passenger cars followed by other road transport modes¹⁰ and trains over the past years¹¹. Considering the share of public transportation, the second most significant mode within passenger traffic is rail transportation. Since 2017, the share of rail transportation has slightly increased (Chart 1 and Chart 2) in terms of the number of passengers carried. The trend indicates that the number of passengers carried by

Chart 1: National interurban passenger transport by mode (passengers carried)



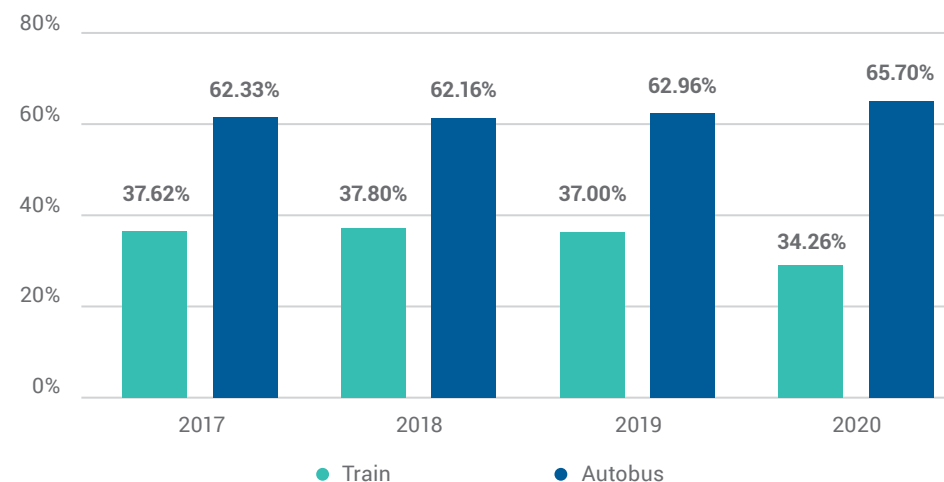
Source: Hungarian Central Statistical Office data¹²

¹⁰ Other road transport indicated motor coaches, buses and trolley buses.

¹¹ Data was reviewed for 2017, 2018 and 2019. No data was available for 2020. Source of data is Eurostat: Modal split of passenger transport.

trains has started increasing, however, due to the COVID-19 pandemic the numbers in the second and fourth quarter of 2020 have decreased significantly. For not only advancing rail transportation but also supporting the post-pandemic recovery of public transportation modes, future developments and grants are crucial.

Chart 2: National interurban passenger transport by mode (passenger-kilometres)



Source: Hungarian Central Statistical Office data¹²

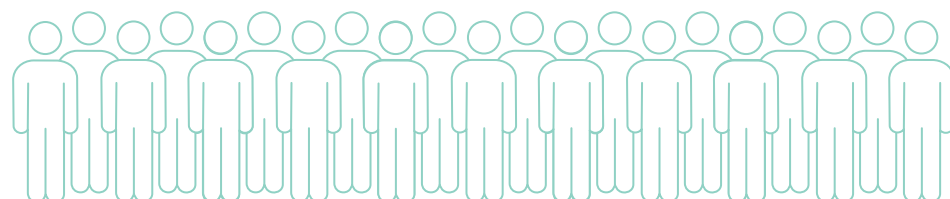
¹² The chart does not contain data on other transport modes (i.e. ship, airplane) as the numbers are not significant.

The indicators selected are used to measure the results of the modal shift to railway transportation mode. According to Hungarian Central Statistical Office, 396.6 million passengers (20.376 billion passenger-kilometres) were carried by rail between 2018–2020.

Passenger-kilometres and number of passengers using railway transportation

	2018	2019	2020
Total number of passengers (in million person)	148	146.9	100.7
Total passenger-kilometres (in million km)	7,770	7,752	4,854

As a result of the pandemic and restrictive measures imposed, the number of passengers has decreased by 46% in 2020 compared to the previous year. Considering the length of passenger journeys (in passenger-kilometres), the decrease was higher (60%) as among the precautionary measures long-distance travelling and non-essential trips were not recommended at that time.



COVID-19 pandemic: unique quarterly dynamics of railway transportation in 2020

We can identify different trends in the distinct periods of the COVID-19 pandemic: in the first and third quarter of 2020 – when mostly no travel restrictions were in place – there were relatively modest fall (5–19%) in number of railway passengers and passenger-kilometres on a year-over-year basis. Compared to bus transportation, the percentage fall in number of passengers was slightly higher for railways, while the percentage decrease in total passenger-kilometres was lower for railway transportation in these quarters. Transportation data for the second and fourth quarters show a much larger passenger number and kilometre decrease in railways than in bus transportation. These quarterly trends support the assumption, that the slight yearly decrease in the share of railway transportation is significantly associated with the COVID-19 pandemic.

Change in passenger-kilometres and number of passengers using railway transportation

Period	Quarterly percentage change in number of passengers (YoY)*	Quarterly percentage change in total passenger-kilometres (YoY)*
2020 Q1	-5.5	-5.5
2020 Q2	-58.2	-64.9
2020 Q3	-17.4	-19.0
2020 Q4	-39.4	-50.1

* Year-over-year comparison: i.e. comparing 2020 Q1 with 2019 Q1

As a main indicator of the impact assessment, a calculation for emission avoidance was based on the length of passenger journey (passenger-kilometres) when using rail transport instead of using a passenger car.

The GHG emission avoided of the reimbursement of uncovered costs of railway passenger traffic programme was determined as following:

- The GHG emission avoided is based on the assumption that those passenger who use rail transportation shifted from the use of passenger cars. Therefore, the calculation is based on a method of carbon footprint of rail passengers who use train instead of passenger cars.
- The calculation method determines specific GHG emissions from rail passenger transport per passenger-kilometre (average value), specific GHG emissions from road transport per passenger-kilometre (average value) and the difference of GHG emission on a passenger journey (in terms of passenger-kilometres) when using rail transport instead of using a passenger car, was determined (average value).¹³
- For determining the carbon footprint of rail passenger transport, data on traction energy (diesel and electricity) was considered, therefore GHG emission avoidance for electrification projects are not indicated separately to avoid double counting.
- The contribution of the Green Bond expenditure to the emission avoidance is based on the assessment of the two beneficiaries' (MÁV-Start Zrt. and GYSEV Zrt.) main expenses (e.g. material expenses, personnel expenses, and other expenses of their profit and loss (P&L) statement) that the Green Bond could cover. The share of the Green Bond expenditures to cover these expenses is approximately 39% on average.

¹³ Data Source: https://www.mavcsoport.hu/sites/default/files/upload/page/denkstatt_szakertoi_velemenypdf

GHG emission avoidance due to the operation of the railway network

GHG emission avoidance	2018	2019	2020
Passenger-kilometres by train (in m km)	7,770	7,752	4,854
GHG emissions related to the operation of Hungarian railway network (in tCO ₂ eq)	349,650	348,840	218,430
Avoided GHG emissions due to the operation of Hungarian railway network (in t CO ₂ eq)	1,017,870	1,015,512	635,874
Average contribution to GHG emission avoidance due to the Green Bond expenditures (%)	39%		
Avoided GHG emissions related to the Green Bond (in t CO ₂ eq)	397,760	396,839	248,485

Overall, the GHG emissions avoided due to the Green Bond expenditures allocated to the Hungarian railway network operation between 2018–2020 were estimated at 1,043.1 kt CO₂eq.

The railway transportation involves various stationary activities that are also the main sources of atmospheric pollution. Therefore, atmospheric pollutants (such as sulphur oxides (SOx), nitrogen oxides (NOx), particulate matter emissions (PM₁₀ and PM_{2.5})), could be also used as indicators of transport developments considering their adverse impact on human health.

The emission of certain air pollutants and particulate matter arising from railways transportation¹⁴

Air pollutants	Emission (thousand tonnes)		Reduction
	2018	2019 (Latest available data)	
SO _x	0.0020	0.0020	0%
NO _x	2.2203	1.9836	10.66%
PM ₁₀	0.0522	0.0474	9.2%
PM _{2,5}	0.0485	0.0436	10.10%

On the basis of a year-over-year comparison, the railway transportation reduced emissions of air pollutants, particularly on NO_x, PM₁₀ and PM_{2,5} with almost 10 percent on average between 2018 and 2019. Due to the decrease of the emission of air pollutant the air quality could increase and associated negative effects of air pollution could be somewhat eliminated.

¹⁴ Data Source: https://cdr.eionet.europa.eu/hu/eu/nec_revised/inventories/envyqfnyq/HU_NFR16_1990_2019_v3.xlsx/manage_document

1.3. Tax Exemptions of Environmentally Friendly Vehicles

The objective of the tax exemptions introduced by the Jedlik Ányos Plan was to promote the purchase of environmentally friendly vehicles, thereby contributing to efforts to reducing GHG emissions. The tax exemptions aimed to lower the cost of environmentally friendly vehicles in four categories: purely electric cars, extended-range externally chargeable hybrid electric cars, externally chargeable hybrid electric cars or plug-in hybrid cars, and zero-emission cars, which do not emit pollutants listed in the regulation. Our impact assessment is focusing on the larger (battery-powered and plug-in hybrid vehicle) categories. Notably, the green expenditures included in ÁKK's Green Bond Allocation Report are less than half the overall value of the tax exemptions, as not all of the tax exemptions were included, due to the lack of appropriate data at the time of the creation of the Allocation Report.

The number of battery-powered and plug-in hybrid environmentally-friendly vehicles tripled between 2018 and 2020, increasing from 6,582 to 19,880. However, in 2020 these vehicles were still only a very small (~0.5%) share of the 3.9 million passenger cars in Hungary¹⁵.

The GHG emission impact of the tax exemption programme was determined by the Ministry of Finance by the following indicators:

- Number and mileage of environmentally friendly vehicles per year in the 2018–2020 period. The Ministry of Finance estimated the approximate mileage data based on the vehicle's roadworthiness test mileage data.
- Electric mileage ratio for the hybrid vehicles – determined to be equal to the estimated ratio for Germany by ICCT (2020)¹⁶.

¹⁵ Data source: Hungarian Central Statistical Office - Road vehicle fleet by county and region

¹⁶ ICCT White Paper (September, 2020): Real-world usage of plug-in hybrid electric vehicles

- GHG emission for electricity production – determined based on the EEA emission report (2020)¹⁷
- Electricity and fuel (petrol, diesel) consumption of environmentally friendly vehicles and internal combustion engine-based vehicles. For environmentally friendly vehicles these values are determined based on WLTP standards. Consumption values for vehicles with internal combustion engines were determined based on petrol sale volumes, milage, and the number of petrol-based vehicles¹⁸.

The GHG emission of environmental-friendly vehicles was determined based on WLTP standards and the EEA emission report, resulting in 47 g/km CO₂ emission for electric cars and 111–139 g/km CO₂ emission for plug-in hybrid cars. The estimated GHG emission reduction impact of the tax exemption programme compared to the baseline as presented by the MoF methodology were 11, 20, and 33 thousand tons of CO₂ in 2018, 2019 and 2020, respectively.

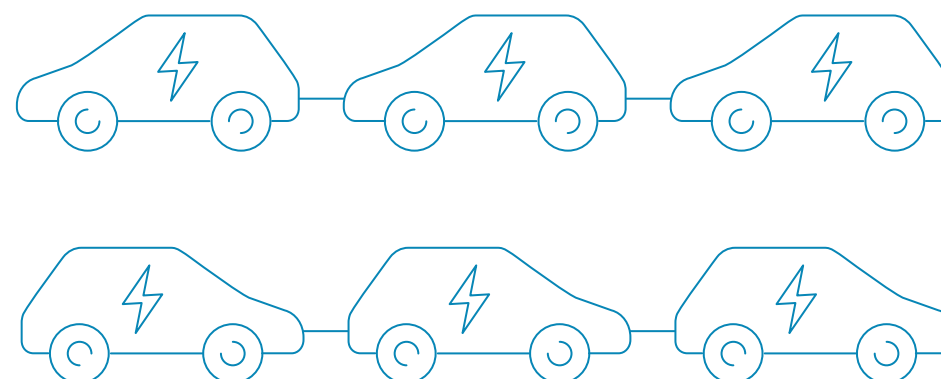
¹⁷ Data source: European Environment Agency - Greenhouse gas emission intensity of electricity generation

¹⁸ The fuel consumption of vehicles with internal combustion engines were estimated by the MoF to be around 8.1 litre per 100 km, based on petrol consumption in Hungary and number of vehicles running by petrol. This methodology is resulting 190 g/km CO₂ emission for petrol cars. This “baseline” indicator – used to determine the GHG emission reduction from the tax exemption by the MoF – is relatively high compared to other approaches, as the methodology includes all internal combustion vehicles in Hungary with an average age of 15 years.

Number and ratio of environmentally friendly vehicles and CO₂ emissions avoided

	2018	2019	2020
Number of battery-powered electric vehicles	2,886	5,182	8,763
Number of plug-in hybrid electric vehicles	3,696	6,962	11,117
Ratio of electric vehicle kms – private*	55%	54%	55%
Ratio of electric vehicle kms – company*	45%	45%	45%
Total GHG emissions avoided (in tCO ₂ eq)	10,708	19,925	32,573

* Weighted average for battery-powered electric and hybrid electric vehicles. Assumptions for the electric vehicle kms ratio of plug-in hybrid electric vehicles based on ICCT (2020): 43% (private), 18% (company).



1.4. Modernization of Rail Transport

Rail transportation is an essential component of the Hungarian transportation system. However, maintaining the popularity of railway transport against other transportation modes (passenger cars, buses, planes) with typically higher GHG emissions requires large-scale new investment to improve the quality of services. The aim of these modernization efforts is include reduced travel time in the TEN-T network, maintaining high-quality urban-suburban community transport performance, and decreasing particulate matter (PM₁₀) and nitrogen-oxides emissions of urban community transport. In these modernization projects, the Connecting Europe Facility (CEF) had a major role as a funding instrument, aiming to build and upgrade the European transport infrastructure using an 85%, 15% co-financing rate. The main transport infrastructure programme (Integrated Transport OP¹⁹) is also funded through CEF that focuses on developing railway, highways, improving public transportation and regional accessibility.

Under the modernization projects 106 km new railway lines were upgraded on two main lines by 2020. Due to further technical design and construction work the remaining projects are either ongoing or will commence after 2020, therefore, further impacts can be captured later. As part of the Modernization of Rail Transportation project, infrastructure upgrading was also completed that consisted of implementation of ETCS and GSM-R systems that aims to improve the lines with appropriate equipment that ensures safe and seamless rail transport. The 21 modernization projects involved in the programme contribute to upgrading railway lines to further increasing the shift to railway modes in terms of carrying goods and passengers.

Length of upgraded railway lines

in km	2018	2019	2020
Upgraded railway lines	106	–	–

¹⁹ This programme refers to the Integrált Közlekedésfejlesztési Operatív Program (IKOP).



Illuminated Trains At Railroad Station Platform At Night

1.5. Electrification of Railway Lines

The electrification of railway lines intends to improve the competitiveness of public transportation changing traction to a more environmentally friendly mode. Some of the main projects are connected to the development of the international (TEN-T) railway and the improvement of the electric power supply of railway lines. The programme is applied nationwide on different lines, including mainlines and branch lines.

Rail transportation accounts for a smaller amount of air pollution in transportation, moreover, this proportion can be further reduced by the electrification endeavours. With increasing the proportion of electrified rail lines the speed of rail transportation can be elevated and therefore environmental load and GHG emissions reduced.

The impacts mainly arise from the modal shift from road to rail, energy efficiency improvements and associated GHG emissions. Additionally, the travel time saved also provides a positive impact given that higher traffic relations can attract new passengers.

Length of electrified railway lines

in km	2018	2019
Electrified railway lines	48.3	41.2

Under the scheme, 89.5 kilometres of new electrified railway lines were constructed by the end of 2019. Data for 2020 was not captured due to no construction works planned to be continued and completed in 2021. Further electrification of railway lines is expected in 2021 with a length of 55 kilometres in Szabadattyán-Aszófő.

1.6. Modernization of Urban Public Transport

A developed urban public transportation is key to improve the accessibility of suburban railway stations. Investment in environmentally-friendly vehicles (trams and electric buses /trolleybuses, CNG vehicles) in public transport directly reduces the GHG emission of the local public transportation and supports the GHG emission reduction by increasing the public use of the railway system.

The largest project in the 2018–2019 period was the upgrade of M3 metro line in Budapest, which is one of the most frequently used public transport lines in the capital. Given that the construction is still ongoing the expected results and related indicators of this project could be measured after installation. In addition, tram lines totalling 3.3 km that support the accessibility of the main railway station (Kelenföld) in Budapest were newly built or renewed.

Length of new or renewed tram and metro lines

in km	2018	2019	2020
New or renewed tram lines	1.7	1.6	–
New or renewed metro lines	–	–	–

Other associated expenditures for fleet modernization include tram, trolleybus purchases and tram renewal in Budapest, electric bus purchase and filling station construction in Pécs, and CNG fuelled bus purchases and constructions in Nyíregyháza. Thanks to the project, overall, 51 buses, 36 trams²⁰, and 21 trolleybuses could enter into services until 2020.

²⁰ The additional costs of the purchased 22 trams in 2016 have been supported by the Green Bond proceeds in the year of 2018.

Number of environmentally friendly vehicles deployed

pcs	2018	2019	2020
Bus	41	–	10
Tram	–	2	12
Trolleybus	–	21	–



Close-Up Of Electric Bus, Budapest

1.7. Rolling Stock Development

A modern and environmentally friendly railway rolling stock can reduce energy consumption and associated GHG emissions while elevating the competitiveness of public transport. Due to the measure electric trains, tram-train vehicles, bimodal electric multiple units (EMUs), intercity carriages were purchased. The Green Bond proceeds were used directly to the purchase of environmentally friendly vehicles or indirectly to support services or additional costs related to the vehicles.

The modernization of the fleet has numerous advantages in terms of energy consumption and associated emissions as well as elevating the comfort level. With less energy consumption and GHG emissions, the modern vehicles of the fleet will be more sustainable. Due to the bimodal trainsets which are capable to operate both from overhead catenary and own battery power supplies on non-electrified railway lines, the change of traction ensure a more environmentally friendly mode.

Thanks to the projects 10 EMUs and 20 intercity carriages were deployed among the two main rail operators of the country until 2020.

Number of environmentally friendly vehicles deployed

pcs	2018	2019	2020
EMU	10	–	–
Intercity carriages	20		–

2. Land Use and Living Natural Resources

Land use involves all economic and cultural activities (e.g. agricultural, industrial, residential use, and forestry) that are practiced on different parts of the land space. Land use has a significant impact on living natural resources. The main goals of the interventions relevant under this heading are to protect and preserve natural ecosystems, to conserve biodiversity and protected areas, and to preserve the natural environment and the diversity of genetic resources (focus area 4ABC), fostering carbon conservation and sequestration in agriculture and forestry (focus area 5E), without endangerment of the interest of farming and safe food production.

Number of Natura 2000 sites and protected areas in Hungary between 2018–2020

	2018	2019	2020
Number of Natura 2000 sites	525	525	525
Number of protected areas ²¹	2,116	2,117	2,134

Throughout the Green Bond expenditures linked to the Land Use and Living Natural Resources project, several programmes related to nature conservation and protection of the ecosystem were supported. The European Union aims to conserve the natural heritage of Europe, thus the Member States are obliged to designate Natura 2000 sites and

protect the natural habitats and wild fauna and flora from significant damaging effects. Most of the agricultural lands belonging to the Natura 2000 network are highly dependent on the environmental measures that ensure the environmental protection and sustainability of these areas. The measures implemented due to the project have positive impacts not only on the Natura 2000 sites but also on protected areas, which are driven by national legislation. As a consequence of these projects and respective measures, ecological conditions and infrastructure contributed to the improvement of the conservation status of species and habitats that could reinforce compliance with legislation on Natura 2000 and national legislation on protected areas.



²¹ Source:

Hungarian Central Statistical Office (https://www.ksh.hu/stadat_files/kor/hu/kor0015.html)

2.1. Nature Protection and Biodiversity

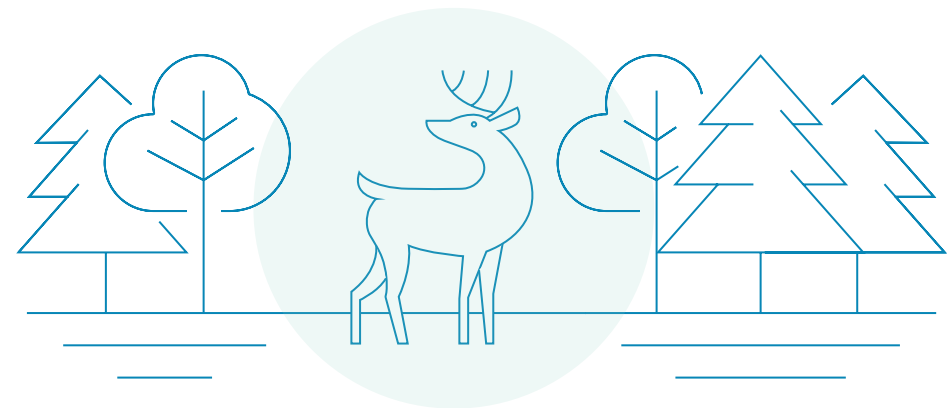
The expenditures related to nature protection and biodiversity support a wide range of nature conservation programmes focusing on the restoration of species and degraded habitats, protection of ecosystems, preservation of genetic resources, conservation and maintenance of genetic resources (e.g. traditional varieties), and promotion of the utilization of preserved genetic resources. The project also aims to halt the loss of biodiversity by implementing the EU's Biodiversity Strategy.

The Environment and Energy Efficiency Operational Programme and the Competitive Central Hungary Operational Programme contribute to a package of nature conservation investments (88 individual projects) with their financial resources provided from the state budget (15%) and the European Regional Development Fund (85%).

The number of species and habitats of community interest is 212 and 45, respectively. The conservation status of these habitats and species is measured by conducting national-scale assessments, which follow a common methodology used by each EU member state, in line with the EU's Habitats Directive and Birds Directive. The below indicators display the number and proportion of species and habitats of community interest that are expected to have an improved conservation status by the end of 2023. The actual results achieved until the end of 2020 are also presented. Furthermore, the area of habitats targeted by measures aiming to improve conservation status, as well as the number of projects that support this ambition.

Results achieved by 2020

	2020	2023 Goal
The proportion of habitats of community interest with an improving conservation status (%)	7	31
Number of habitats of community interest with an improving conservation status	3	14
The proportion of species of community interest with an improving conservation status (%)	5	11
Number of species of community interest with an improving conservation status	10	24
Area of habitats targeted by measures aiming to improve conservation status (ha)	110,845	188,000
Number of completed projects that support the improvement of the conservation status of the habitats	19	66



Quantitative results of conservation projects

	2018	2019	2020
Number of gene bank samples of agricultural plant varieties available in the Hungarian gene banks	293	328	433
Number of seed sample requests recorded	1,131	1,282	1,457
Number of seed samples handed over for public use	9,764	12,391	14,209

The achievement related to species and habitats of community interest is supported by 62 projects with an overall budget of HUF 30.82 billion, corresponding to 76% of the overall allocation to nature conservation investments. As a result of the projects, ecological conditions and infrastructure necessary for the improvement of the conservation status of species and habitats will be improved. Until the end of 2020, 17 projects can be considered technically closed, covering 20% of the overall budget.

As a result of the implementation of the National Gene Conservation Strategy, the number of gene bank samples of agricultural plant varieties available in the Hungarian gene banks increased by 32% between 2018 and 2020. Due to the promotion of the utilization of preserved genetic resources, the number of seed sample requests and samples handed over for public use also significantly increased.



Farmer controlled harvest in his field

2.2. Environmental Administration

At the regional level directorates of the 10 national parks of Hungary are key institutions of state nature conservation. Their territory of operation covers the whole national territory, and each national park directorate is responsible for the nature conservation management of all protected areas and Natura 2000 sites within their area of operation. The national parks directorates are not only focused on the preservation of the natural environments but also have a significant role in raising awareness and education. Throughout the Environmental Administration project, the operation of national parks was supported, including the management, maintenance, and conservation of protected areas, ecological awareness-raising, and education. National park directorates organise thematic programmes, including guided hiking or cave tours, offer a wide range of possibilities for the general public for environmental education, and operate demonstration areas, including visitor centres, arboretums, and educational trails.

The number of visitors to national park facilities and demonstration sites and the number of national park showrooms

	2018	2019	2020
Number of visitors to national park facilities, demonstration sites, etc. (in million people)	1.65	1.65	1.00
Number of national park showrooms	344	348	366

The number of visitors was steady in 2018 and 2019. In 2020, it has decreased, due to the restrictive measures introduced during the COVID-19 pandemic, however, the number of national park educational showrooms increased. The showrooms can help visitors to learn more about the environment and develop a personal relationship with nature and the cultural landscape.

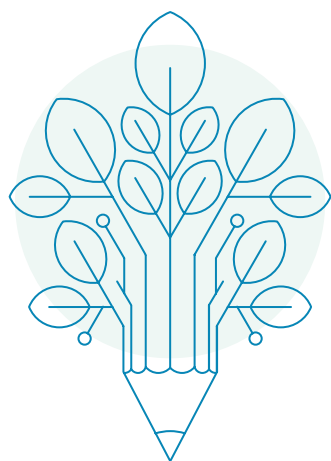


Bullocks in Hortobagy moorland

2.3. Education, Awareness-Raising

Programmes related to environmental topics, such as sustainable agriculture, nature conservation and protection, sustainable forestry, and healthy and safe food production are key to support education and raise awareness in this matter. Through the project, 50–60 non-governmental organizations that are focused on sustainability, environment, and climate protection awareness-raising and knowledge-sharing were supported each year.

The number of Hungarian citizens that actively took part in communication actions related to nature interpretation measures promoting Natura 2000 was 5,200 in 2020. The set target figure to be achieved by the end of 2023 is 30,000 people²². These communication actions offer a great possibility for the general public for environmental education and awareness-raising. This result is supported by 21 individual projects with an overall amount of HUF 8.66 billion, corresponding to 21.4% of the overall allocation of nature conservation investments.



5,200

**citizens actively participated
in communication actions
in 2020**

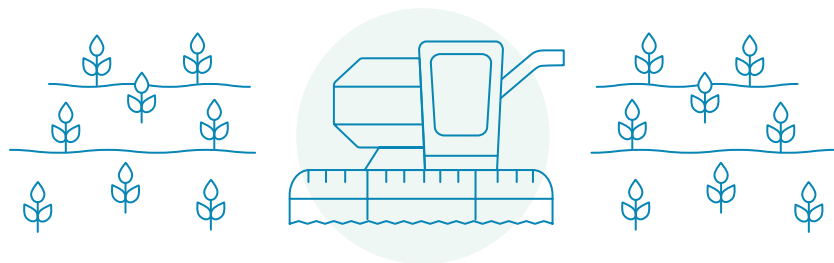


Young girl touching solar panel

²² Preliminary estimates.

2.4. Sustainable Agriculture

The Hungarian Rural Development Programme focuses on restoring, preserving, and enhancing ecosystems (focus area 4ABC), fostering carbon conservation and sequestration in agriculture and forestry (focus area 5E), promoting social inclusion, poverty reduction and risk management in agriculture. One of the main objectives of the Programme is to support the development of a sustainable, low-carbon, resilient and competitive agri-food and forestry sector. This programme aims to assist in the sustainable development of rural areas and to promote the sustainable utilisation of the environment, landscape, and natural resources.



Number of projects supporting sustainable agriculture as part of the Hungarian Development Programme

	2018	2019	2020
Number of projects that support sustainable agriculture	35,034	39,439	38,850

The indicators clearly show that the number of projects that support sustainable agriculture and rural development as part of the Hungarian Rural Development Programme increased between 2018 and 2020. The projects that were supported are related to the sustainable development of rural areas, the application of agricultural production methods that are based on the sustainable utilisation of natural resources, environment, and landscape, promotion of preserving the genetic resources, and ecological farming. The total affected area by this measure programme is 794,438 hectares. Between 2018 and 2020 the total cost of the Programme was over HUF 221 billion, 17% of which is provided from the state budget, while the remaining 83% comes from EU funds.



Flowering yellow buckwheat field

2.5. Others (Noise Mapping, Remediation, Environmental Projects)

For the sake of protection of the environment and environmental awareness and education, noise mapping, remediation, and further related projects were supported by the Green Bond proceeds. Noise mapping helps to gather data and information about the population's noise exposure deriving from transport, infrastructure, and industrial activity and to create and design action plans to reduce noise pollution. The remediation projects are focused on the removal of dangerous and poisonous substances from the contaminated land and groundwater, and the protection of air, water, soil, and wildlife.

Remediation programmes

Of the 13 nationally funded remediation projects, 9 projects were still ongoing in 2020. The projects involved in this programme aim to remediate 50 hectares of the contaminated areas. Remediated areas include Esztergom Strázsa-hegy, Szekszárd Lőtéri-vízbázis, Peremarton, Berhida, Gyálai Holt-Tisza, Taszár, Mezőkövesd, Kaposvár, Ócsa, Berhida, Szentendre Déli vízbázis.

²³ The number of projects should be interpreted as not being aggregated. The projects in progress in 2018 were supplemented by two more projects, and they were ongoing in 2020 as well.

²⁴ Noise mapping are completed in every 5 years. The exact results of the noise action plans that was implemented in 2018 will be measured in 2023.

Number and type of official remediation projects

	2018	2019	2020
Number of official remediation projects ²³	7	9	9

Noise mapping programmes

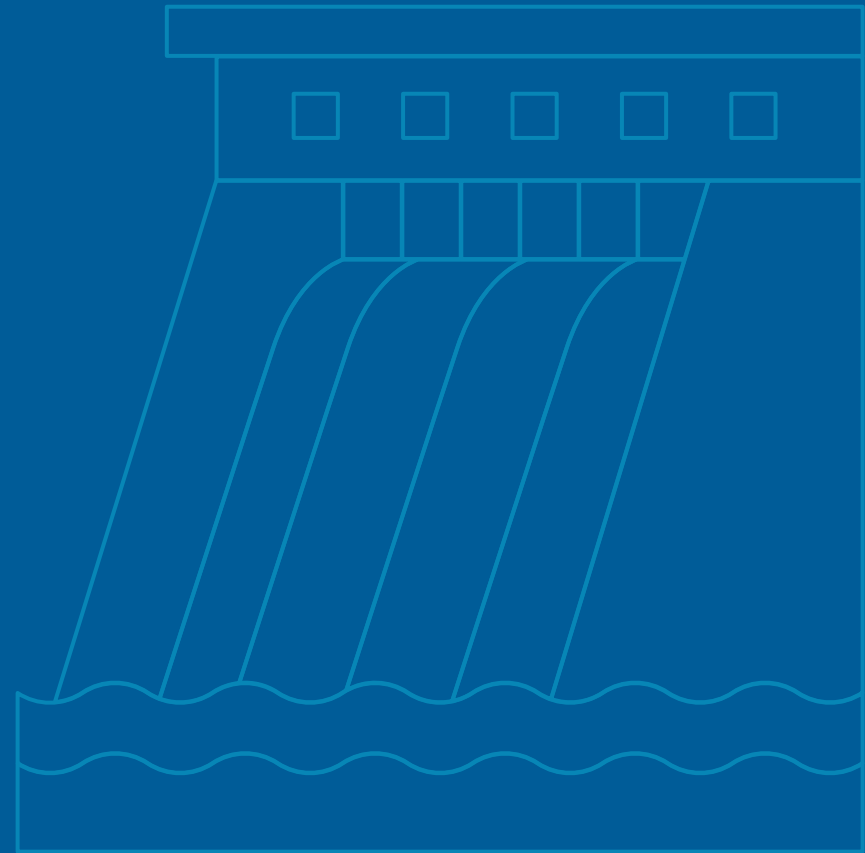
The noise action plans cover 28 settlements with an overall population of 3.1 million. The goals of these action plans are to manage the most exposed areas with specific measures in the next 5 years and to lay down a long-term strategy for lesser exposed areas. The most common measures in the action plans are road surface renewals, noise barriers road traffic management including speed and access restrictions, development of urban public transport, and cycling infrastructure.

Noise mapping and number of actions implemented to noise reduction

	2018 ²⁴
Number of noise action plans	28
Number of people experiencing noise reduction	151,400

3. Waste & Water Management

Waste management tasks include the collection, transportation, disposal, and recycling of different types of waste materials. Water management tasks are mainly related to the process of planning, developing, managing, and distributing water resources, as well as the collection and treatment of wastewater. Both waste and water management are a matter of cherishing the environment and maintaining human health. This expenditure category consists of four focus areas: the reconstruction and improvement of the water utility system, the support of waste separation and recycling, the transition to the circular economy, and other related projects such as efficient water use in agriculture.



6 CLEAN WATER
AND SANITATION



11 SUSTAINABLE CITIES
AND COMMUNITIES



3.1. State Reconstruction Fund for Water Utilities

Water utility network developments are essentials for maintaining adequate, modern, and sustainable water and wastewater supply. Therefore, a state reconstruction fund (Rolling Development Plan) was initiated to continuously allocate investments to the public utility assets for developing technical conditions and expanding the availability of qualitative water utility services. The Rolling Development Plan defines a 15-year planning phase for local governments and water utility companies for renovation, replacement, and new investments of the water utility system. Approximately HUF 1,300 billion (approximately annual HUF 90 billion) is planned for investments until 2033²⁵, which is partially financed by the Green Bond (HUF 3 billion for 2018–19). The implementation of various projects has been started, such as the renewal of drinking water and wastewater treatment systems and the reconstruction of drinking water and wastewater pipelines in many territories. Major parts of the projects are ongoing and significant resources are planned to be used for further renewal and restructuring activities in the next 10–15 years.

The initial investments of the Rolling Development Plan have supported the expansion and development of water utility systems. The following indicators²⁶ represent the improvements achieved in the last two years by the renovation, replacement, and new investments.

²⁵Source: data provided by the Hungarian Energy and Public Utility Regulatory Authority (HEA) (2018).

²⁶Source: Hungarian Central Statistical Office data

	2018	2019 (Latest available data)
Length of the drinking water system (in km)	66,799	66,907
Length of sewage system (in km)	3,433	3,436
The number of households connected to the drinking water system	4,246,868	4,246,896
The number of households connected to the sewage system	3,653,622	3,694,793
The length of sewage system per kilometres of the drinking water system (in metres)	756	761
Wastewater treated with tertiary treatment (in thousand m ³)	510,110.9	491,689.4

Investments have fostered renovation and development activities of the water utility system, which have resulted in the expansion of drinking water and sewage systems. In 2019, 94.9% of Hungarian households are connected to the drinking water network and 82.6% of the households are connected to the sewage network. These improvements are also observed by the decreasing difference between the proportion of connected dwellings to the water utility system and also connected to the sewage network: in 2011 the difference was 22 percentage points, while in 2019 it reached 12.3 percentage points.

3.2. Subvention for Waste Separation and Reutilization as an Energy Resource

On 5 February 2016, the Government adopted the Irinyi Plan for the development of the Hungarian industry. The majority of applicants for the Irinyi Plan programmes are small- and medium-sized enterprises interested in developing and launching state-of-art products and services. This project pays special attention to green technologies and products that also hold considerable promise regarding protecting the environment and reducing the environmental footprint. The below table shows the number of projects that are focused on waste separation and reutilization that received grants under the Irinyi plan.

	2018	2019	2020
The number of projects that received grants	1 completed project	–	3 ongoing projects

Overall 4 projects received grants under the Irinyi Plan. These projects are associated with the development and optimization of technologies related to waste management, the utilization of different waste items to generate valuable products, the design, development, and reusable packaging materials, and plastic drinking glasses.

3.3. Supporting Waste Management Tasks

To achieve the waste management and recycling targets set by the European Union several companies were supported under this point. Financial support was dedicated to provide support to investments in technologies, efficiency improvement and capacity building of collection, pre-treatment, and recycling of wastes from packaging, electrical and electronic equipment and batteries subject to environmental product fee. These developments also support the transition to a circular economy.

The number of projects that applied for and received waste management support

	2018	2019
Number of projects that received waste management support	44 projects were supported out of 81 that applied	5 projects were supported out of 17 that applied

Overall, 49 projects received waste management support between 2018 and 2019. Most of the projects are still in the process of implementation. The first quantitative results will be available in 2022 because the first project maintenance reports based on contracts and supporting documents will be submitted only in late 2021. In 2020, no projects received waste management support given that there was no proceed allocation. Until 2019, HUF 3.073 billion were disbursed out of the allocated HUF 3.31 billion.

3.4. Others (Monitoring, Remediation, Efficient Water Use in Agriculture)

The environmental projects focused on water and waste management, including the remediation of polluted and contaminated surface water, groundwater and soil, and sustainable agriculture and land use. The National Environmental Remediation Programme focuses on the removal of pollution and contamination from the environment, as well as the lowering the risk of further pollution and contamination. Rural Development Programme focuses on efficient water use in agriculture, including water-saving irrigation methods, climate-resilient production methods, and sustainable land use.

Remediation projects as part of the National Environmental Remediation Programme

Remediation Projects	Details
Damage prevention and reclamation at the Cséry site	• Cséry site used to be a wasteyard in Budapest • Area is highly contaminated • Recultivation plan was prepared to remediate the area and protect groundwater
Remediation technology for chlorinated hydrocarbons	• Support to a research consortium for volatile chlorinated hydrocarbons • Development of innovative technological procedures for remediation activities in the former „Magyar Optikai Művek” factory in Mátészalka

The number and nature of projects that support efficient water use in agriculture as part of the Hungarian Rural Development Programme

	2018	2019	2020
Support for the construction of water reservoirs	0	1	4
Construction of land reclamation roads	1	0	3
Improving the water efficiency of existing irrigation equipment	16	35	35
Purchase of new irrigation equipment	19	58	82
Improving the energy efficiency of irrigation equipment	9	33	39
Regarding new irrigated orchards	26	88	81

Two projects were supported as part of the National Environmental Remediation Programme. One project focused on planning feasible remediation actions to remove dangerous and poisonous substances from the environment and protect the groundwater at the Cséry site. The other project fostered the innovation of new remediation technologies, particularly on volatile chlorinated hydrocarbons. This technology supports remediation activities in the former “Magyar Optikai Művek” factory in Mátészalka.

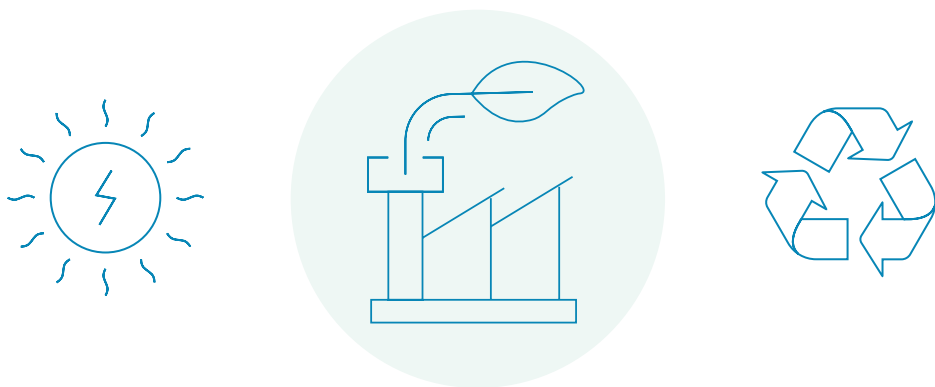
More than 500 projects were supporting efficient water use in agriculture between 2018 and 2020. Nearly 40% of the projects supported new irrigated orchards, which covered more than 1424 hectares. The other projects focused on the construction of water reservoirs and land reclamation roads, improvement of the water and energy efficiency of existing irrigation technologies, and acquisition of new irrigation equipment.

3.5. Case Study: Water and Waste Management: Irinyi Plan

The Irinyi Plan focuses on the development and promotion of high value-added products and services that can compete on international markets. The Plan supports small- and medium-sized enterprises with the development and commercialization of state-of-the-art – and increasingly green – technologies and devices. The majority of the enterprises that applied for the programme are in the food industry, the green economy and specialized machinery and vehicle industry. Subsidies are provided for research and development activities, capacity and infrastructure development, and market entry.

This Plan focuses on green technologies and products. Financial support to enterprises that are focused on the recovery and treatment of different waste materials, such as plastic, glass, wood, metal, paper, packaging materials, electrical and electronic waste.

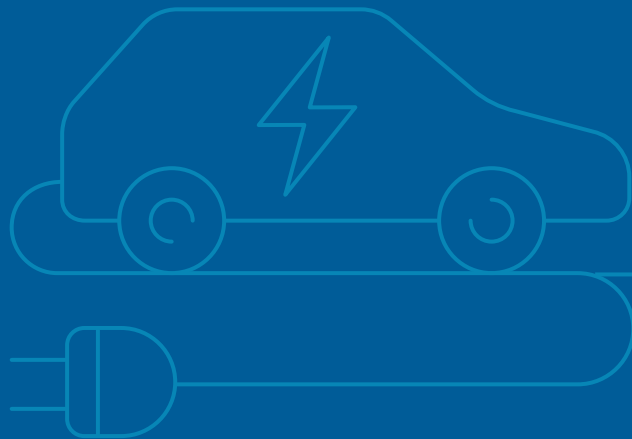
The Plan also supports the transition to circular economy by providing funds that finances the implementation of technologies that utilizes different types of secondary raw materials. Funds are also provided to project that are working on the reutilization of waste materials and hazardous wastes as energy source.



Interior of modern factory

4. Renewable energy

Renewable energy is one of the most essential assets in the successful transition to an economy with net-zero greenhouse gas emissions. Renewables have several benefits compared to conventional energy sources as they are clean, inexhaustible, and abundant energy sources. The financed projects aim to promote the use of renewable energy sources in Hungary among residents and SMEs to cut back their emissions resulting from energy consumption.



7 AFFORDABLE AND
CLEAN ENERGY



4.1. Subsidized Loan for Renewable Energy Use in Buildings

The energy consumption of buildings is responsible for over 40% of the national energy consumption in Hungary and a similar proportion of greenhouse gas emissions. In Hungary, the overall proportion of renewable energy from the total gross final energy consumption was between 12% and 15%²⁷ in the last five years, which is aimed to be increased to a minimum of 21% until 2030²⁸.

This financial support programme provides combined loan and non-refundable support for micro, small and medium-sized enterprises located in Pest county and Budapest to reduce their primary energy use and increase the use of renewable energy sources in buildings. The programme was partially financed from the Green Bond proceeds to complete the European Union funds.

Indicators present the number and capacity of the installed renewable assets in each year with their generated production. The GHG emission avoidance is estimated based on the difference between the building's emission after the renewable asset installation and the baseline value before the project using the dataset of the official Energy Certifications.

²⁷ Hungarian Central Statistical Office: Share of use of renewable energy sources in gross final energy consumption (2000–2019)

²⁸ Ministry of Innovation and Technology: National Energy and Climate Plan of Hungary (2018); Ministry of Innovation and Technology: National Energy Strategy (January 2020)

Results of the Programme

	2018	2019
Number of projects (pcs)	7	33
Installed capacity (in MW)	0.2	1.3
Annual energy production (in MWh/year)	475	2,267

	2018	2019
Annual GHG emission avoidance (in tCO ₂ eq)	431	1,827

Over the 2 years of the programme in total 1.5 MW renewable resource capacity was installed which resulted in 2,258 tCO₂ eq emission avoidance. To generate energy consumptions from renewable resources most of the beneficiaries installed solar panel systems, modernized their non-productive heating systems or lighting systems, introduced renewable electricity generation, or developed their domestic cooling or hot water systems.

4.2. Subsidized Loan for Increased Energy Efficiency and Renewable Energy Use in Residential Buildings

The residential sector is responsible for one-third of the overall final energy consumption in Hungary. Their energy use is mainly generated from the buildings in which major areas of energy consumption are heating, ventilation, and air conditioning. In Hungary, the proportion of gross final energy used for heating and ventilation from renewable energy sources was on average 20% in the last 5 years²⁹. According to the National Energy and Climate Plan, it aims to be increased to 28.7% by 2030³⁰.

This loan programme's main objective is to finance the installation of renewable energy resources or energy efficiency developments in buildings supporting the improvements in the residential sector involving private individuals, condominiums, or flat cooperatives. The programme was partially financed from the Green Bond proceeds completing the European Union funds.

Indicators present the number and capacity of the installed renewable assets in 2018 with their generated production. The GHG emission avoidance is estimated based on the difference between the building's emission after the renewable asset installation and the baseline value before the project using the dataset of the official Energy Certifications.

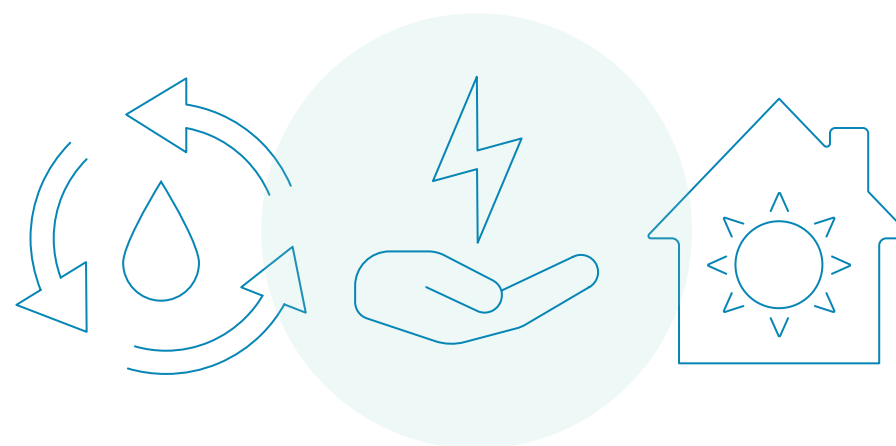
²⁹ Hungarian Central Statistical Office: Share of use of renewable energy sources in gross final energy consumption (2000–2019).

³⁰ Ministry of Innovation and Technology: National Energy and Climate Plan of Hungary (2018).

Results of the Programme

	2018
Number of projects (pcs)	1,499
Installed capacity (in MW)	6.6
Annual energy production (in MWh/year)	8,743
Annual GHG emission avoidance (in tCO ₂ eq)	5,950

In total 1,499 loans were provided to different residents to install renewable energy systems mainly solar systems, geothermal water-, water-to-water-, air-to-water heat pump systems, or construct new boiler systems utilizing briquettes, pellets, or wood chips. Due to these energy efficiency and renewable energy developments 6.6 MW capacity was installed which resulted in 5,950 tCO₂eq emission avoidance.



5. Adaptation

Adaptation projects support activities related to the anticipation of the adverse effects of climate-related hazards and natural disasters and take action to strengthen the resilience and adaptive capacity of the country. The four adaptation projects are associated with the expenditures that supported the implementation of the Water Framework Directive (2000/60/EC), rehabilitation of the Mosoni-Danube, reduction of certain air pollutants and particulate matters, activities of the Hungarian Meteorological Services.



6 CLEAN WATER
AND SANITATION

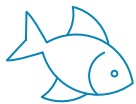


13 CLIMATE
ACTION



5.1. Development of the Monitoring Stations for the Implementation of the Water Framework Directive

In the European Union, water resources are under increasing pressure from the continuous growth in demand for sufficient quantities of good-quality water for a whole range of uses. Water Framework Directive (WFD) was adopted to set out rules to halt deterioration in the status of water bodies and achieve 'good status' for Europe's rivers, lakes, and groundwater. To protect and improve the quality of water it is necessary to develop a monitoring system that provides information on the quality and quantity of surface water and groundwater bodies. The project includes 1,074 surface water bodies and 185 groundwater bodies, and covering the whole territory of Hungary. The purpose of this adaptation project is to protect water bodies and water-related ecosystems, create a data and knowledge base for adaptation to climate change, and prevent natural disasters.



The number and nature of projects that support the development of the monitoring stations for the implementation of the Water Framework Directive (WFD)

Projects	Achieved and planned results
Review and coordination of the national quantitative monitoring station and measuring point network (Completed in 2020)	Optimized network of stations for the quantitative monitoring and evaluation of waters and water bodies in the medium term, which can meet the requirements of the WFD.
Design and development of sectoral software elements and regional subsystems (Completed in 2020)	- Improved data generation in the monitoring system. - Newly developed elements: Balaton forecasting model, online water quality data manager, online industrial data management system.
Renewal and modernization of hydrographic monitoring stations (Ongoing)	64 modernized measuring stations, 38 renovated or built monitoring wells, - Network of stations for the quantitative monitoring and evaluation of waters and water bodies. - Digital equipment modernization to measure water level/pressure.
Upgrade and replacement of mobile measuring devices (Ongoing)	- Improved measuring capability by the replacement of devices. - Mobile and on-site digital equipment to measure water flow rate, velocity, depth, temperature, distance, and level.
Acquisition of measuring boats (Ongoing)	- Improved measurability of quantitative monitoring. - Acquired ships, drones, related equipment, and provided training.

Projects	Achieved and planned results
High-precision measurement (Completed in 2021)	• Accurate quantitative and hydro morphological monitoring system. • High-precision measurement of the altitude position of 365 monitoring stations.
Expansion of the accreditation of the directorate, water quality sampling groups (Ongoing)	• Water quality sampling groups for the examination of surface water and groundwater. • Development of the equipment necessary for water quality monitoring.
Development of groundwater chemical monitoring (Ongoing)	• 93 groundwater quality monitoring wells.
Research (Ongoing)	• Method development and data collection programme in the group of biological and chemical quality elements. • Development of evaluation and data systems, to fill the professional gaps and to complete the tasks of the ecological intercalibration procedure.
Development of hydro morphological monitoring (Completed in 2020)	• Elaboration of the methodological background of the hydro morphological monitoring.
Renovation and establishment of water quality monitoring stations in the Eastern Hungarian region (Ongoing)	• On-site water quality monitoring stations (including sensors, water samplers, etc.) and data collectors, communication systems.

Overall, 11 projects support the implementation of the Water Framework Directive. Out of the 11 projects, 4 are already completed and 7 are still ongoing. The projects support the monitoring and protection of surface waters and groundwater all over the country. The developments not only help to achieve “good status” for all waters but also reduce the risk of natural disasters.

5.2. Water Level Rehabilitation of the Mosoni-Danube

As a result of natural processes and human interventions the natural state of the Mosoni-Danube has changed, the tributaries have dried up, the extent of wetlands has gradually decreased, and the ecological diversity has declined. To rehabilitate the river and regulate the water level a weir/floodgate at the mouth of the Mosoni-Danube will be constructed. This will have significant ecological, social, and economic impacts. The main goals of the project are the improvement of the water quality and quantity, the improvement of ecological potential, and the reduction of flood risk.

The indicators show the developments that were implemented to support the water level rehabilitation of the Mosoni-Danube and the expected ecological, social, and economic effects.

Main developments

	Details
Construction of weir/floodgate at the mouth of the Mosoni-Danube (Ongoing)	• Weir is equipped with movable closure mechanisms and is used to raise the water level in mid and low water situations. • The floodgate function is used to protect 660 hectares from inundation. Fish passages and water navigation locks will be built.
Flood bank (Ongoing)	• Flood banks are built in Vének és Gönyű to reduce the risk of flooding by ensuring the continuous safety measures against a significant rise in the water level.
Related projects (Ongoing)	• Alteration of the river bed and the construction of riverbank protection structures are necessary before and after the weir/floodgate.

Expected effects of the developments

	Details
Ecological	• Regulate the water level of the branches. • Mitigate the effects of the diversion of the Danube main branch. • Retain water in the Szigetköz area. • Restore the natural ecosystem of the Mosoni-Danube tributary. • Mitigate the effects of climate change on water bodies. • Halt the decline in groundwater levels. • Reduce flood risk. • Lowers ambient temperatures. • Create habitat corridors. • Increase the proportion of water bodies in good status in compliance with the Water Framework Directive 2000/60/EC.
Social	• Creates the conditions for navigability in compliance with the regulations. • The rehabilitated groundwater affects soil moisture, which also increases yields.
Economic	• Reduction of port dredging cost at Gönyű, as the sediments of the Mosoni-Danube and the Old Danube are expected to decrease. • Economic development of the region by creating recreational opportunities. • Water weirages become less significant.

The developments are critical to improve the quality and to regulate the fluctuations of Mosoni-Danube, to restore the natural ecosystem of the Szigetköz region, and to protect the people and property from flood weirages. The developments will also help to increase tourism by creating the conditions of navigability and recreational opportunities. The total cost of the project is HUF 28.4 billion of which HUF 2.78 billion were allocated from the Green Bond proceeds.

5.3. Reduction of PM₁₀/National Air Pollution Control Programme (NAPCP)

PM₁₀ describes inhalable particles, with diameters that are generally 10 micrometres and smaller. Numerous negative health effects have been associated with exposure to particulate matter. It also adversely affects climate, ecosystems, and materials. A programme implemented by the Hungarian Government was focusing on the reduction of particle matter (PM₁₀) pollution. The programme ended in 2019 with outstanding results that are shown in the following table.

The emission of particulate matter (PM₁₀) in 2005 and 2019

	Emission (in thousand tonnes) ³¹			Total Reduction
	2005	2018	2019	
PM ₁₀	74.3	63.0	61.9	16.7%

The particulate matter (PM₁₀) emission reduction project resulted in an additional 1.8% decrease from 2018 to 2019 achieving a 16.7% total reduction compared to the 2005 base year. This result could increase the air quality and have a positive effect on the environment and public health.

³¹ Data Source: https://cdr.eionet.europa.eu/hu/eu/nec_revised/inventories/envyqfnyq/HU_NFR16_1990_2019_v3.xlsx/manage_document

The EU Directive 2016/2284³² (NEC) entered into force in December 2016. The NEC Directive sets national emission reduction commitments for the Member States and the EU for air pollutants, such as sulphur oxides (SO_x), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC), ammonia (NH₃), and particulate matter (PM_{2.5}), compared to 2005. These pollutants contribute to poor air quality, leading to significant negative impacts on human health and the environment. The Directive requires that national air pollution control programmes be drawn up, adopted, and implemented to the emissions of the mentioned and other pollutants. The programme that was implemented in 2020 aims to contribute to the fulfilment of the obligations of the Directive.



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³² https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2016.344.01.0001.01.ENG

5.4. Hungarian Meteorological Service

The incentives were implemented to support the operation of the Hungarian Meteorological Service (HMS) that collects, processes, and provides meteorological data and information. With the project, the development of the institute's nationwide monitoring systems, radiosonde upper air measurements, and meteorological radar operation was supported. This project also supports the institute's research and development projects.

The number and nature of developments that were implemented to support the activities of the Hungarian Meteorological Service (HMS).

Developments	Detailed Information
Development of an air pollution forecasting system (Ongoing)	• Development of a mesoscale model and predict the formation of air pollution. • Understand the interaction of aerosol particles with atmospheric water.
Mapping the effects of climate change in Hungary (Ongoing)	• Conduct regional climate model simulations. • Carry out sensitivity studies, validation experiments, and projection simulations. • Develop a representative database.
Electronic General Aviation Forecast (eGAFOR) (Completed in 2021)	• Cooperation of meteorological service providers in Central and South-Eastern Europe. • Develop a system for low-level flights.

Developments	Detailed Information
Interreg Romanian-Hungarian cross-border (Ongoing)	• Construction of a hail-suppression system with a soil generator in the territory of Satu Mare County, Romania. • Mitigate the negative effects of hail.
LIFE-IP HungAiry 2016 (Ongoing)	• Improve air quality at the most relevant Hungarian municipalities. • Implement air quality plans and measures. • Set up a national network of experts and consultants.
Special products developed for the energy sector (Ongoing)	• Modification and development of a weather forecasting system serving the needs of the energy sector.
Establishment of a weather radar (Completed in 2021)	• Part of the national ice damage prevention system. • Reduce the significant damage caused by hail.
WASTE_Service Contract (Completed in 2020)	• Analyse the effect of residential solid waste burning on ambient air quality in Central and Eastern Europe and potential mitigation measures.
Drought risk in the Danube region (Completed in 2019)	• Development of a drought response strategy. • Improvement of cooperation between operational services and decision-makers in the region. • Development of a methodology for near real-time assessment and forecasting of drought risks and impacts.

Overall, 9 projects are supporting the activities of the Hungarian Meteorological Service. The projects are mainly focused on air pollution, climate change, weather forecasting, and draught. The development supports the HMS to fulfil its duties to a high standard. The total cost of the development was over HUF 2.6 billion of which HUF 1.5 billion is covered by the Green Bond.



Scenic view of storm clouds over landscape

5.5. Case Study: Water level rehabilitation of the Mosoni-Danube

The water level of the branches of the Mosoni-Danube is currently unregulated. The extremely low or high water levels must be adjusted because where the water level is low, areas dry out, and when it is high, the risk of flooding is increased. The low water affects the groundwater level, which has a negative impact on agricultural areas, forests, and their ecosystem. Floods also have significant effects, including loss of human life, damage to property, destruction of crops, and deterioration of health conditions due to waterborne diseases.

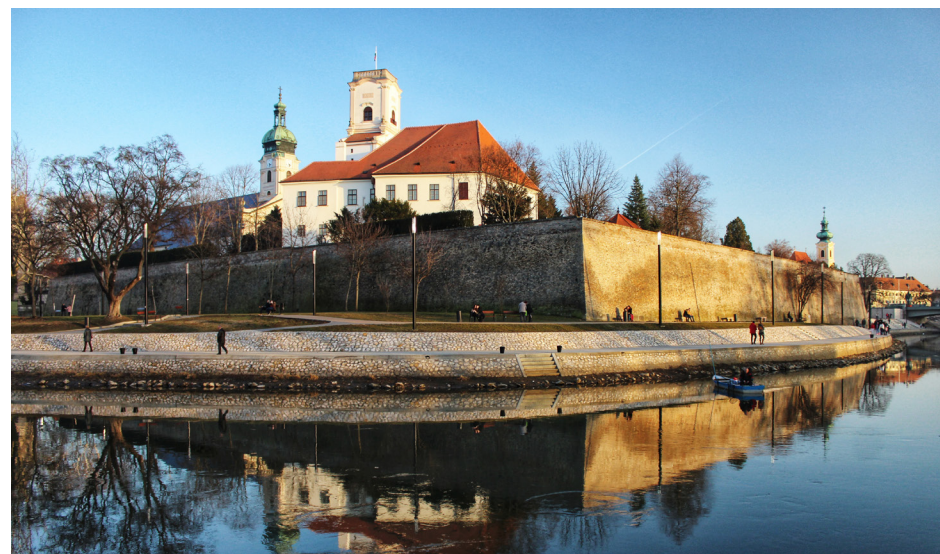
As part of the project, a weir/floodgate at the mouth of the Mosoni-Danube will regulate the water level of the branches. Weir is equipped with movable closure mechanisms and is used to raise the water level in mid and low water situations while floodgate function is used to protect from floods. Flood banks will also be built at Vének és Gönyű to guarantee the continuity of safety against significant flood levels. Furthermore, the necessary alterations of the riverbed will be completed.

The project influences 8,350 hectares in Szigetköz area water balances in Győr-Moson-Sopron County. As a result of the developments, the water level of the branches of the Mosoni-Danube will be regulated, which has significant ecological, social, and economic impacts. The effects of the diversion of the Danube main branch will be mitigated and the water in the Szigetköz area will be retained. The natural ecosystem of the Mosoni-Danube tributary will be restored. The risk of flooding will decrease, and 660 hectares will be protected from inundation. Water level rehabilitation also contributes to the mitigation of the negative impacts of climate change. Groundwater level will rise to 8 350 hectares, supporting 2,258 hectares Natura 2000 sites in increasing the vegetation mass, which will also influence the microclimate by increasing evapotranspiration, leading to lower ambient temperatures. Furthermore, the proportion of water bodies in good condition will be increased in compliance with the Water Framework Directive.

As the groundwater levels change, soil moisture of the agricultural areas will improve, which also affects yields. It is expected that the average yield on 3,071 hectares will increase by 10% just because the groundwater level is being rehabilitated.

The developments also create conditions for navigability in compliance with the regulations. Further impacts include the reduction of port dredging cost at Gönyű and the decrease of water damage.

The total cost of the project is HUF 28.4 billion of which HUF 2.78 billion was covered by the Green Bonds.



Basilica of the Assumption of the Virgin Mary in Győr (Mosoni-Danube)

6. Energy Efficiency

Using resources more efficiently throughout the economy is of paramount importance to achieve sustainability, and though in the long run, the more energy-efficient solutions are more financially viable, there are segments in the economy that cannot finance the more efficient solution. Different energy efficiency schemes, therefore, target these segments to create incentives or provide additional funding for reducing energy use and therefore the emission of greenhouse gases.



7 AFFORDABLE AND
CLEAN ENERGY



6.1. Energy Efficiency Grant Scheme

Hungarian households produced approximately 15% of CO₂ emissions in 2018³³, thus it is imperative to assist households in achieving better energy efficiency. Therefore, to cover additional costs of a higher level of energy efficiency, funds from the Green Bond issuance were allocated to improve the energy efficiency of Hungarian households.

The Warm Home Programme was first launched in 2014 with the aim to provide non-refundable support to households to improve energy efficiency and thereby reduce CO₂ emissions. As part of the Programme, several subprogrammes were initiated that were funded through ETS revenues, national grants and Green Bond proceeds.

One of the subprogramme (*HGCS/2017_Újranyitás*) starting in 2018 focused on improving household energy efficiency by financing the replacement of large household appliances with new refrigerators, freezers or washing machines that have an at least A+ energy rating. The impacts can be captured after the disbursement that has started in 2019.

The subsidy has enabled Hungarian consumers to purchase large household appliances at a reduced price. Call *HGCS/2017_Újranyitás* has resulted in 9,099 certificates of support with a total grant contribution of HUF 375.5 million as of December 31, 2020.

³³Source: Hungarian Central Statistical Office: Emission of air pollutants and greenhouse gases (1985–2018)

³⁴Emission avoidance and annual energy savings were calculated automatically as per the methodology used by the Ministry of Innovation and Technology. Data was based on the type (e.g. washer, freezer), measurements (i.e. width, height, capacity in kg), and year of manufacturing of the old appliance, and the model number and energy label of the new appliance, all provided by the applicants themselves.

Indicators show the number and nature of beneficiaries of the grant and the estimated annual energy savings and emission avoidance in accordance with the applications for the grants. If energy savings surpassed 10%, and CO₂ emissions were reduced by at least 20kg per annum, the applications were accepted automatically.

Throughout the programme, 2,101.5 MWh of energy has been saved and associated 445.5 tCO₂eq of GHG emission has been avoided³⁴, spread out through all counties of Hungary.

Results of the Warm Home Programme 2019–2020

Number of applications	Number of improvements
9,099 pcs	9,472 pcs

	2019	2020
Annual energy savings (in MWh)	2,071.3	30.2

	2019	2020
Annual emission avoidance (in tCO ₂ e)	439.1	6.4

6.2. Tax allowance in corporate income tax

To incentivize companies to improve their energy efficiency, a corporate income tax grant scheme was financed, expanded to energy efficiency improvement as well in 2018, using the proceeds of the Green Bonds.

Part of the corporate income tax due for the company can be claimed as a tax allowance, in the tax year following the commissioning of the investment by taxpayers that make a renovation or an investment resulting in the reduction of their final energy consumption. A total of 595 building energy reduction, heating reconstruction, renewables, and heat reclaim projects, 662 electric vehicle purchases and 245 other investments were implemented in the period of 2018–2020.

Results of the Programme

	2018	2019	2020
Number of projects (annual)	341	544	617
Total value of projects affected by the tax allowance (annual) in bn HUF	10.6	18	17.9
Tax allowance used (annual) in bn HUF	0.7	2.4	3.3

Indicators show the annual energy savings and avoided CO₂eq emissions based on tax returns of eligible companies, as well as the number and nature of companies benefiting from the scheme, the number of projects financed, their geographical distribution, and the total value invested in relation to the tax allowance scheme.

Overall, 195,595 MWh energy savings were estimated in the period of 2018–2020 with associated CO₂ emission avoidance at 49,093.9 tonnes.

Energy savings and emission avoidance due to the Tax Allowance scheme

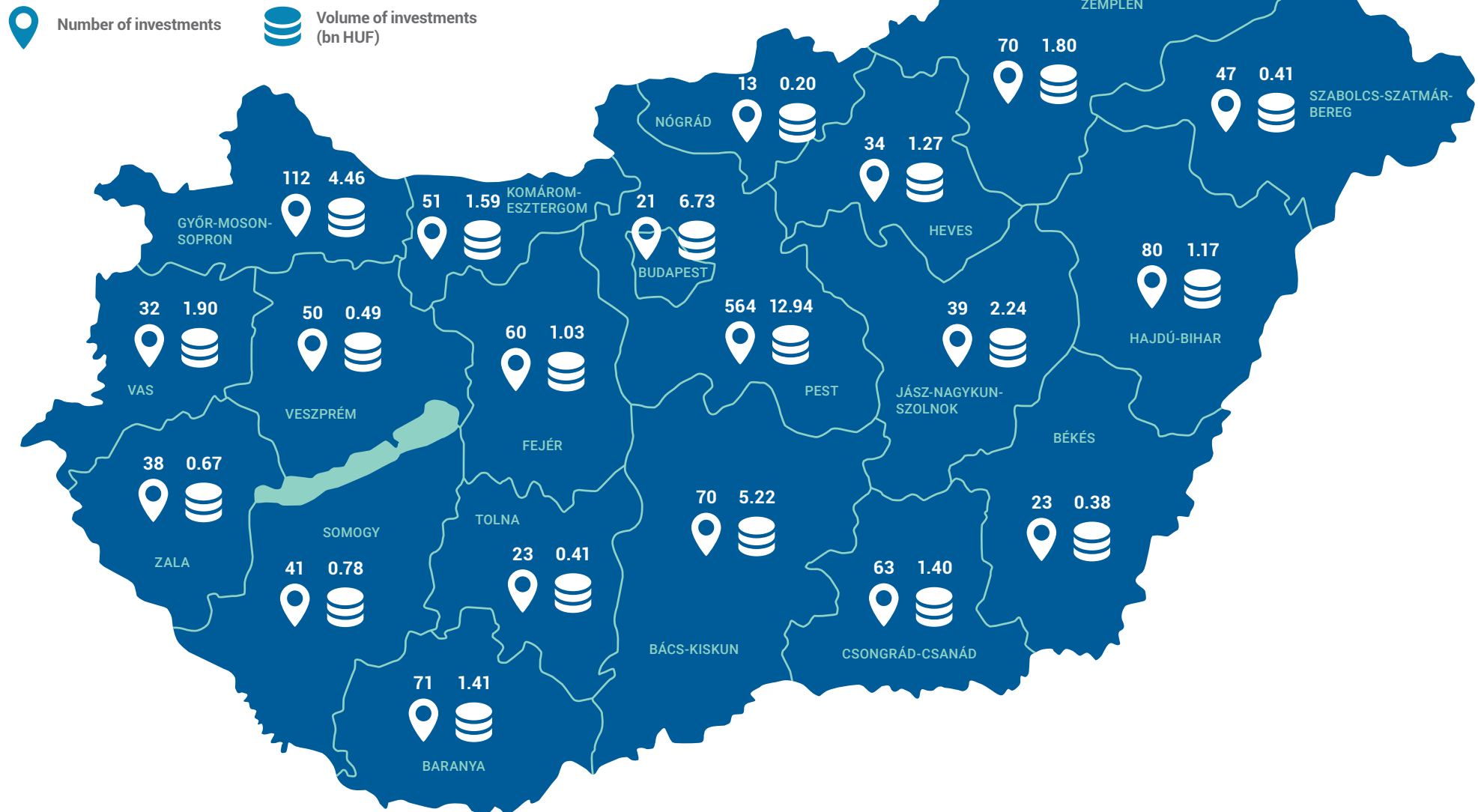
	2018	2019	2020
Annual energy savings (in MWh)	50,950	83,600	61,045

	2018	2019	2020
Annual emission avoidance (in tCO ₂ eq)	12,788.2	20,983.5	15,322.2

Proportion of small and medium-sized enterprises (SMEs)

	2018	2019	2020
Number of projects (cumulated)	49%	54%	60%
Total value of projects affected by the tax allowance (cumulated) in bn HUF	28%	30%	28%
Tax allowance used (cumulated) in bn HUF	41%	34%	29%

Geographical distribution of projects (number and volume of investments)



6.3. Investment Expenditures for Agriculture

To enhance the energy efficiency of the agricultural sector, proceeds from the Green Bonds were used to finance focus area 5B of the Hungarian Rural Development Programme, aiming to improve the energy efficiency of livestock farming. The focus area financed increased the efficiency of energy use by the agriculture and food processing industry, and facilitated the transfer to and use of renewable energy sources, and the reuse of by-products, waste, residues, and other non-food raw materials for organic farming. The measure also improved the modernization of energy production with applying technologies that use renewable energy.

The total value of investments includes the total amount of funding, which also includes the amount of national funding received from the proceeds of the Green Bonds. The annual energy savings of the scheme is estimated based on the applications for funding that includes projections from third party professionals, while relevant data was collected and stored by the Hungarian State Treasury.

Annual energy savings due to the Hungarian Rural Development Programme focus area 5B

	2018	2019	2020
Annual energy savings (in MWh)	327	4,739	7,182

Due to the focus area 5B of the Hungarian Rural Development Programme enhances the efficient energy utilisation overall 12,248 MWh of energy was saved between 2018–2020.

Annual renewable energy production due to the Hungarian Rural Development Programme focus area 5B

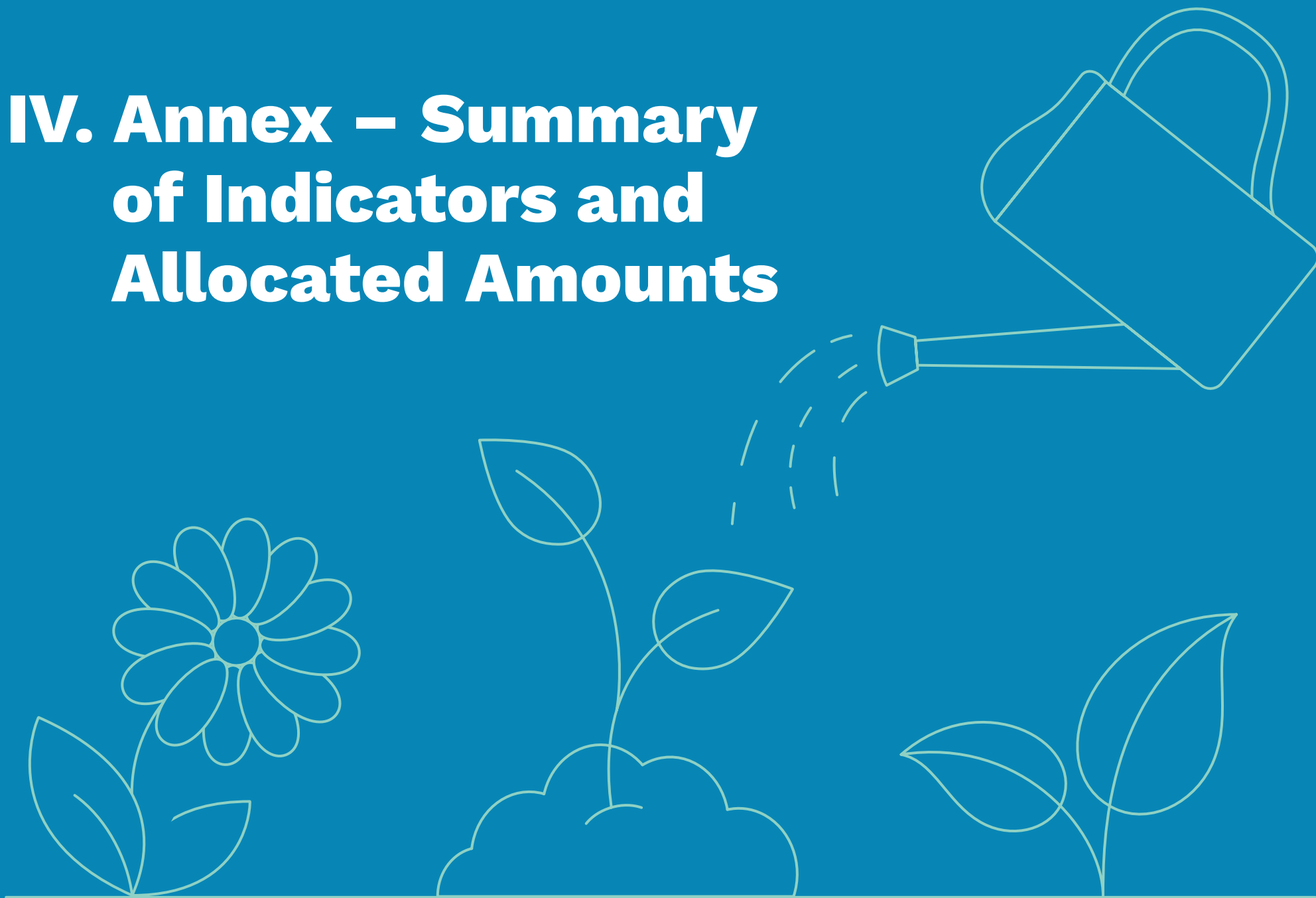
	2018	2019	2020
Annual energy production (in MWh)	1,798	9,029	6,681

As the programmes were also focused on improving energy efficiency by applying renewable energy resources totally 17,508 MWh energy was produced between 2018–2020.



Hay Bales On Field, Magyarország

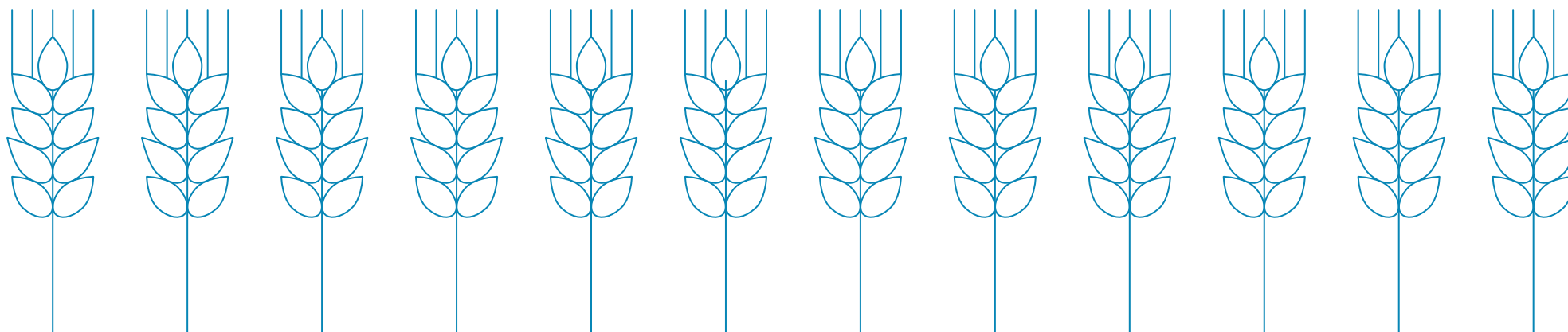
IV. Annex – Summary of Indicators and Allocated Amounts



Cumulative results of eligible green projects and their main output and impact indicators between 2018–2020 are summarized in the following tables:

Clean Transportation	Allocated Amount	Passenger-kilometres and passengers		Total length of reconstructed or upgraded railway, metro, or tram lines	Total length of electrified railway lines	Total GHG emissions	Total GHG emissions avoided	Number of new environmentally friendly trains, carriages, vehicles deployed
	2018–2019	2018–2020						
	HUF (bn)	Passenger kilometres (million km)	Number of passengers (million)	km	km	tCO ₂ eq	tCO ₂ eq	pcs
Reimbursement of the operation of the railway network	138.22	–	–	–	–	–	–	–
Tax exemptions of environmentally friendly vehicles	0.88	–	–	–	–	–	63,206	19,880
Reimbursement of uncovered costs of railway passenger traffic	246.35	20,376	395.6	–	–	916,920	1,043,084	–
Modernization of rail transportation	89.10	–	–	106	–	–	–	–
Electrification of railway lines	16.83	–	–	–	89.5	–	–	–
Modernization of urban public transport	8.34	–	–	3.3	–	–	–	108
Rolling stock development	3.02	–	–	–	–	–	–	30

Land Use and Living Natural Resources	Allocated Amount	Habitats of community interest with an improving conservation status		Species of community interest with an improving conservation status		Number of supported projects and measures	Number of persons reached
	2018–2019	2018–2020					
	HUF (bn)	proportion (%)	pcs	proportion (%)	pcs	pcs	per capita
Nature protection and biodiversity	9.90	7	3	5	10	19 projects	–
Environmental administration	12.84	–	–	–	–	–	4,300,000
Education, awareness-raising	1.93	–	–	–	–	–	5,200
Sustainable agriculture	24.46	–	–	–	–	113,323 projects	–
Others (noise mapping, remediation, environmental projects)	1.66	–	–	–	–	9 projects	151,400



Waste and Water Management	Allocated Amount	Households connected to the drinking water system	Households connected to the sewage system	Length of sewage system per kilometres of the drinking water system	Number of supported projects
	2018–2019	2018–2020			
	HUF (bn)	proportion (%)	proportion (%)	m	pcs
State Reconstruction Fund for Water Utilities	2.27	94.9%	82.6%	761	–
Subvention for waste separation and reutilization as energy resource	0.23	–	–	–	4
Supporting the waste management tasks	2.92	–	–	–	49
Others (monitoring, remediation, efficient water use in agriculture)	0.31	–	–	–	2 remediation projects 530 agricultural projects



Selective waste collection

Renewable Energy	Allocated Amount	Annual electricity generation		Total installed renewable energy capacity	Total GHG emissions avoided	Number of beneficiaries
	2018–2019	2018	2019	2018–2019		
	HUF (bn)	MWh		MW	tCO ₂ eq	pcs
Subsidized loan for renewable energy use in buildings	0.58	475	2,267	1.5	2,258	40
Subsidized loan for increase energy efficiency and renewable energy use in residential buildings	4.71	8,743	–	6.6	5,950	1,499

Adaptation	Allocated Amount	Number of supported projects and developments	Reduction of PM ₁₀ compared to 2005
	2018–2019	2018–2020	
	HUF (bn)	pcs	proportion (%)
Development of the monitoring stations for the implementation of the Water Framework Directive	0.22	11	–
Water level rehabilitation of the Mosoni-Danube	2.78	3	–
Reduction of PM10/National Air Pollution Control Programme (NAPCP)	0.08	–	16.7%
Hungarian Meteorological Service	1.5	9	–

Energy Efficiency	Allocated Amount	Total energy savings	Total energy production from renewable energy sources	Total GHG emissions avoided	Number of beneficiaries	Number of improvements
	2018–2019	2018–2020				
	HUF (bn)	MWh	MWh	tCO ₂ eq	pcs	pcs
Energy efficiency grant scheme	0.37	2,101.5	–	445.5	9,099	9,472
Tax allowance in corporate income tax	2.97	195,595	–	49,093.9	659	1,731
Investment expenditures for agriculture	1.20	12,248	17,508	–	–	–



High Angle View Of Agricultural Field Against Sky, Agyaglik

