GOBIERNO
DE ESPAÑA

GREEN BOND PROGRAM OF THE KINGDOM OF SPAIN

IMPACT OF THE FUNDS ISSUED IN 2021

GRUPO DE TRABAJO PARA LA ESTRUCTURACIÓN DE LAS EMISIONES DE BONOS SOBERANOS VERDES DEL REINO DE ESPAÑA Y LA PROMOCIÓN DE LAS FINANZAS SOSTENIBLES

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1. EXECUTIVE SUMMARY

This **report** fulfils the commitment assumed in the Green Bond Framework of the Kingdom of Spain in terms of **transparency and information for investors**. Therefore, this report analyses the estimated environmental impact of those budget programs selected according to the allocation report, published together with this report.

The **first issuance under the** Kingdom of Spain's green bond program was executed on **September 7, 2021**, through the syndication of a new bond in the amount of €5 billion, maturing in July 2042. This issuance was based on the Green Bond Framework and the eligible expenditure published beforehand.

5 billion euros have been allocated to the **clean transport category**, which contributes to the **objectives of climate change mitigation** and **pollution prevention and control**, as stated in the Allocation Report. Specifically, it **has been decided to allocate** these amounts to State transfers to the **infrastructure managers (ADIF and ADIF AV)** and the **operator Renfe Viajeros, Sociedad Mercantil Estatal, S.A., (hereinafter RENFE)**.

The report summarizes the **environmental benefits** linked to the eligible clean transport expenditure category. This is done using **sector specific core indicators and other indicators in line with the basic principles of the "Harmonized Framework for Impact Reporting Handbook[1]"** (June 2022 edition) **published by ICMA[2].** The indicators have been selected to provide both **physical** (e.g. kilometres of rail infrastructure) and **environmental** (e.g. avoided CO_2 emissions to the atmosphere) **performance metrics.**

Rail transport, as the backbone of sustainable mobility in Spain, has a key role to play in achieving the objectives of decarbonization and in the fight against climate change. This cannot be achieved without adequate conservation and improvement of the railway infrastructure. Transfers to the railway infrastructure managers ADIF and ADIF AV are mostly used to finance current and capital transfers, as well as the equity contributions required to provide these entities with the necessary own resources to carry out investments in the railway networks or high-speed tracks whose construction and management they are responsible for. In this context, the body of the report provides the impact of the first issue of Green Bonds using **physical performance indicators** and **environmental efficiency indicators** for the 2018-2021 allocation period. The following are the results for the physical performance indicators:

- **234.1 km built or renovated.**
- **5.9 km of electrified tracks[3] .**

[1] Harmonised-Framework-for-Impact-Reporting-Green-Bonds_June-2022-280622.pdf (icmagroup.org)
[2] International Capital Market Association.
[3] To avoid double counting, in the calculation of emissions reduction, the electrification of tracks included in the section of track construction or renewal has not been taken into account. In addition, only the proportional part corresponding to the contribution of MITMA's Green Bonds has been accounted for out of the total financing.

- **1,223,052 train-km** that have used the network in the period and have benefited from the application of reduced fares[4] .

In terms of **environmental efficiency indicators**, the budget items of the program of transfers to rail infrastructure managers (ADIF and ADIF AV) have contributed to **savings of 3.77 million tons of CO_2, 37.06 thousand tons of NO_x and 1,076 tons of PM_{10}.**

As for **environmental efficiency indicators**, according to the calculations made, the allocation of the 2021 Green Bonds to the budget program of transfers to RENFE for the compensation of Public Service Obligations has contributed, in the period 2018-2019, to a **total saving of 3.14 million tons of CO_2, 10.34 thousand tons of NO_x and 356.10 tons of small particles PM_{10}.**

A summary table with both the physical indicators and the environmental indicators obtained is included in the annex.

[4] The calculation of emissions reduction takes into account the train-km that have benefited from the application of reduced fares in 2021 (year of allocation in the Green Bonds to the corresponding budget item), taking into account the proportional part corresponding to MITMA's contribution for fare reduction over the total funding.

2. APPROACH. OBJECTIVES OF THE REPORT

This impact report aims to **synthesize the environmental benefits** linked to the eligible clean transport expenditure category. The indicators used present the evaluation of **sustainable transport spending programs**, both from an economic perspective, using rail sector specific metrics, and an environmental one, using other indicators in line with the basic principles of the **"Harmonized Framework for Impact Reporting Handbook"** (June 2022 edition) **published by ICMA**.

For the purposes of this report, as will be reflected later in the explanation of the **methodology used, the overall impact** approach has been used**,** based on public spending programs in the railway sector, and not on a project-by-project approach, given the difficulties in reporting at the project level, due to the very nature of the public sector and the large number of actions included in these programs. It is worth mentioning that this reporting at a program level is precisely what has been foreseen in the Proposal for a Regulation of the European Parliament and of the Council on European green bonds[5] in most cases.

For the drafting of this report, the Green Bonds working group has had the collaboration of environmental experts from RENFE and ADIF, with extensive experience in environmental sustainability, energy efficiency and the fight against climate change. To estimate the **savings in greenhouse gas (GHG) emissions and other atmospheric pollutants**, specific approaches have been adopted for the Spanish case. These approaches or methodologies are aligned with the work of the European Union's Sustainable Finance Platform. Efforts have been made to ensure that **the methodologies are based on standard market practices** and are in line with other impact reports already published by other sovereign issuers. For the sake of clarity and accessibility, the complexity of the assessment has been reduced wherever possible to what is strictly necessary to ensure rigorous results.

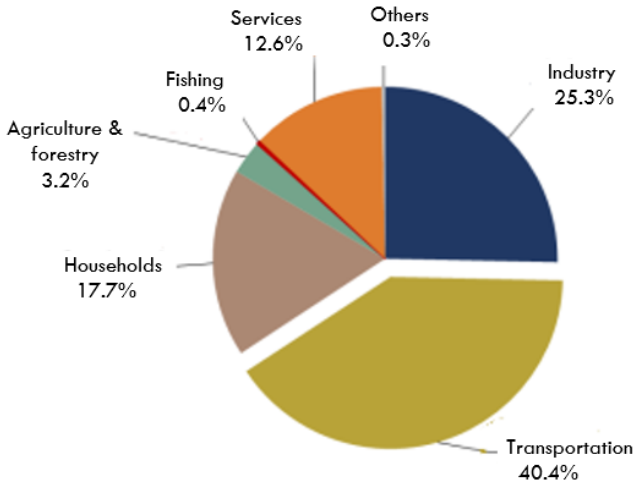
[5] EUR-Lex - 52021PC0391 - EN - EUR-Lex (europa.eu)

3. ENVIRONMENTAL IMPORTANCE OF THE TRANSPORT SECTOR

Currently, **transport** and mobility **policy is** an **essential lever** for achieving the **objective of decarbonizing the Spanish economy.** The transport sector is the most energy-intensive activity and the most important source of greenhouse gas emissions when compared to other economic sectors, as shown by the data from the Observatory of Transport and Logistics in Spain (OTLE) detailed below.

In 2019, according to the latest OTLE annual report published in June 2022, **transportation** is the sector with **the highest energy consumption**, consuming 40.4% of final energy[6] .

Diagram 1: Final energy consumption

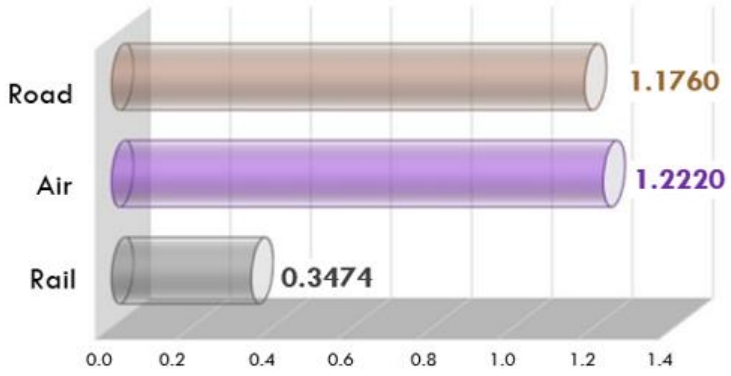


Source: OTLE-2021

Saving energy in such an energy-intensive sector must necessarily involve promoting the most energy-efficient mode of transport, those that have the lowest final energy consumed per unit of transport. Based on this definition, **rail transport** has a clear advantage over the other modes of transportation, since it is more than **3 times as efficient than air or road transport**, as shown in diagram 2, obtained from OTLE-2021:

[6] In the EU-27 countries, transport has a share of 30.8%.

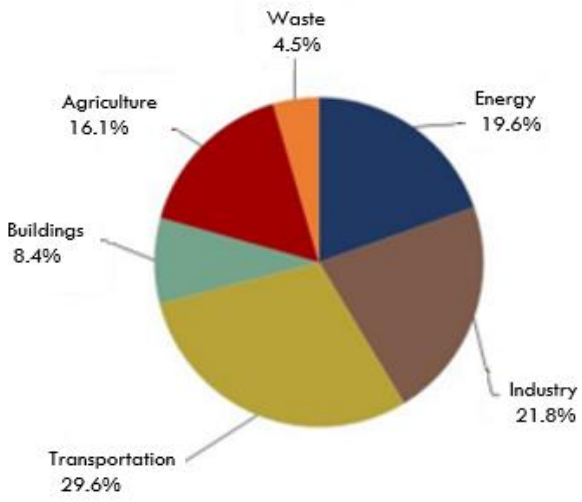
Diagram 2: energy consumption per unit of traffic (TJ/UT-km) by mode. 2019



Source: OTLE-2021

On the other hand, **transportation** is the sector with the **highest share of GHG emissions**, with 29.6%[7] of the total, ahead of the industrial sector with 21.8%.

Diagram 3: GHG emissions from transportation relative to other sectors. 2019



Source: OTLE-2021

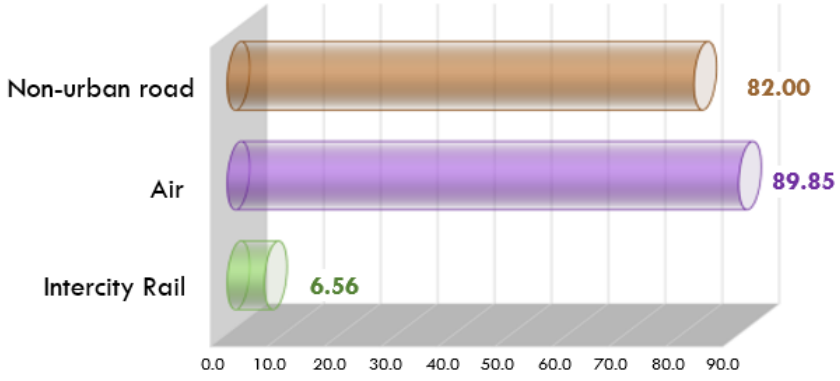
OTLE data indicates that the **total emissions of the transport sector in 2019** reached the magnitude of **91.24 million tons of CO_2 equivalent (CO_2 -eq).** Of this total amount, road transport alone has a share of 92.6%. However, **rail transport contributes only 0.3%** (0.25 million tons CO_2 -eq), behind air transport with 3.5% and maritime transport with 3.6%.

Analogous to how energy efficiency was defined above, one can speak of environmental efficiency, which consists of the ratio between GHG emissions and unit-kilometers of each mode

[7] In the EU-27 countries, transport has a share of 23.7%.

of transport. Spanish data confirms that **rail transport has a clear advantage in terms of direct GHG emissions per transport unit-km,** since it emits (according to OTLE-2021 data) approximately thirteen times less GHG than road (in non-urban pattern) and fourteen times less than air transport, as shown in diagram 4:

Diagram 4: GHG emissions per transport unit (kt CO_2 -eq/miles UT-km) by mode. 2019



Source: OTLE-2021

Given the weight of transport in both final energy consumption and GHG emissions into the atmosphere, it is clear that this sector is vital to the success of the ecological transition and the long-term decarbonization of the economy. In this sense, in order to achieve environmental sustainability, **Spain considers** the implementation of policies that **increase the modal share of the most sustainable modes of transport a priority**, by promoting public transport and multimodality and taking advantage of the options offered by digitalization.

In this context, **rail transport** is the mode of **collective transport** with the **lowest emissions** and, must therefore play a decisive role in the fight against climate change. The promotion of railroads, the **maintenance and improvement of the infrastructure**, as well as the **support for the public rail operator**, must be the backbone of **sustainable transport and mobility policies** that will contribute to achieve the objectives set by the EU and those established by the international community.

The MITMA **budget programs** that finance the Spanish railway system, **"Subsidies and support for land transport"** and **"Rail Transport Infrastructure"**, contribute to meeting the country's environmental challenges. The former finances the Public Service Obligations in the provision of passenger rail transport services, among other items. The latter, on the other hand, brings together transfers to ADIF and ADIF AV, with the aim of improving the conventional network, boosting rail freight transport, completing the high-speed rail network and improving the suburban network.

These MITMA budget programs are also in line with the main policies on sustainable transport, including the **Safe, Sustainable and Connected Mobility Strategy 2030**, and are congruent with the **objectives set out in the program for the issuance of Green Bonds of the Kingdom of Spain**

by the Spanish Treasury. Therefore, they contribute to the **environmental objectives of climate change mitigation and pollution prevention and control**, set both at national and European level, and are expenditure items aligned with the objectives of the **EU Sustainable Finance Taxonomy[8] .** Additionally, they contribute to the following **Sustainable Development Goals of the United Nations 2030 Agenda:**

- Nº9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.
- Nº11: Making cities inclusive, safe, resilient and sustainable.
- Nº13: Take urgent action to combat climate change and its impacts.

In this context, **the allocation of the Kingdom of Spain's sovereign green bond program, for the funding raised in 2021** is focused on the aforementioned budgetary programs, which constitute **public expenditure aimed at developing and maintaining the railway system for the transportation of goods and passengers.** As has been previously highlighted, this expenditure is the most efficient from an environmental point of view and greatly contributes to the **reduction of fossil fuel transportation and its environmental implications.**

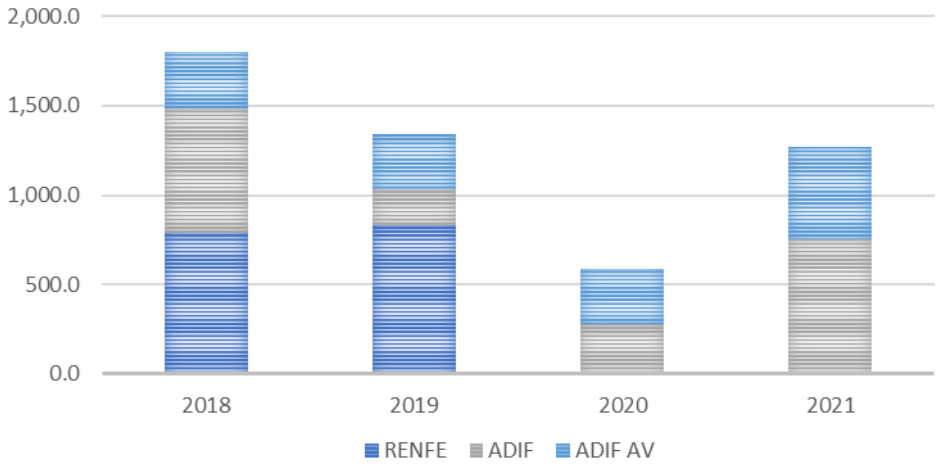
[8] The six environmental objectives are: mitigation of climate change, adaptation to climate change, protection of water and marine resources, transition to a circular economy, pollution control and protection of ecosystems.

4. ALLOCATION OF EXPENDITURES. GREEN BOND ISSUANCE 2021

Regarding the allocation of the funds corresponding to **green bond issuance in 2021**, it has been decided to **allocate all the** funds to the programs of the **Ministry of Transport, Mobility and Urban Agenda,** and, specifically, to two large groups of transfers made to entities associated with this ministry. These transfers are aimed at **promoting railways as a mode of transportation**, supporting both the deployment of rail infrastructure (ADIF and ADIF AV) and the transport activity itself (RENFE). Thanks to these initiatives, **passengers** in the Kingdom of Spain **have** a safe, efficient and **low-carbon mode of transportation.**

Specifically, **1.6153 billion euros** are allocated to the railway operator to finance the **Public Service Obligations** provided by **RENFE**, whose operating deficit is compensated via the General State Budget, and which essentially affect the commuter and conventional medium distance network. The rest of the allocation is completed with **1.9338 billion euros for ADIF** and **1.4509 million euros** for **ADIF AV**, both of which are transfers aimed at the **development and sustainability of rail infrastructure and the promotion** of **modal transfer.** Of these amounts, 25.4% correspond to programs included in the General State Budget for the year 2021 and the remaining 74.6% to the period 2018-2020.

Diagram 5: Allocation of eligible expenditure for 2021 emissions (millions of euros)



5. ENVIRONMENTAL IMPACT OF CLEAN TRANSPORTATION.

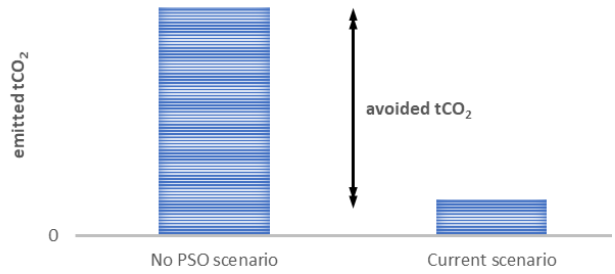
5.1. ALLOCATION TO THE RAILWAY OPERATOR FOR THE FINANCING OF PUBLIC SERVICE OBLIGATIONS.

5.1.1. Methodology

The **environmental benefits** derived from expenditures in the clean transport category are most directly manifested in the significant **savings in atmospheric emissions**, both of **greenhouse gases** (GHG) and local pollutants such as **nitrogen oxides** and **small solid particles**. To calculate the avoided emissions, the methodology- used has been the one applied by RENFE as the operator of the Public Service Obligations.

This methodology is based on **comparing the current real scenario with a hypothetical scenario** in which the railway Public Service Obligations would not exist and there would be a **modal transfer of passengers to private vehicles.** The savings in atmospheric pollutants would be obtained by comparing the emissions of both modes.

Diagram 6: CO_2 emissions avoided with the existence of rail Public Service Obligations



To calculate the environmental indicators, the unit **emission factors** for **CO_2, NO_x and PM_{10}** obtained in the **2011 Study of External Costs of Transport in Europe**[9] (CE Delft, INFRAS and Fraunhofer) were used. From these emission factors, measured in grams of CO_2, NO_X and PM_{10} per vehicle km, and the corresponding occupancy ratios (passengers per vehicle), the values needed to calculate the tons of CO_2, NO_X and PM_{10} emissions avoided are obtained. These factors are available for each country, differentiated by mode of transport, for goods and passengers.

For the calculation of the savings in tons of CO_2 , NO_x and PM_{10} , the **traffic corresponding to the Public Service Obligations** relating to the eligible contributions under the allocation report for the years 2018 and 2019 were used:

Diagram 7: Traffic corresponding to Public Service Obligations 2018-2019

[9] External costs of transport in Europe (cedelft.eu)

Traffic Million passenger kilometers	2018	2019	TOTAL
RENFE-PSO TOTAL	**8,510**	**8,440**	**16,950**
Commuter	5,794	5,807	11,601
Standard mid-distance	1,571	1,467	3,038
High speed mid-distance	1,027	1,055	2,082
Metric Width	118	111	229

5.1.2. Impact indicators

This section values the **savings in pollutant emissions** generated by the **Public Service Obligations**, **during 2018 and 2019**, since the allocation made in the 2021 Green Bonds issue has considered the transfers made in this period.

Three key indicators were chosen. In the case of GHGs, **CO_2** was chosen**;** for local pollution, the two most harmful pollutants were chosen, **nitrogen oxides (NO_x),** which includes NO_2 (linked to gasoline and diesel engines), as well as **small particles smaller than 10 microns (PM_{10}).**

Diagram 8: Impact indicators

INDICATOR	AVOIDED EMISSION TO THE ATMOSPHERE	UNITS
Sustainability	Greenhouse gases (GHGs)	Million tons of **CO_2**
Local pollution	Nitrogen oxides (NO_x)	Thousand tons of **NO_X**
Local pollution	Small particles (smaller than 10 microns)	Tons of small particles **PM_{10}**

By using the methodology described in the previous section, the **emissions avoided** thanks to passenger traffic within the framework of the **Public Service Obligations** are obtained. Diagram 9 shows the emissions savings achieved in the period 2018-2019 (years to which RENFE's allocation refers):

Diagram 9: Emission savings from PSOs 2018-2019.

PSO AVOIDED EMISSIONS	2018	2019	TOTAL
CO_2 (Million tons)	1.58	1.56	**3.14**
No_x (Thousand tons)	5.19	5.15	**10.34**
PM_{10} (Tons)	178.80	177.30	**356.10**

5.2. ASSIGNMENT TO INFRASTRUCTURE MANAGERS FOR THE DEVELOPMENT AND SUSTAINABILITY OF RAIL INFRASTRUCTURE

5.2.1. Methodology

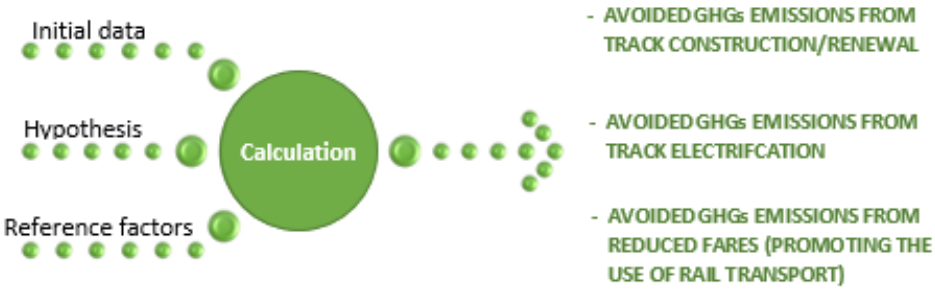
The methodology used by railway managers is based on the calculation of **GHG and local pollutant emissions savings** resulting from the modal shift of passengers and freight from road to rail achieved by several initiatives, in particular the following: the construction of km of new railroad tracks, track renewal, track electrification and the application of reduced fares to railway operators.

The calculation accounts for the modal shift that occurs when **new sections of track** are built, or the use of more polluting modes of transportation if the existing tracks were not renewed. It also considers the **sections that are electrified** and can thus be used by electric traction trains, which are much less polluting. Finally, the modal shift that would occur if the **reduced fares** were not applied is also considered.

The initial data used is kilometers of track built, renewed, electrified and their associated use in the period of 2018-2021. The train-km that benefit from reduced fares in 2021 are also considered. GHG and local pollutant emission factors (obtained from the EMEP/EEA of the **Emission inventory guidebook 2019[10])** are applied to them**,** differentiating by mode of transportation, for freight and passengers. Finally, the savings in emissions are obtained from the difference between the current scenario and the hypothetical scenario of modal shift without the use of railways.

Diagram 10: Diagram of the methodology used in calculating avoided emissions

[10] EMEP/EEA air pollutant emission inventory guidebook 2019 — European Environment Agency (europa.eu)



It is important to highlight three methodological clarifications regarding the results obtained. Firstly, to calculate the environmental benefit of ADIF's actions, train traffic operating under the Public Service Obligations operated by Renfe Viajeros has been excluded, which have already been considered in the calculation of emissions avoided by RENFE in section 5.1.1, in order to avoid double counting emissions savings.

Secondly, all the newly constructed sections are electrified, so there could be a double counting of the environmental benefit obtained by electrification and new track construction actions. To avoid this problem, the electrification has been taken into account when calculating the environmental benefits of newly constructed sections. For these newly constructed sections, the emission factor corresponding to electric traction rolling stock has been used. For sections that were not newly constructed and were only electrified, the environmental benefits have been calculated as the difference between the use of diesel and electric machines.

Lastly, when building and renovating track or electrifying existing track, it must be considered that these are infrastructure investments. This means that the savings that will be made during the lifetime of the investment must be considered. These savings have been estimated over a period of 30 years, in line with the **EU Regulation 480/2014[11],** which is widely used for this type of calculations. For this purpose, the calculation has been based on the real values of savings during the period of 2018-2021 and it has been assumed that emissions are reduced linearly by 90 % until 2051, in line with what is indicated by the European Commission and Spain's long-term decarbonization strategy.

5.2.2. Impact indicators

5.2.2.1. Physical Performance Indicators

In line with the **basic principles of the "Harmonized Framework for Impact Reporting Handbook"** (June 2022 edition) **published by ICMA,** and more specifically those proposed for the evaluation of sustainable transport expenditure programs, the following physical indicators have been established to reflect **the impact** that the Green Bonds have had on the Spanish **railway system:**

[11] EUR-Lex - 32014R0480 - EN - EUR-Lex (europa.eu)

- **km of track built** or **renovated,**
- **km of electrified track**,
- and **train-km** that have benefited from the fare reduction.

Km built or renovated

In the case of ADIF, the kilometers renovated have been used, while for ADIF AV, the kilometers of track put into service between 2018 and 2021 have been used. Therefore, the kilometers built or renovated are shown in Diagram 11:

Diagram 11: total kilometers built by ADIF and ADIF AV in the period 2018-2021.

Manager	2018-2021	% of total network (2021)
ADIF	400.8 km	3.38%
ADIF AV	452.4 km	12.14%
TOTAL km built or renovated	**853.2 km**	**5.47%**

It should be noted that this data doesn't include renovations that are considered less than "integral renovation".

Km of electrified track

The km of new electrified track are 22.8 km. This number does not take into account the electrification of tracks that are already included in the Km built or renovated section above.

Train-km

The train-km that have benefited from fare reductions have been used as an activity indicator, thanks to the contributions made by MITMA to ADIF AV in 2021 for this end[12] .

Train-km running on the ADIF AV network in 2021 totalled 44,839,870 train-km.

Out of the total activity of infrastructure managers, only the part that corresponds to the activities in the 2018-2021 period that have been allocated to Green Bonds must be considered. For ADIF, this amounts to 34.53% of their total funding sources. For ADIF AV, the public transfers allocated to Green Bonds accounted for 21.15% of funding. Also, for ADIF AV, the allocated

[12] It is interesting to highlight that the use of the network has been influenced by aspects external to the railway manager's management during 2021, among which the most significant is the reduction in mobility motivated by the COVID-19 pandemic.

amounts assigned for fare reduction in 2021 accounted for 2,73% of ADIF AV's total funding for that year. Therefore, the overall impact obtained from the Ministry of Transport, Mobility and Urban Agenda's contributions in the period is as follows:

- **234.1 km built or renovated.**
- **5.9 km of electrified track.**
- **1,223,052 train-km** that have used the network during the period and have benefited from **reduced fares**.

5.2.2.2.2. Environmental indicators

The activity indicators listed in the previous section have an environmental benefit for society, the direct expression of which is the reduction of atmospheric pollution.

To measure this environmental benefit, the same environmental indicators as the railway operator (RENFE) have been used. Specifically, GHG emissions savings in tons of CO_2, nitrogen oxides (NO_X) and small particles smaller than 10 microns (PM_{10}).

As indicated in section 5.2.1, the calculation of emissions avoided with the construction, renovation or electrification of track has been carried out considering the actions executed in the period 2018-2021. For this we have used the real traffic circulating on the track as well as the emission coefficients of the current vehicles. Based on this, a projection has been made for the future, considering a30 year period as the useful life of these investments, in line with the **EU Regulation 480/2014**.

Diagrams 12 and 13 summarize the emissions savings from ADIF and ADIF AV actions referred to in section 5.2.2.1 of this report:

Diagram 12: Emissions avoided by construction, renovation and electrification of tracks

	tCO_2	tNO_x	tPM_{10}
ADIF	3,338,312	33,876	971
ADIF AV	399,655	3,049	99
TOTAL	**3,737,967**	**36,925**	**1,071**

Diagram 13: Emissions avoided by the application of reduced fares

	tCO_2	tNO_x	tPM_{10}
ADIF	0	0	0
ADIF AV	28,246	137	5
TOTAL	**28,246**	**137**	**5**

ANNEX. SUMMARY OF INDICATORS. GREEN BONDS 2021 ISSUE OF THE KINGDOM OF SPAIN

Main performance and environmental impact indicators.

CLEAN TRANSPORTATION 	INDICATORS						
	Physical-Performance				Environmental		
	Built or renovated track (km)	Electrified track (km)	Train-km benefited from reduced fares	Passenger-km (Millions)	Avoided CO_2 emissions (Million tons)	Avoided N_{ox} emissions (Thousand tons)	Avoided PM_{10} emissions (Tons)
Renfe Viajeros for compensation of Public Service Obligations*	-	-	-	16,950	3.14	10.34	356
Infrastructure managers for development and sustainability of rail infrastructure**	234.1	5.9	-	-	3.74	36.93	1,071
Infrastructure managers compensation for reduced fares***	-	-	1,223,052	-	0.03	0.14	5

** The pollutant emissions avoided by the public operator refer to the years 2018 - 2019 (according to section 5.1.2).*

*** For the emissions of pollutants avoided by the development and sustainability of the infrastructure, a lifetime period of 30 years has been considered, in line with the EU Regulation 480/2014 (according to section 5.2.1).*

**** The indicators refer to the year 2021 (according to section 5.2.2).*