GHG REPORT
2023

SUSTAINABILITY TAKES SHAPE

FERROVIE DELLO STATO ITALIANE

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004 **Foreword and report objectives**

006 **Milestones**

008 A positive path

009 **Towards Net Zero and Water Security**

010 FS Group's objectives in a changing world

012 Towards climate net zero and a responsible use of water resources

015 FS Group structure and the management of environmental impacts

020 **The pillar projects**

020 The FS Group's key initiatives

032 Environmental Management
034 FS Italiane's Sustainability Governance Model
035 Stakeholders: a shared path

038 Measuring sustainability
038 Tracking emissions: details of the journey to net zero
040 Emissions
045 Methodology: measuring emissions to evaluate the distance to net zero
047 Energy consumption

050 The water resource
050 Withdrawals and Water Security
050 Drains and Water Security
051 Water consumption
051 Recycling and Water Security

FOREWORD AND REPORT OBJECTIVES

The IPCC's latest summary report, presented on 20 March 2023, leaves little interpretation as to the direction indicated by the data collected: the increase in global warming over the decade 2011-2020 is +1.1 °C, compared to pre-industrial levels. This trajectory is not compatible with the goals set by the 2015 Paris Agreement, as it places many ecosystems and the populations dependent on them in grave danger of survival and unable to adapt to change. Unfortunately, we have directly experienced some of them in our own Country, such as the severe floods in northern Italy and persistent droughts in the south, which also affected northern regions. While some changes are now irreversible, the IPCC report also highlights how research and technology are capable of providing an increasing number of solutions and opportunities to halt - if not reverse - the course.

The FS Group does not intend to shy away from this challenge, and has implemented strategies and solutions to combat climate change, in synergy with its primary goal and purpose: transport. As the Country's leading energy consumer, the Group's prioritizes projects aimed at phasing out fossil fuels, through network electrification, fleet renewal with more green vehicles, energy efficiency, experimenting with the use of alternative fuels such as HVO, energy production from photovoltaic plants, and recovery of the energy produced when trains are braking.

Water resource management is also one of the key goals of FS Group's sustainability policies, by making its use efficient, treating wastewater before putting it back into the environment and, whenever possible, adopting collection, purification and reuse systems.

Based on circular economy principles, the transport sector must be - and is being - rethought by focusing on two strategic paths simultaneously: a greater integration of the various mobility systems, and vehicles and infrastructure development in a life-cycle perspective, considering both the materials used and the quality of the energy sources employed.

FS Italiane's constant commitment - achieved also through agreements and collaboration with international bodies dealing with transport and climate change management - is proven by the latest certifications obtained. They attest to the dedication, transparency and robustness with which environmental issues are managed: in 2024 the Group's decarbonisation targets were validated by the Science Based Target initiative (SBTi), and it obtained the ISO 14064 and ISO 14083 certifications, which concern the methods for calculating CO_2 emissions and the reporting of greenhouse gas emissions.

Purpose of Ferrovie dello Stato Italiane's GHG Report - which in 2024 reaches the 4th edition - is to investigate the impact of the Group's activities on the environment, with a particular focus on climate-altering gas emissions and the use of water resources. The document stems from the Carbon Disclosure Project (CDP) questionnaire - Climate Change and Water Security - the tool adopted by FS Italiane to monitor and assess its commitment to decarbonisation goals, and mitigate its impact on climate change and water availability and quality.

This document continues the gradual process of integrating the recommendations of the Task Force on Nature-related Financial Disclosures (TNFD) on disclosing information on nature-related risks, by extending it to water resource management issues.

The document illustrates the Group's environmental impacts, objectives, strategies, actions and performance with an informative approach. Climate change and water scarcity pose major challenges, and everyone needs to understand the magnitude of these challenges, because only a shared commitment can bring concrete results.

MILESTONES

FS Group's commitment to the environment and the effects its activities have on climate and water resources began a long time ago.
This a journey that gradually accelerated over the years in terms of choices made, actions, and commitments undertaken toward the community, and went so far as to include carbon neutrality within the Group's strategic objectives and the definition of a multi-year decarbonization plan, concerning all its individual business activities.

2001

First Environmental Report

2008

First Sustainability Report

2010

Introduction of the green ticket

2011

Publication of the Group's first environmental policy

2013

FS' first ISO 14001 certification

2015

Underwriting of UIC's Rail Climate Responsibility Pledge

2017

First Green Bond issued

Adherence to the UN Global Compact

2019

Definition of long-term corporate climate objectives

First CDP Climate reporting

Underwriting of the UIC Railway Climate Declaration

Publication of FS Group's First Sustainability Policy

2020

Publication of the first GHG Report

Publication of the first CDP Climate Change

2022

Definition of strategic objectives concerning environmental aspects

2023

First CDP Water Security reporting

First ISO 14064 certification for the Group data

2024

First declaration of compliance to ISO 14083 requirements

Validation of medium- and long-term decarbonisation targets by SBTi

First CDP integrated reporting

A positive path

Figure 1 - FS Group CDP Climate Questionnaire Evaluation

2019 was FS Italiane's first reporting year on the CDP platform, and it was useful to frame the Group's performance in the questionnaire and rating scheme.
From the second year onwards, the goal was to improve and consolidate the positioning also through **complete, public and transparent reporting to stakeholders** and **engagement by top management**. With these elements, **a marked improvement in the rating** attributed to the FS Group by CDP has been achieved, reaching **Level A-** (Leadership range) in the second year, and B in the third, in a post-pandemic context where, on average, European and transport companies settled on Level **B** (in 2021).
On the strength of the new **Industrial Plan**, especially focused on climate issues, in **2022 the FS Group scaled up once again the Leadership range**, thus surpassing the European and railway sector average.
Thanks to the experience gained and the progressive bridging of some gaps, the Group is consolidating its leading role in contrasting climate change, and in 2023 confirmed a positive A- rating, higher than the European and sector average.

To achieve these goals and always strive for improvement, FS Italiane has increasingly involved its stakeholders in various ways:

- **Sustainable Supply Chain Management** to improve and monitor the **ESG profile of economic operators and suppliers**, also through desk and on-site auditing activities
- **ESG KPI Catalogue** included in tender specifications and among Qualification and Vendor Rating Systems requirements
- Processes and tools for **systematic verification of the suppliers' sustainability** during the awarding and qualification phase of tenders and subsequent implementation
- Monitoring and improvement of the ESG profile of 100%[1] of economic operators included in the supplier qualification system integrated with 2026 ESG criteria

Since 2023, the FS Group has also started reporting on water issues according to CDP schemes.
Transparency and **quality of climate reporting, involvement of all organisational levels** and **sustainability strategy**: these are just some of the elements recognised as FS Group's **strengths** and represent the foundations of the path taken to date and projected into the future.

1. *Of the suppliers included in the qualification system.*

TOWARDS NET ZERO AND WATER SECURITY
Objectives and strategies

GROUP HIGHLIGHTS

to contrast climate and water impact

Electrification of over 1,800 km of railway network in 10 years	**By 2030 (baseline 2019)** • **-50% emissions scope 1+2** • **-30% emissions scope 3**
Self-generated energy from renewable sources by 2040 • **1 GWp by 2028** • **2 GWp by 2030**	**Specific emissions 2033 vs 2019** • **freight -60%** (CO_2 e/tonne-km) • **passengers -65%** (CO_2e/pass-km)
Energy consumption from renewable sources • **45% by 2028** • **70% by 2033**	**80% green buses in the fleet by 2033** **electric or alternatively powered buses**
Modal shift enhancement	**Fossil fuels phase out** in plants and vehicles, replaced by **biofuels** and **energy from certified renewable sources**

-50% water consumption by 2040 compared to 2019

20% share of water used from recovered sources by 2040

100% monitored water network for leakage identification and management by 2028

The transport sector has a significant impact on climate change, contributing about a quarter of global greenhouse gas emissions. The Group is aware of its role in this scenario, therefore, in addition to the commitment it has already undertaken on specific climate targets, in 2023 it also included in its business strategy those related to the management and responsible use of water resources.

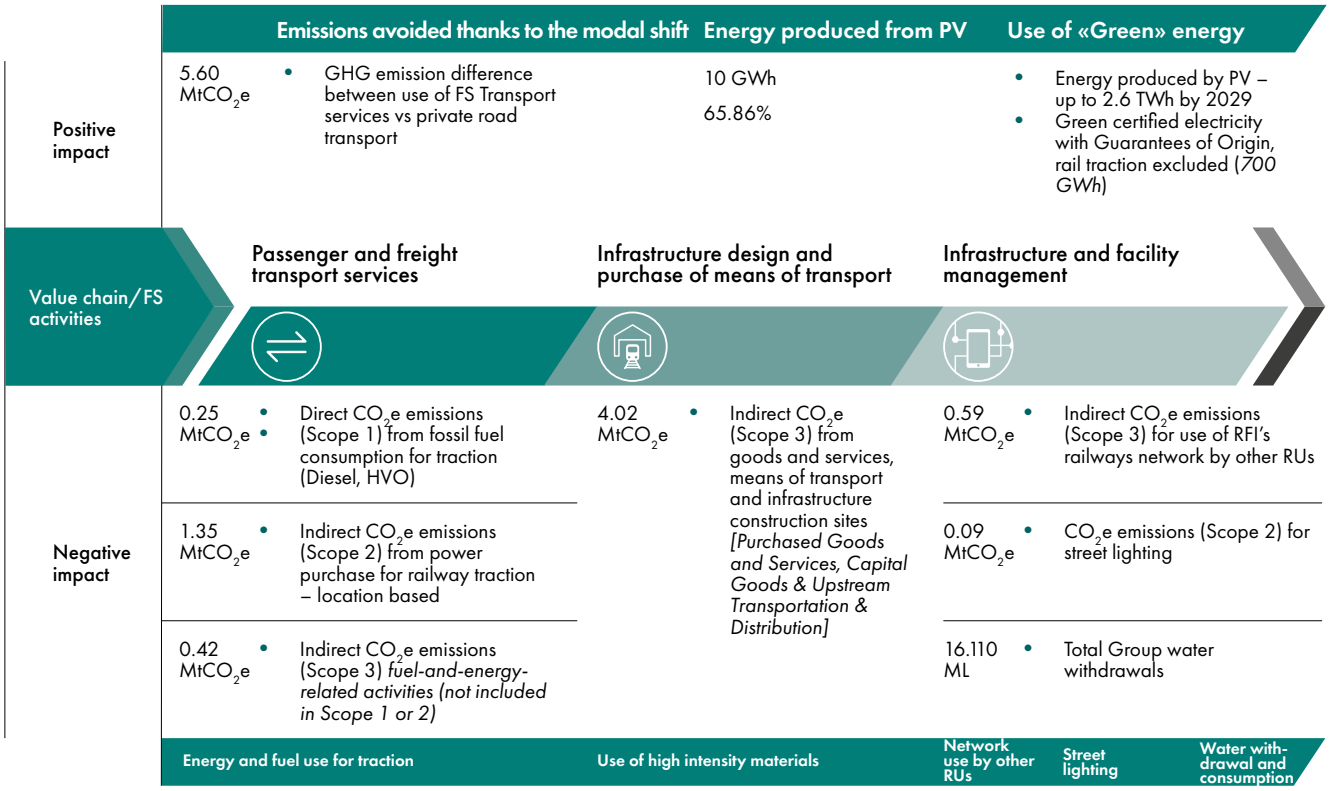


Figure 2 FS Group climate impact and water withdrawals

The certified positive results prove FS Italiane's commitment to give substance to its commitments to combat climate change, by timely planning objectives and developing careful strategies.

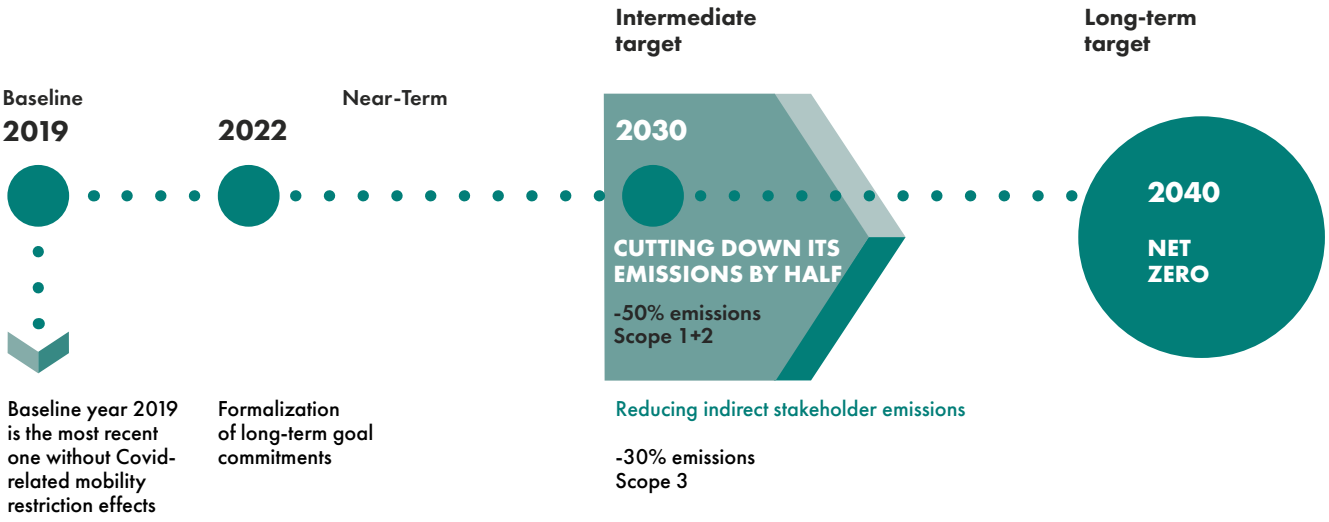
FS Group's objectives in a changing world

The term **net zero** refers to the complete zeroing of CO_2 emissions along the entire supply chain, both nationally and internationally.
With the aim of transforming the EU economy in a sustainable and resilient way, the **European Green Deal** has mapped out the path to net zero by setting a medium-term and a long-term target.

The former **forecasts at least a 55% reduction of emissions by 2030** compared to 1990, while **the latter sets 2050 as the deadline** to become a net-zero-emissions economy, by concretely acting in line with the Paris Agreement target of COP 21 (2015) to limit global warming to +1.5°C compared to the preindustrial era by the end of the century.

When we talk about **carbon neutrality**, we refer to projects and activities aimed at reducing and offsetting the carbon emissions of a company, an activity, a service, or a product.
On the other hand, the **net zero** concept emphasises the balance between production and emission reduction, in order to achieve zero net emissions, in line with the decarbonisation scenario recognised by the scientific community.

FS Group's net zero targets



FS Group has set its **long-term net zero target**, which is to achieve zero net emissions by 2040, thus anticipating the EU's decarbonisation ambitions by a decade. To achieve this, it has drawn up a programme of initiatives and defined a mid-term target by 2030 which consists, with reference to the 2019 baseline, of cutting down scope 1 and scope 2 emissions by half, and reducing scope 3 emissions by 30%.

In 2022, FS Italiane signed the Commitment Letter to certify the targets with SBTi (Science Based Target initiative), which validated them in early 2024. SBTi is a leading international reference body for the validation of environmental sustainability targets aligned with the Paris Agreements.

Towards climate net zero and a responsible use of water resources

In order to achieve its goals, the Group is moving along several lines: a progressive decarbonisation and reduction of emissions; building reliable and climate-resilient infrastructures and vehicles; protecting biodiversity, and minimising consumption and resources, starting with water.

Decarbonisation through photovoltaic electricity
Decarbonisation is pursued through various projects aimed at increasing the electrified railway network, reduce the use of fossil fuels, and use energy from certified renewable sources.

The construction of **photovoltaic power generation plants**, which will allow **40% of the company's annual electricity needs** to be met, and the testing of **HVO biodiesel fuel**[2], which allows regional trains to be driven on non-electrified lines, play a crucial role in this sense.

2. HVO (Hydrotreated Vegetable Oil) is a non-fossil and circular fuel produced from waste and renewable raw materials such as waste cooking and vegetable oils, residues from the agro-food industry, etc.

2022

Launch of FS's renewable energy plan

2024

Installation and grid connection of solar farms, with a capacity of 21 MW

2032

Installation of renewable generation plants with a 2 GW capacity

Sustainable and climate resilient infrastructure and efficient transport systems

Resilient infrastructures and efficient transport systems are success factors on the path to achieve net zero objectives. Specific programmes were defined in response to the physical risk from climate change, to improve the service performance and reliability, reduce emerging climate-induced costs and enhance traffic safety. The objective of the climate adaptation and resilience program is to manage the uncertainty of the impact of these changes, by identifying and planning the most appropriate physical interventions on the infrastructure network in a proactive manner.
To strengthen the achievement of a prospective a sustainable infrastructure and mobility system, FS Group resorts to dedicated instruments, such as Green Bonds and investments of the National Recovery and Resilience Plan (NRRP). These are intended to promote rail transport, contributing significantly in terms of **modal shift** from private road transport to rail transport, with a consequent reduction in emissions.

Network electrification and High Speed trains extension

Connectivity and integration within the context and other modes of travel

Implementation of resilience and adaptation interventions

Conscious water management

FS Group considers it essential to manage water resources in the best way possible, in order to face the challenges of climate change, as these will also affect the availability of water and its quality.
This entails an ever-increasing commitment to improving the quality of water discharges and safeguarding the quality of the water supplied, through regular checks and quality monitoring on the water network and at supply points, thus ensuring access to drinking water for employees, workers and customers, and a sustainable water management.
The total volume of water withdrawn by the Group during 2023 was just over 16 million cubic metres.

16.1 million
cubic metres in 2023
Water withdrawals
decreased compared to 2022

equivalent to the annual water consumption of a conurbation with approximately **185,000 residents**

The importance of water as a primary resource is well known. The UN 2030 Agenda has set several targets on water resources and the European Union has also identified it as one of the main elements to be monitored.

This is why water efficiency is part of FS Italiane's strategy, and has become **one of the pillar projects** supporting its environmental commitment.

2 MILLION EUROS INVESTED IN GREEN ENERGY, ENERGY EFFICIENCY, AND WATER EFFICIENCY

The Officina Nazionale Mezzi d'Opera (ONMO) in Catanzaro is a pilot plant for the design and implementation of a system to reuse internally purified wastewater for industrial use only; a total investment of 2 million Euro for an 80% saving in annual water consumption and other energy efficiency measures.

BIODIVERSITY IN FS GROUP'S ENVIRONMENTAL STRATEGIES

For years, the FS Group has adopted a Sustainability Policy and a specific Environmental Policy that promote the adoption of sustainable practices within the activities and services managed and the reduction of negative impacts on the environment and biodiversity. The commitments undertaken aim to stimulate the diffusion of a model capable of **reducing and making efficient use of resources**, alleviating the pressure of its activities on habitats, by guaranteeing and restoring biodiversity, and consciously managing a precious commodity such as water.

The commitment to environmental protection is also ensured by the Parent Company and its main subsidiaries, through the adoption of **certified environmental management systems compliant with ISO 14001:2015**. These systems allow the identification, monitoring and management of environmental impacts related to the activities and services provided.

Each operational site manages activities in respect of environmental matrices, eliminating or minimising the environmental impact, adopting risk mitigation strategies and emergency management procedures, in compliance with legal provisions to assess whether a state of contamination of soil, subsoil or groundwater exists. The presence of some soil impairment situations relates to historical contamination that has come to light during works or periodic monitoring activities, and which concern sites that have been used for industrial and commercial purposes in the past.

In addition, in 2023, all incidents involving spills of hazardous substances not directly attributable to Group companies (such as, for example, spills of fuel or hazardous liquids by road transport vehicles or rail vehicles using the road or rail infrastructure) without causing any damage to the environment.

FS biodiversity management principles

- Avoiding building unnecessary infrastructure by evaluating all available alternatives and, if possible, ensuring that the route does not involve areas where protected natural areas or endangered habitats are present;
- Preliminarily assessing the environmental factors involved, identifying potential risks to biodiversity;
- Developing mitigation strategies by identifying appropriate measures to minimise, or even eliminate, any direct or indirect, short-, medium- or long-term effects or impacts on plant and animal populations, habitats and site integrity, both during the construction phase and subsequently during operation (e.g. wildlife passages, fencing, noise barriers);
- Restoring or creating new habitats to compensate for those lost due to infrastructure construction works, and re-establishing the overall biodiversity value;
- Assessing the project resilience, i.e. the ability to withstand and adapt to disturbing or catastrophic events caused by extreme weather, natural disasters or other critical scenarios.

FS GROUP STRUCTURE AND THE MANAGEMENT OF ENVIRONMENTAL IMPACTS

FS Group is the leading national player, and one of the most important transport companies at European level. It encompasses several companies, grouped into specific business units, with homogeneous missions and objectives.

INFRASTRUCTURE Business Unit

It deals with the design, construction, management and maintenance of infrastructure networks for rail, road and motorway transport, nationally and internationally.

PASSENGER Business Unit

It ensures the supervision of the passenger transport sector, nationally and internationally.
It develops the integrated offer of products and services, and promotes and manages initiatives in the field of passenger transport through an articulated mix of distribution channels.

LOGISTICS Business Unit

It supervises the logistics and freight transport sector at national and international level.
It deals with the promotion, implementation, management and sale of initiatives and services related to mobility and freight transport.

URBAN Business Unit

It manages activities in the field of real estate and deals with urban regeneration and inter-modal and logistics solutions in urban areas, for the first and last stage of the supply chain.

Figure 4 - FS Group business areas

The **large territorial presence** of the different business areas, combined with the **significant use of energy resources** necessary to carry out their activities, in addition to water consumption, produce an impact on the environment, with two consequences to consider: one on the community and one on the economic societal level.
The **collectivity**-facing consequence concerns the well-being of the entire community, both those who work for the Group and those who live in the territories where FS Italiane carries out its activities or part of them.
While **economic** consequences concern the high costs that the environmental impact produces for the Group, which are manifested when it is called upon to adapt and be resilient against increasingly extreme and frequent weather events. This circle can be broken by turning risk into an opportunity to study new solutions, to make rail, road or maritime transport more sustainable. This is the direction the Group has undertaken also during 2023.
For these reasons, FS Italiane has opted to include climate objectives and safe and conscious management of water resources in its Industrial Plan.

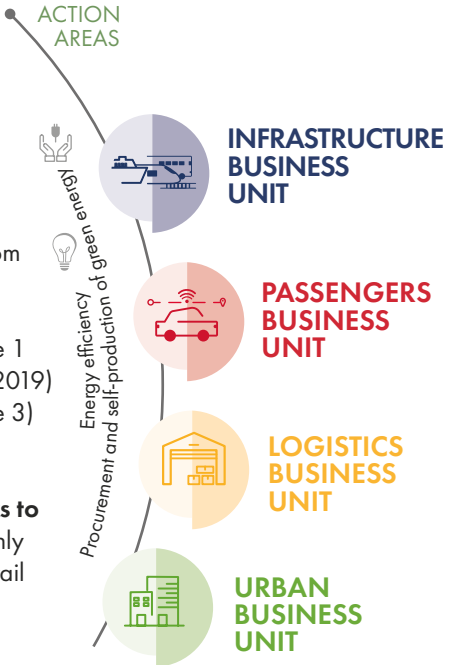
JUST TRANSITION AND ECONOMIC TRANSITION

The possibility of self-producing electricity contributes to solving the issues related to the difficulty of finding energy, which have arisen as a result of the recent geopolitical instability, and which have **heavy repercussions on costs**: in recent years, the increase in energy prices has had a significant impact on the total operating expenditure of companies.
This can translate into higher costs, making choosing train transport more difficult for the **most disadvantageous groups**.
The transition to a green economy should not leave anyone behind in the process of change: securing a source of energy, and thus a fixed and controlled cost, is a step in this direction of fairness.

This is why, in 2023, the FS Group, in partnership with the Fondazione per lo Sviluppo Sostenibile, has undertaken the *Just Transition project in the transport sector*, with the aim of promoting consideration of the social and distribution impacts of adopting climate change mitigation and adaptation measures.
As part of this initiative, FS organised two workshops involving representatives of various categories (authorities and institutions, the scientific community and civil society organisations, etc.), to initiate a discussion on the topic of the just transition in mobility. The work led to the publication, in early 2024, of a document summarising the main considerations discussed in the workshops, and is available on the fsitaliane.it website.

CLIMATE CHANGE

≈2.6 TWh self-produced from photovoltaic energy – 40% electricity requirements
-50% CO_2 emissions (scope 1 and 2) **by 2030** (baseline 2019)
-30% CO_2 emissions (scope 3) **by 2030** (2019 baseline)
Over 50 m tonnes of CO_2 avoided in ten years **thanks to railways and buses** (roughly 50% due to the increase in rail traffic compared to 2021)



- Extension of HS network through the construction of new lines
- Electrification of the network
- Actions for the resilience of the infrastructure and climate change adaptation
- Extension of connectivity through integration of the railway network with other infrastructure and towns
- Development/upgrade of connections between railways and other modes for ever more integrated services
- Acceleration of road digitalisation and connectivity (Smart Roads)

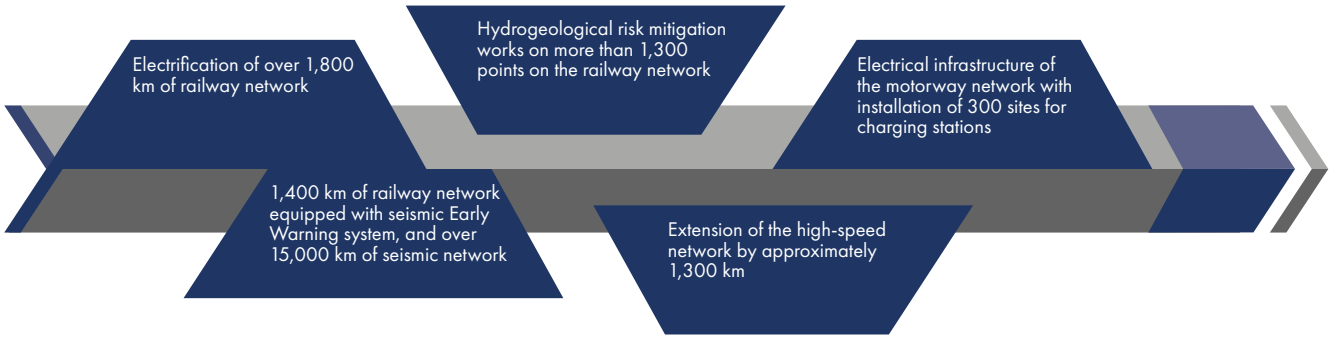
- Fleet renewal with electric, hybrid, methane and battery-powered vehicles
- Use of low environmental impact fuels
- Actions to improve energy efficiency of fleets, plants and depots
- Modal integration solutions (including digital technology with a view to MaaS)

- Fleet upgrades
- Introduction of alternative solutions for powering engines
- Initiatives to improve energy efficiency of lighting and heating systems
- Analysis of cap&trade systems

- Redevelopment of abandoned railway areas for the production of renewable energy
- Construction of parking lots supporting the modal shift
- Reactivation of abandoned railway areas to be used for first and last mile logistics

INFRASTRUCTURE BUSINESS UNIT

At the infrastructure level, the focus is on implementing interventions to improve resilience and adaptability to climate change, along with the **Smart Rail** - a fibre optic backbone for digital monitoring of the railway infrastructure, capable, for instance, of launching hydrogeological alerts to intervene in good time.
In order to **cut energy consumption and reduce emissions**, major work has been undertaken to expand the electrified railway network and to make charging stations available along the motorway network for electrically powered cars, which can thus cope more comfortably with long journeys.
Among the pillar projects to support the net zero target path, there is the **construction of photovoltaic plants for self-generation of electricity**, coupled with interventions and studies for reducing consumption.

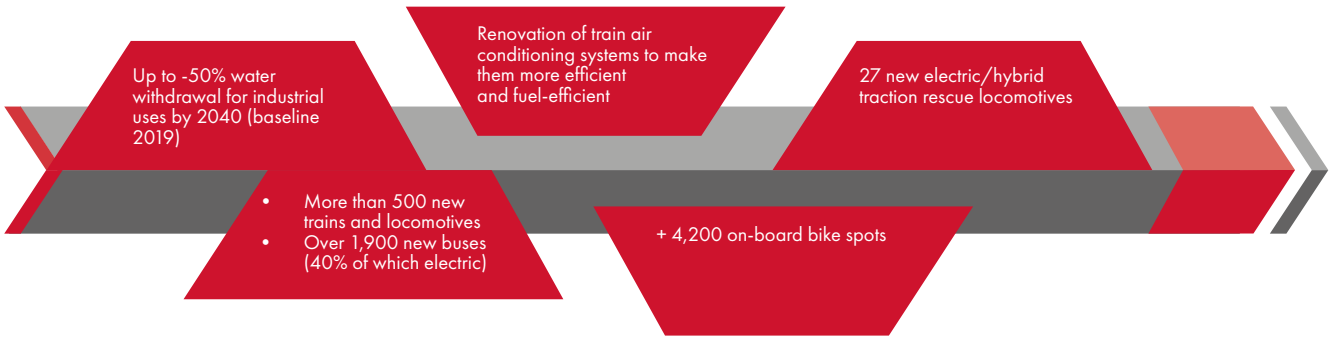


PASSENGER BUSINESS UNIT

The Passenger Business Unit modified and expanded its service offering to make it more sustainable.
Some of the interventions include an **initial phase-out of fossil fuels** for buses and trains, by experimenting with **sustainable fuels such as hydrogen and HVO** - a biodiesel produced from waste and renewable raw materials - and the use of **electricity from renewable sources** to power LEDs, compressed air and building automation systems and so on.

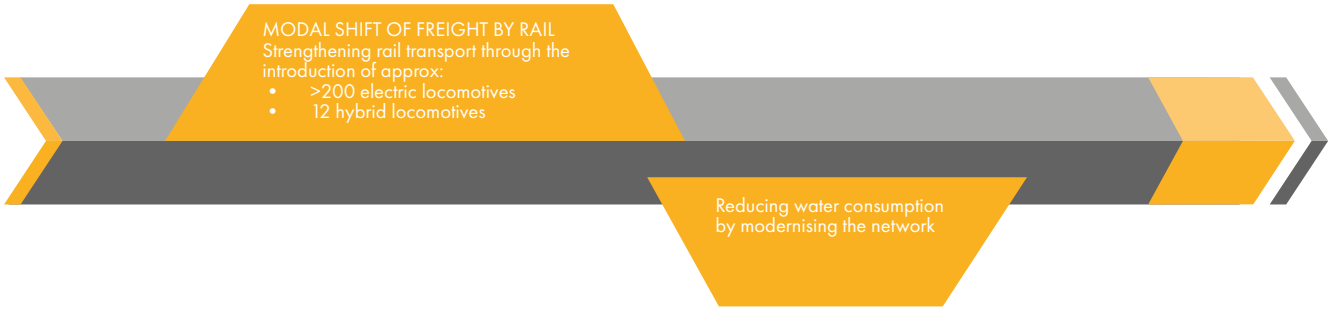
The bus and train fleet also saw a **progressive replacement of old vehicles with new, more efficient** and less-consuming vehicles during 2023. FS Group prioritizes the electrification of its fleets and, where this is not possible, climate-friendly options to power its vehicles, such as HVO. The **modal shift** is also supported by the development of rail-road plans.

On the water consumption side, the Passenger Business Unit has initiated **Water Circular Economy** projects to reduce water withdrawal for industrial purposes.



LOGISTICS BUSINESS UNIT

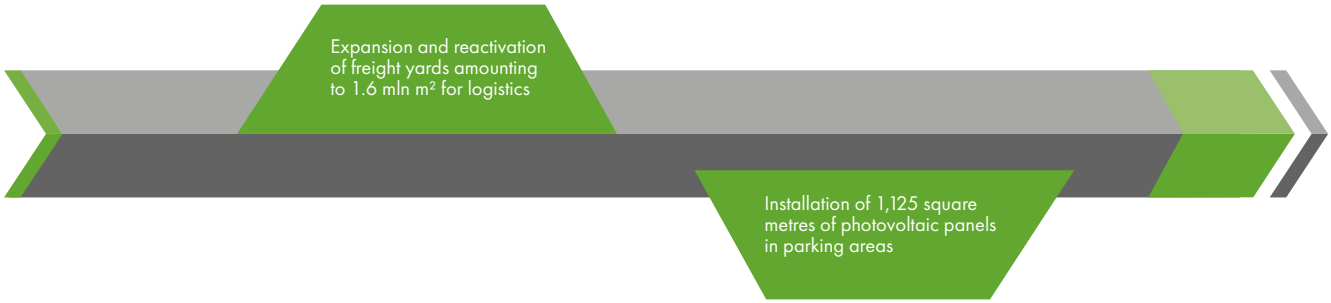
To stimulate rail freight transport, **new, environmentally friendly rail terminals** were built, directly connected to the main commercial hubs, and new, more efficient vehicles were introduced.
In 2015, the UIC launched a challenge for the transport sector, within the green growth agenda framework and the climate change perspective, for 2030 and 2050: the Low Carbon Rail Transport Challenge. The Group joined by involving its Logistics business area in a **modal shift freight** project, which concerns the shift of transport activities towards low-carbon rail transport.



URBAN BUSINESS UNIT

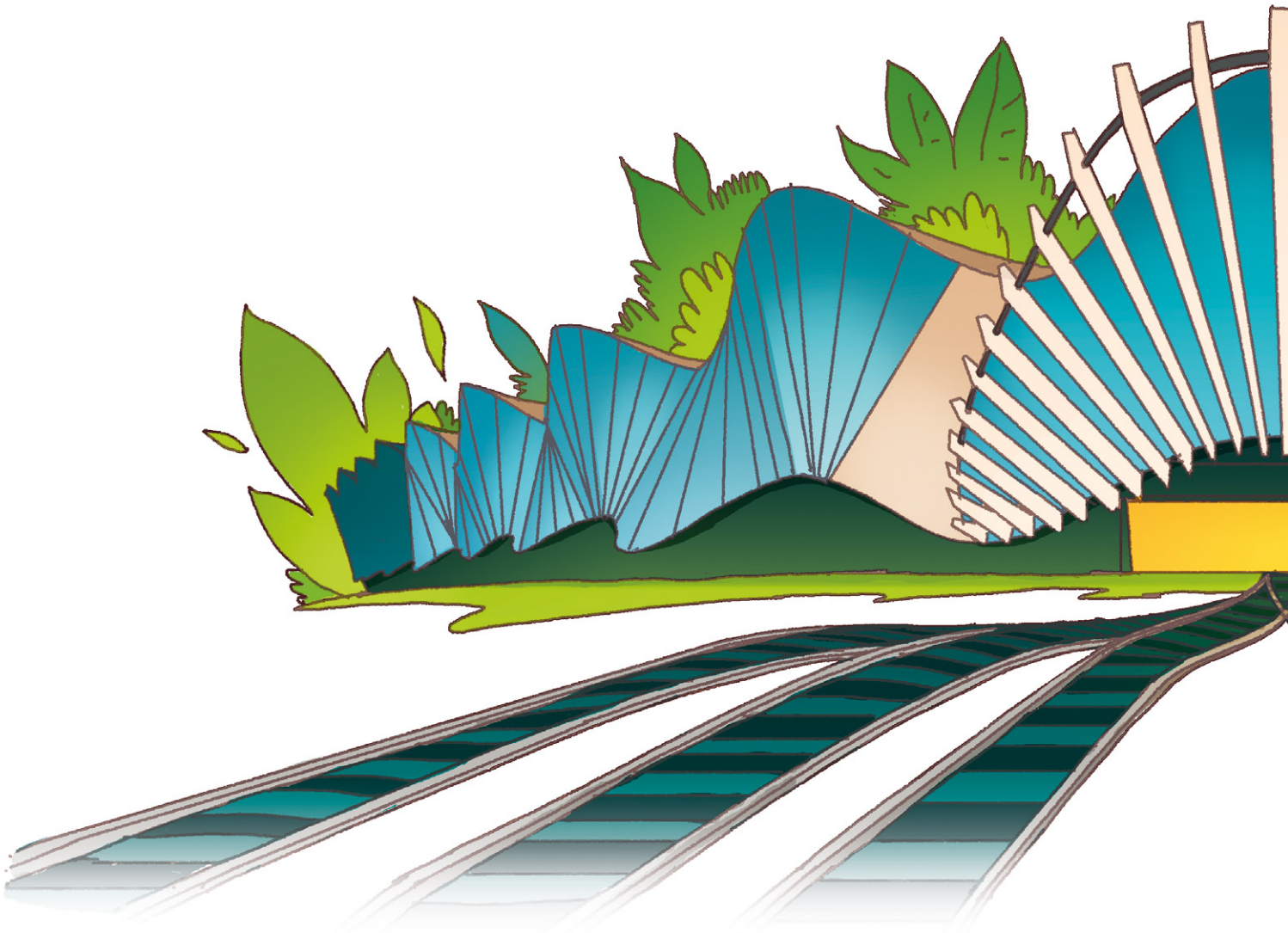
The Urban Business Unit made available areas no longer used for railway operations to **be construct photovoltaic plants**, which can produce green energy for the Group.

It has increased the supply of parking spaces to promote and encourage a modal shift, by installing photovoltaic panels to power the LED lighting of these spaces.
Expansion and reactivation of freight yards have been initiated to promote and support first- and last-mile logistics.



THE PILLAR PROJECTS
The FS Group's key initiatives

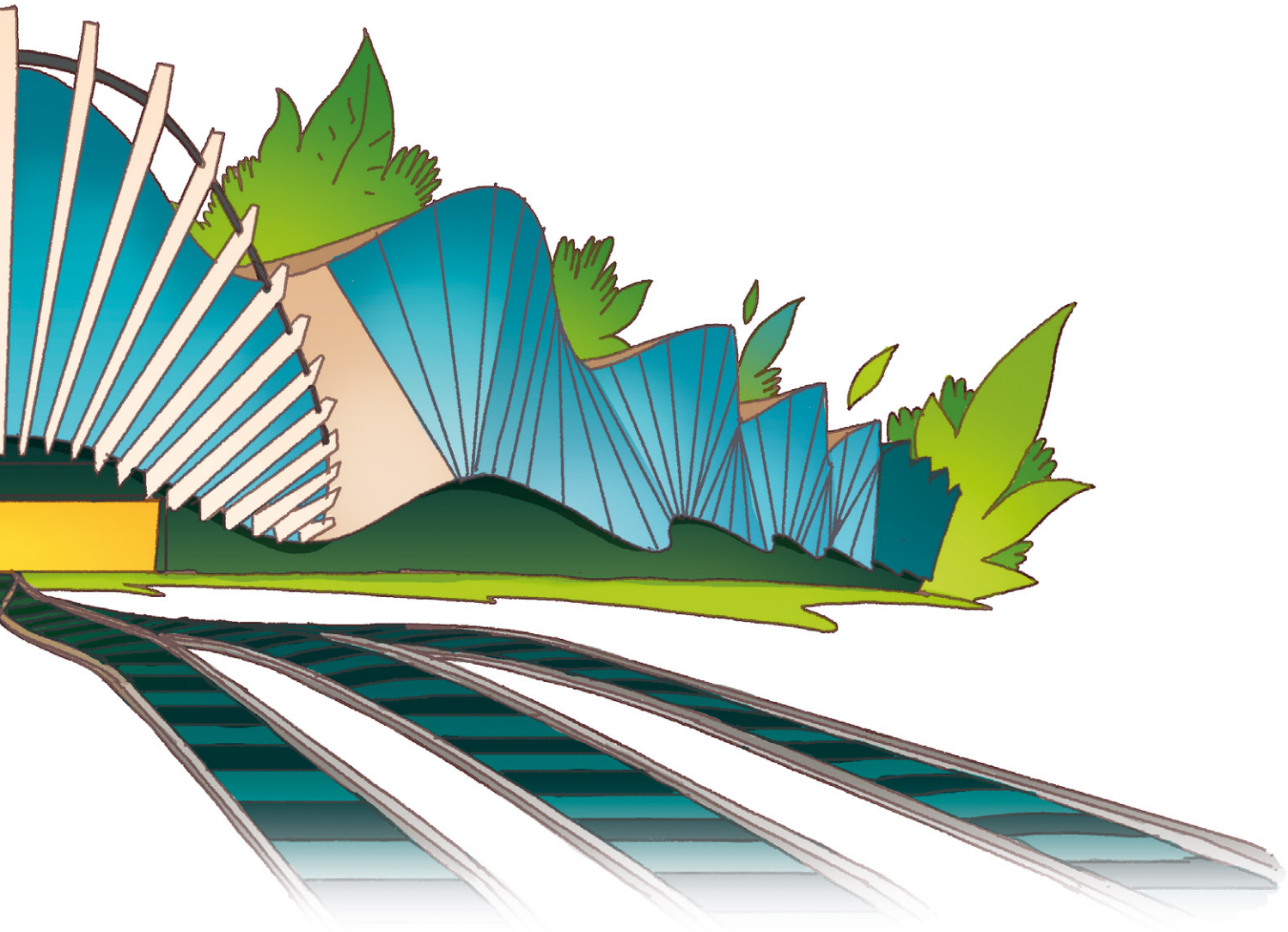
In order to achieve its ambitious sustainability targets, FS Italiane has been focusing on several initiatives, which can be traced back to six main lines of action that underpin the entire Group's strategy towards more sustainable mobility and the reduction of its impact on GHG emissions and water consumption.



Modal shift

Line Electrification

Self-Produced Power And Alternative Energy



Fleet Renewal

Improving Energy Efficiency

Water Efficiency

Modal shift

The most effective action to reduce the impact of the transport sector is to **increase the share of environmentally high-performance travel**, and make the different transport modes work in synergy, to mutually maximize their performance. This can be achieved through:

- Innovative solutions
- Strengthened (material and digital) infrastructure
- Improved vehicle efficiency, starting with public transportation.

The Group's strategy to contribute to sustainable progress will always be focused on customers, by offering increasingly high-quality **multi-modal mobility** services, and promoting collective and shared modes of travel. FS Group's **mobility project intends to promote an integrated and systemic approach**, capable of exploiting **synergies and strengths**, achieving ambitious initiatives, investing in innovation, and enhancing collective transport services, all while improving people's well-being.

Modal shift and logistics

On the **logistics** front, in particular, the aim is to maximise the rail transport share, and consequently reduce non-rail transport and related emissions, in line with the European Green Deal's goal of increasing rail freight transport **to 25% by 2030, and reach 50% by 2050**. FS Group's plan to achieve these objectives provides for:

- Introduction of new vehicles in the train fleet: around **200 electric locomotives, plus hybrid locomotives and ships, and around 3,000 freight wagons**
- Study of **cap&trade systems applied to the freight transport value chain**
- Construction of **new rail terminals** with low environmental impact

LOGISTICS TERMINAL

Integrated Logistics Business Unit
Companies in Italy, Germany, Greece
Integrated logistics platforms

TRAIN

about 21.3 billion tonne-kilometres, of which 10.5 billion are abroad
about 43.9 million train km, of which 20.4 million abroad

The Group's commercial offer is based on a wide range of Italian and international connections, and meets the different product sectors needs, also through its organization in separate Business Units, to ensures the shortest time-to-market for customers.

NATIONAL FREIGHT TRANSPORT		
Industry	**Intermodal**	**General**
Services dedicated to the Steel, Chemical and Automotive industries	Complete range of rail and logistics solutions for container, mobile crate, semi-trailer and articulated truck transport	Transport services concerning the manufacturing and shipbuilding industries, and retail trade products, and military transport

During 2023, TX Logistik AG, a subsidiary of Mercitalia Logistics (part of the Logistics Business Unit), has finalised the acquisition of Exploris Deutschland Holding GmbH Hamburg, a European rail freight company, making it the **second largest rail freight operator in Germany**. With the signing of this agreement, the **Logistics Business Unit now has a presence in eleven countries**, including through Exploris companies such as Via Cargo, HSL Logistik and Delta Rail, strengthening the FS Group's presence in the European market.

Another major initiative undertaken during the year was the beginning of the construction works on the Milano Smistamento inter-modal terminal.
The Milano Smistamento inter-modal terminal will be built on an area of approximately **240,000 square metres**, and will be equipped with technologically advanced state-of-the-art equipment, to provide highest safety and efficiency standard and generate the least possible impact on the surrounding environment.

Line electrification

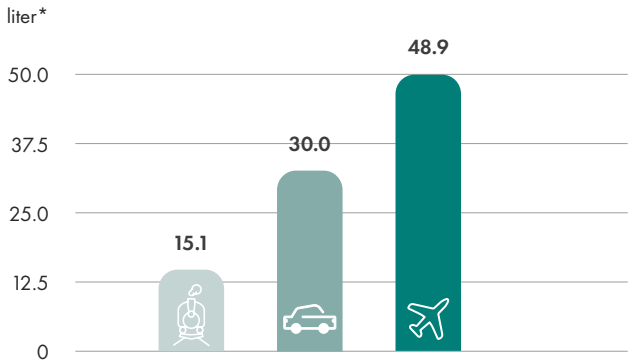
Line electrification is one of the projects in which FS Group is investing the most, complementing the self-production of sustainable energy from renewable sources through the construction of photovoltaic plants. Implementing **more than 1,800 km of electrified railway lines within the next 10 years** (supported and flanked by the introduction of new-generation hybrid trains with electric power, and diesel and battery power, where the lines cannot be electrified) will significantly boost the decarbonisation process.

72.5% Electrified railway network

Approximately **1,850 km** of further electrification expected in 10 years

The impact the project may have from a climate point of view can be easily guessed, by comparing the emissions and energy consumption, on the same route, produced when travelling by train, plane or car.

Energy consumption of a Rome - Milan trip



Liter = litres of petrol equivalent. Includes the energy consumed to produce and distributes electricity/fuel

source ecopassenger.org

Increasing the availability of electrified railway lines means having more efficient connections and benefiting from an increasingly renewable energy mix immediately.

It also means enabling greater mobility and connection between people, by providing more equitable and sustainable means of transport.

Self-produced power and alternative energy

Power consumption is one of the main items in FS Group's environmental sustainability report.
The electric component accounts for the majority share and is largely spent for railway traction.
In order to cope with electricity consumption, one of the most important projects initiated concerns the construction of photovoltaic plants capable of generating **1 GW by 2028** and **2 GW by 2032**, according to the plan's climate targets.
The large-scale plan to install photovoltaic systems is flanked by other less powerful projects, such as **solar panels installed on workshops, buildings, station parking lots** (e.g. Roma Termini) and at the entrances of road tunnels. In most cases, through these interventions, fossil fuels may be replaced, and, if combined with LED lighting, they will reduce overall consumption.
The decision to phase out fossil fuels has driven FS Italiane to use energy from renewable and sustainable sources, such as **GO (Guarantee of Origin) certified electricity and new fuel (HVO biodiesel and hydrogen)**.

Some self-production initiatives (year 2023)

3 photovoltaic plants in Foligno, Voghera and Foggia producing approximately 2.1 GWh/year of electricity	**PV plant repowering** in Milan, producing approximately 0.3 GWh/year of electricity

620 tCO_2e of emissions avoided in 2023

Fleet renewal

In order to have vehicles with low fuel consumption and minimal emissions, the Group has invested in electrically powered vehicles and in R&D on new, non-fossil fuels, when the electric solution alone is not sufficient or adoptable for infrastructural reasons. One example is the **Qbuzz bus company** active in the Netherlands, which is implementing a green transition in the road transport sector. The company has developed a solid experience in **electric bus management** and in the **green hydrogen** field.
In terms of road transport, the objective of upgrading buses to lower environmental classes (Euro 2, 3, 4) continues, along with services offering the best environmental standards, with hybrid (hydrogen and electric) engines and using biofuels such as HVO.

70.5%
Percentage of the Group's road fleet dedicated to low-emission local public transport (Electric, Diesel Euro 6, HVO, GTL vehicles)

HYDROGEN TRAINS
Through an extended in-Group collaboration (RFI, Mercitalia Shunting Terminal, Italferr, FSE), a trial project concerning hydrogen use in railways has been set up, on current diesel-fuelled railway lines and docks. The project will take place in Apulia, on railway lines operated by FSE, through the construction of a hydrogen storage and refuelling plant in Melissano (Salento), as part of NRRP interventions (commissioned by the Apulia Region), which will also lead to new four hydrogen-powered trains.
Preliminary analyses show that CO_2 decrease related to the new fuel system could reach up to 3,000 tonnes/year.
The investment amounts to €13.4 million and is expected to be completed by June 2026.

Biofuel HVO

FS Group's **decarbonisation** objectives also include experimenting with alternative fuels. **HVO** (Hydrotreated Vegetable Oil) represents a transitional solution that could be used to reduce the climate impact of non-electrified mobility, because it is a non-fossil and circular fuel, as it is partly produced from waste and renewable raw materials, such as used vegetable and cooking oils, and agro-food industry residues.
Tests conducted with HVO showed a **positive performance** from an **environmental** standpoint, and found it is **possible to use it without the need for significant modifications**.
The results of Eni Mobilità Sostenibile's biofuel experimentation led to the journey of Trenitalia's **first Blues train fuelled exclusively with pure HVO**, which took place in **July 2023, between Sibari and Reggio Calabria**. In the following months, experiments on the use of HVO on specific railway routes continued, confirming the interest in this technological solution. The trial also concerned the ALN668, and the vehicles involved were further expanded in 2024.

-875 tonnes of CO_2
Estimated reduction (well-to-wheel approach) using HVO compared to conventional diesel for traction, of which approximately 770 tonnes of CO_2 for the tank-to-wheel share.

EUR 5.5 billion

Green Bonds issued from 2017 to 2023

Green Bonds have so far funded the purchase of state-of-the-art rolling stock for public (high-speed and regional) transport and freight transport, the maintenance of rolling stock, and the construction of a high-speed railway infrastructure, whilst reducing service-related emissions.

Pop, Rock and Blues trains

The roll-out phase involving over 100 units of new **regional Pop, Rock and Blues trains** continued throughout 2023. These trains reduce **consumption up to 30%** compared to previous generation trains.

Low-impact features of the new regional fleet	
Energy consumption reduced by 30% compared to previous generation trains	Material recyclability of over 93%
Green drive and smart parking functions	Energy efficiency technologies (LED lighting, climate optimisation, ...)
Smart air conditioning consumption management	**AND BEYOND** Blues trains, with triple hybrid power supply (electric, diesel, battery), can also be used on non-electrified network segments, by temporarily powering them with diesel or batteries.

Frecciarossa trains

Frecciarossa trains are Trenitalia's flagship product combining high speed and maximum comfort. Since its activation, the high-speed rail service has been the core of the **modal shift from air to rail in Italy**, changing travel habits on certain national routes.

The ETR 1000 (Frecciarossa 1000) train is produced by Hitachi Rail, on behalf of the FS Group, and it features an aerodynamic design and state-of-the-art energy-saving solutions. It is the first high-speed train in the world to obtain the **Environmental (EPD)**.

Improving energy efficiency

The Group is one of the largest consumers of electricity in Italy, accounting for about **2% of national demand**. Increasing the efficiency of energy consumption, and the company's electricity consumption in particular, can improve the welfare of the whole community.
There are numerous projects underway that can reduce consumption, such as the recovery of electrical energy during braking for rail traction.
First-type projects have focused on energy efficiency measures in infrastructures, such as replacing station and industrial plant boilers with new energy-efficient models and using smart building solutions (presence sensors, dimmers, etc.).

EFFICIENCY INCREASING STRATEGIES

During 2023, **a 15.6% reduction in consumption** for **heating** was registered, thanks to the energy efficiency measures set in place by Group companies, as well as milder winters in recent years.

- 15,000 tCO_2

A SYNERGISTIC STRATEGY IN TRENITALIA'S PLANTS

Phasing out fossil fuels in the plants, combined with an increased production and self-consumption of electricity from renewable sources and system energy efficiency measures (LEDs, building automation, compressed air systems) will result in savings of more than 15,000 tCO_2/year once these measures are fully operational, compared to 2019.

On the road infrastructure side, ANAS is involved in a 4-year European-funded project called **CIRCUIT**, which began in June 2023. The aim is to develop a holistic approach supported by digital solutions and guidelines to foster the introduction of innovative engineering practices in the entire construction supply/value chain, thus enabling the construction of **circular, sustainable, resilient and intelligent transport infrastructures** and a wider dissemination of Green Public and Innovation Procurement.
ANAS takes part in this project as coordinator of the five pilot sites and as manager of the strategic energy programme. It is involved in the implementation of 3 experimental areas:

- A90 Selva Candida tunnel: implementation of an **adaptive lighting system**.
- A90 - SS4 Salaria junction: installation of **lamps powered by a hybrid generator** consisting of **photovoltaic panels and wind power.**
- A91: implementation of an **adaptive lighting system** installed along **the entire motorway section**.

-225 tCO_2

STORING AND RECOVERING ENERGY

RFI is involved in several Europe's Rail projects. The most significant for low-carbon products and services is Rail4EARTH, under the HORIZON tender, in which it participates together with Trenitalia.
Rail4EARTH involves the design, development and validation of an innovative Energy Storage system, capable of harnessing braking energy and photovoltaic renewable energy for electric traction.
15 electrical substations will be built by 2032 to store energy from train braking and adjust the voltage, to reduce losses and improve the performance of the 3 kV DC electrical traction system.
The expected CO_2 reduction is -225 tCO_2.

Modal shift

The approach to modal shift, or modal transfer, is still lukewarm. Territorial organization and a tendency to maintain a traditional approach to mobility have not always incentivized environmentally friendly transport solutions, nor deterred motorised traffic. The pandemic crisis has undoubtedly left traces of suspicion towards shared mobility, which, combined, in certain territories, with a structural weakness in the quality of services, in the capillarity of the offer, and in the network of dedicated infrastructures for rapid transport, make this choice less preferable.
However, supporting a modal shift towards sustainable transport choices is crucial for the transport sector's decarbonisation strategy, which the Group has applied to all its business areas through specific initiatives and projects.

Modal shift
road-vehicle transport - and private vehicles in particular - to more sustainable means, towards low-impact solutions such as trains and vehicles using renewable energy.

Approximately 5.7 million tonnes of CO_2e

The difference estimated by calculating the emissions from the use of FS Group's collective transport vehicles, as a whole, for rail and road passenger transport and for rail freight transport, compared with the emissions estimated by simulating the use of private cars and heavy commercial vehicles in 2023.
The modal shift is favored by initiatives such as

- Expansion of the HS rail network
- Development and enhancement of connections between the railway network and other transport nodes: new connections with **airports, ports and freight terminals**
- Progress of the station development plan to improve usability, accessibility, public information, intermodality
- Construction of new access points to the railway network
- New **bicycle parking spaces** on board regional and Intercity trains
- Development of rail-road plans to promote modal shift solutions, including digital ones, in a **MaaS**[3] perspective
- Increased parking spots to promote modal shift, in disused areas close to stations or interchanges
- Installation of electric charging points in parking areas
- Expansion and rehabilitation of railway areas for first and last mile logistics
- Inclusion of footpaths in the regeneration projects of the Group's disused real estate assets

3. Mobility as a Service (MaaS) is a concept involving the integration of different public and private transport services, accessible through a single digital channel, where travellers can plan their journey using a mix of public transportation options, such as metro, train, bus, walking, car sharing etc.

Water efficiency

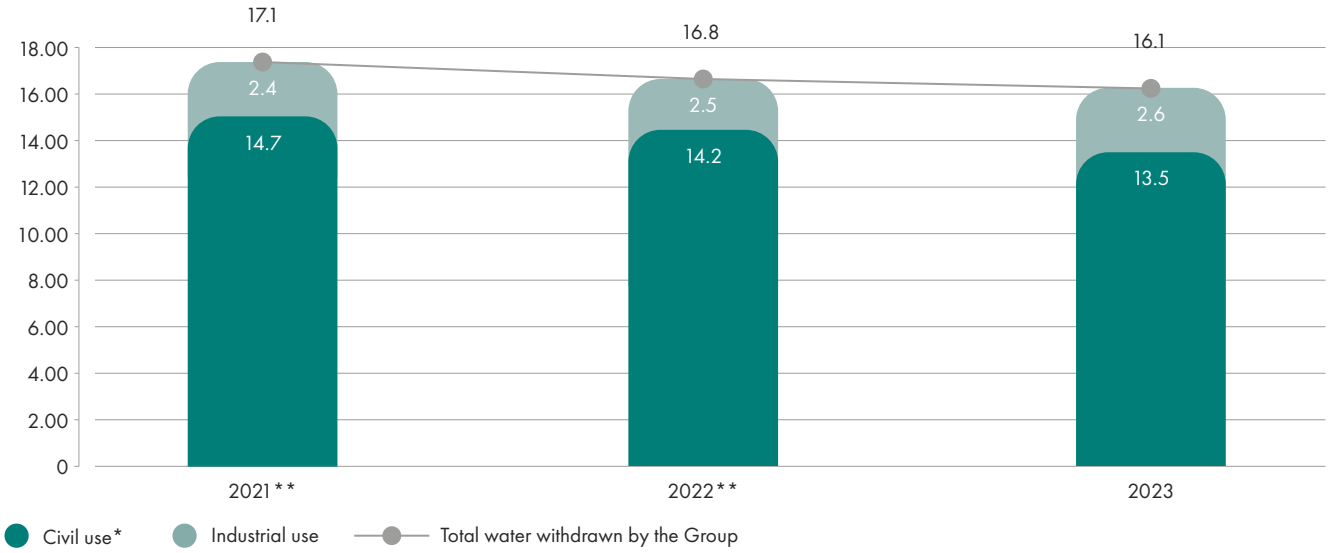
Managing water resources in the best possible way is essential, to be ready to face the challenges of climate change, as these will also affect water availability and quality. Anticipating such scenarios can help prevent or mitigate future water crises, which could also have major consequences on operations, process quality and economic sustainability of the services provided by the Group.
This is why FS Italiane is committed to both reducing water withdrawals and increasing consumption efficiency, by increasing the volumes of recycled and reused purified water for technological processes, and starting in 2024, improving the criteria for reporting and calculating water consumption.

THE WATER CIRCULAR ECONOMY PILOT PROJECT

Trenitalia promoted a project of **Water Circular Economy** in maintenance plants, aimed at reusing wastewater for industrial processes. The project is a response to the growing concern about water stress issues. The experimental project involves those sites belonging to railway vehicle maintenance facilities, such as Rome AV, Pisa, Siena, Lecce and Rimini.
The project provides for wastewater recovery through tertiary, treatment including a reverse osmosis or chlorination (disinfection) system, with its subsequent reuse within the same operating unit for industrial purposes. This process would allow a significant reduction in the consumption of aqueduct water or groundwater. This trial initiative includes the provision of new portions of the water mains, purified water collection tanks and the necessary pumping systems, together with new treatment sections in the purification plants.

In order to monitor the effectiveness of water-related initiatives more accurately, in 2023, FS Group introduced new specific KPIs to support the improvement path undertaken by its companies.
Water withdrawals are constantly monitored at several levels, from Operating Units to the entire Group on a half-yearly basis, and collected annually in the Sustainability Report. The improvement is related to a more careful management of water and networks, to allow for, among other things, the implementation of technological solutions and increase awareness around this topic. The reported progress curve is relevant, as water withdrawal **has already been reduced by almost 20% from 2019 to 2023**, despite the increase in services provided.

Water withdrawn by use (millions of cubic meters)



** Includes water withdrawals for civil use at stations*
***Data for water withdrawn "for civil use" and for "industrial use" in 2022 and 2021 have been adjusted following a refinement of the data collection process and calculation methodology*

WATER-STRESSED AREAS

In these territories the demand for water significantly exceeds the availability of resources, causing a critical imbalance between water supply and demand.
In line with the main environmental standards and based on the guidance provided by the World Resources Institute (WRI), as early as 2022, the Group has begun to monitor the volumes of water it withdraws and discharges in these areas.
Specifically, it should be noted that slightly more than 70% of the total withdrawals, to meet the Group's demand, takes place in areas subject to water stress (mainly due to the activities and services carried out by companies belonging to the Passenger and Infrastructure Business Units).

ENVIRONMENTAL MANAGEMENT

Approaches, roles, responsibilities and stakeholders involved

For years, the FS Group has adopted a Sustainability Policy and a specific Environmental Policy to promote the adoption of sustainable practices within the activities and services managed and the reduction of negative impacts on the environment and biodiversity.

The structure responsible for identifying these policies over time has evolved to respond more efficiently and concretely to the new climate target challenges, and is encompassed in the current Sustainability Governance Model.

PROMOTING A POSITIVE IMPACT: FERROVIE DELLO STATO ITALIANE'S ENVIRONMENTAL POLICY COMMITMENTS

- Manage its activities in compliance with current legislation and voluntary standards, pursuing environmental opportunities while mitigating risks
- Promote the efficient use of energy resources and the reduction of greenhouse gas emissions through the implementation of energy-efficient technologies and the promotion of renewable energy sources, with the aim of achieving net zero by 2040
- Promote, through its processes, activities and services, a resilient mobility system with a view to adapting to climate change
- Encourage the protection of biodiversity and of the different environmental components, enhancing natural capital and preserving the environment, landscape and ecosystems
- Support a rational and efficient use of natural resources, particularly non-renewable ones, by reducing consumption, paying attention to the protection of water, and promoting the recovery and reuse of water, especially in water-stressed areas
- Promote the transition to a circular economy of its activities and processes in a Life Cycle Assessment (LCA) logic, preventing waste production, promoting reuse and increasing recovery
- Monitor impacts on the entire value chain, encouraging suppliers and business partners to improve their performance, and promoting sustainability principles in procurement choices

The Governance Structure

Board of Directors (BoD)

It is responsible for the Sustainability Governance Model and determines the strategic direction of the FS Group

CONTROL, RISK AND SUSTAINABILITY COMMITTEE (CCRS)

Composed of board members, the majority of whom are independent.
It deals with FS Group sustainability issues, such as environmental impact, and their reporting.
It **supports the assessments and decisions of the Board of Directors** relating to the internal control and risk management system, the **approval of periodic reports**, and any **sustainability profiles** connected to the performance of FS Group's activities.*
*[to be added as note] Since July 2024, two different board committees have been established: Control and Risk Committee and Sustainability Committee.

CHIEF EXECUTIVE OFFICER

Plays a key role in **strategy definition**, providing the main guidelines to promote a sustainable business model.
Verifies the effectiveness of the Sustainability Governance Model, by analysing **corrective actions and opportunities for improvement** at FS Group level.

CHIEF CORPORATE AFFAIRS OFFICER COA

Guarantees the definition of FS Group's strategies and the related **strategic planning, monitoring and control processes, and verifies the results** achieved.

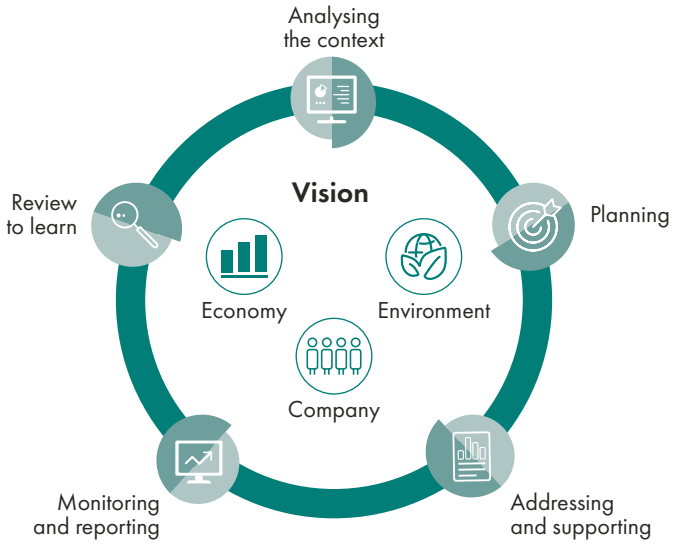
SUSTAINABILITY COMMITTEE

Advisory body supporting the CEO, who chairs it.
It ensures the integration of a sustainable development model within FS Group's strategies.
Its members are FS' Chief Executive Officer and Chief Officers, and the CEOs of the companies heading each business unit of the FS Group (four companies).

SUSTAINABILITY MANAGER

Ensures the definition of strategic policies and guidelines to **improve the Group's sustainability performance**. The Sustainability Manager acts as the Technical Secretariat of the Sustainability Committee.

FS Italiane's Sustainability Governance Model



In a market context increasingly attentive to the economic, social and environmental impacts of subsidiaries' activities, compliance with sustainability principles is considered a strategic driver for the Group's growth and development. This is why FS Italiane has adopted a **Sustainability Governance Model (MoS)**. This tool identifies and defines governance and management processes, to achieve the highest performance, create value and promote an approach attentive to the legitimate needs of all stakeholders.

The **Board of Directors (BoD)** represents the highest internal governing body of the Group, determines its strategic direction and oversees the implementation of its corporate vision. Moreover, **it is also responsible for the Sustainability Governance Model**.

According to the Model, the Board of Directors approves the main aspects related to FS Italiane's sustainability issues, such as its vision and the related commitments for each sustainability dimension, the Sustainability Policy, the Sustainability Report, and the medium to long-term sustainability objectives and targets.

The Board of Directors is also responsible for the Management by Objectives (MBO) policy, a short-term incentive system of the FS Group. From 2020, part of the **variable remuneration component** is linked to the **achievement of a climate-changing emission reduction target**.

MANAGEMENT BY OBJECTIVES (MBO)

Management by Objectives allows the inclusion of GHG emission targets in remuneration policies. Management, including the CEO of the holding company and the CEOs of the subsidiaries, is evaluated based on carbon performance.

The incentive applies to the variable remuneration component, and includes an avoided emissions indicator, assessed as the additional volume of emissions that would occur if the same amount of traffic was recorded on private road transport instead of FS Group trains and buses.

Junior managers who lead micro-units of the organisation crucial to the company's mission and the achievement of the Group's main objectives also receive the same incentives as senior managers.

Stakeholders: a shared path

Each year, the Group updates the materiality analysis, an essential tool for planning and managing sustainability performance and adequately representing achievements and targets in Group reporting.
In 2023, an analysis of **Impact Materiality** characterised by the identification of material issues based on the most significant impacts generated by the Company on the economy, environment and people. The materiality analysis process **involves the stakeholders**, by listening to and including those that influence or could influence the Group's activities.
These analyses are useful to establish the **specific themes to prioritize action**, based on which the Group plans the levels of action in the medium and long term.

Internal stakeholders

A great deal of attention has been paid to sharing the progress of the Industrial Plan with internal stakeholders, and to creating an ecosystem of continuous dialogue with all people in the Group.
For instance, the internal communication channels hosted a regular column in which the words and deeds of sustainability were discussed and reported, to improve awareness, transparency and information on the Company's sustainable strategies and their real meaning.

Suppliers

In its supply chain management, FS Group pays great attention to the environmental performance of its suppliers.
The inclusion of scope 3 emission reduction targets in its strategy expresses the Group's intentions to play an active role in combating climate change. On a practical level, this has been translated in the **Sustainable Supply Chain Management** project, which sets two important steps:

- From 2023, the **progressive application of the ESG score to contractors and suppliers** active in all FS Italiane companies;
- From 2026, **the obligation**, for all companies wishing to work for the Group, **to undergo an ESG assessment** via a dedicated IT platform (the score will be an important element of the assessment).

The materiality analysis is a process of investigation and evaluation to identify everything that has an impact on the business of an activity or everything on which the business of an activity may have an impact.

This objective is also pursued through the self-assessment questionnaire submitted to strategic suppliers for the Group's business. The survey collects relevant information about **the effect that their services or products have on climate and the environment**, and allows monitoring and promoting strategic activities concerning **energy, CO_2 emissions and the reduction of environmental impacts in general**.
On a last note, **Italferr**, the Group's engineering services company, **monitors the materials used, water and energy consumption, and the waste produced** within the main construction sites **by contractors**, reporting them through FS Group's sustainability reporting platform.

Customers

With more than 600 million passengers, considering only rail passengers in Italy, FS Group service customers are very important stakeholders.
For this reason, FS Italiane pays great attention to the **environmental performance of the vehicles** placed at their disposal, is committed to **offering sustainable travel comfort** also in terms of pollution and consumption, and provides passengers with options (**digital ticket**), tools (**modal shift**) and information to increase awareness about the impact their travel choice has on the environment.
The **Group periodically surveys its customers** to assess its commitment to the environment, energy and climate, and to obtain valuable suggestions for improving its strategies and activities.

Sustainability is achieved together. Awareness-raising paths.

Our gestures together make all the difference

In 2023, Trenitalia continued its external communication campaign, *Our gestures together make all the difference*, focusing on sustainable mobility, with the aim of raising awareness among customers to move responsibly by using trains, also in combination with other low-impact modes such as cycling and sharing.

Trenitalia School Fair

In 2023, the 2nd edition of the '*Trenitalia School Fair*' took place, featuring meetings in charming venues like museums and historic palaces. The event aimed to inform and raise awareness among primary and secondary school teachers across Italy about the benefits and advantages of organising educational trips sustainably, highlighting both the environmental advantages of train travel and the value of Italy's artistic heritage.

Communities

Geographical and interest-based communities are important both as parties affected by the Group's activities, and as parties that can, in turn, influence them.
FS SpA is specifically targeting **local communities to investigate what benefits they have obtained from the infrastructural projects** implemented in different geographical areas, and what is their ability to create value in terms of environmental development.

Trade Associations

Joining a trade associations provides broad representation on various issues. Typical activities include the organisation of meetings and round tables, the production of studies and position papers, participation in European tenders, and the creation of opportunities for cooperation between companies, suppliers, and international institutions operating worldwide, with potential significant influence for the FS Group.
One of the main environmental objectives proposed by trade associations - of which the Group is an active part - concerns the promotion of modal shift towards more sustainable modes of transport in order to reduce transport emissions.

Supranational trade organisations

In recent years, there has been growing awareness about the importance of engaging the various stakeholders and communicating with them through concrete, real information, with the highest level of transparency that can help them understand the environmental impacts of works and initiatives.
An important game on these fronts is played together with supranational trade organisations and institutions.
The Group participates through specific figures, with official standings on environmental issues, in the activities of European **institutions**, such as the Parliament, the Commission, the Council and the European Railway Agency (ERA). It also promotes rail transport and network in Europe through the **Community of European Railway and Infrastructure Companies (CER**).
Included in specific working groups, Corporate Affairs also participates in the activities promoted by the **International Union of Railways (UIC)**, such as the annual international negotiations of the **Conference of the Parties on Climate Change** (the last was held in Dubai in 2023), energy efficiency projects and other activities conducted by the Sustainability Platform (the Railway CSR Sustainability Index, the UIC Task Force on Energy Savings, collaboration with the World Bank, etc).
Within the **International Association of Public Transport** (UITP), the FS Group joined the efforts of the Committee for Sustainable Development to launch 3 working groups on circular economy and sustainability.

MEASURING SUSTAINABILITY

Measuring to evaluate the direction undertaken

In order to understand how far we have travelled, we need to have a reference system and a shared unit of measurement that help us assess how far we have come. Similarly, in order to assess the path of decarbonisation and conscious use of water resources undertaken, and to understand whether it is leading in the right direction, it is important to set certain and unambiguous references in place. FS Group has chosen to adopt the parameters set by international organisations to measure its results. For instance, the method used to calculate emissions meets the criteria defined in UNI EN ISO 14064-1:2018.

Tracking emissions: details of the journey to net zero

The FS Group reports its greenhouse gas emissions in accordance with the **main international reference standards**, the GHG Protocol Corporate Accounting and Reporting Standard of 2004 and UNI EN ISO 14064-1:2018.
Although both are GHG inventory reports, they represent greenhouse gas emissions in two different ways, as shown in the table below.

GHG Protocol Scope	UNI EN ISO 14064 category	Description	Emission sources
Scope 1	Category 1	Direct emissions and removals	• Combustion fuels • Fugitive emissions • Change of land use
Scope 2	Category 2	Indirect emissions from energy imports	• Energy, heat, steam purchases
Scope 3	Category 3	Indirect transport emissions	• Business trips • Home-work commutes • External visits to the organisation's premises • Upstream transport and distribution • Downstream transport and distribution
	Category 4	Indirect emissions from products used by the organisation	• Purchased goods and services • Capital goods • Upstream activities related to energy and fuel use (not included in Scope 1 & 2/ Category 1&2) • Waste generated by the organisation • Assets leased by the organisation
	Category 5	Indirect emissions from use of the organisation's products	• Product use • Manufacturing applied to the product sold • End of life of the product sold • Assets of which the organisation is lessor • Franchise • Investments
	Category 6	Indirect emissions from other sources	• Other issues not listed above

Both methodological approaches are used by FS Group: for example, the **UNI EN ISO 14064** methodology is used for certification of the Group's impact, a commitment made annually to **ensure transparency and accuracy in the measurement of the climate footprint**; reporting according to GHG Protocol is also used to define **targets for emission reductions in line with the Science Based Target initiative (SBTi)** criteria and reported annually in the Sustainability Report to declare the progress of the calculation year against short-term and net zero targets.
In the remainder of this report, reference will be made to the classification of emissions in line with the GHG Protocol, then to scopes.
The concept of scope refers to all processes and resources required to complete a project.

Scope 1	Direct emissions generated by the company, (source owned or controlled by the company).
Scope 2	Indirect emissions generated with energy purchased by the company. These are emissions physically produced outside the company.
Scope 3	The result of assets from assets not owned or controlled by the reporting company, issues generated by its value chain. They are generated by the company's value chain.

Emissions

It is worth highlighting that FS Group's scope 1, 2 and 3 emissions for 2023 are higher than in the previous year.

DIRECT AND INDIRECT EMISSIONS OF CO_2e (location based) (source)	Unit of Measurement	2023	2022	2021	%Δ 23/22
Railway traction electricity	tCO_2e	1,348,198	1,202,656.9	1,209,347.1	12.1%
Electricity for other uses	tCO_2e	179,596	176,103.1	184,429.4	2.0%
Electricity for street lighting	tCO_2e	95,665	91,979.6	96,738.4	4.0%
Other*	tCO_2e	15,487	18,910.7	19,939.9	-18.1%
TOTAL scope 2 location-based	**tCO_2e**	**1,638,946**	**1,489,650**	**1,510,455**	**10.0%**
Diesel	tCO2e	450,352	444,549	480,331.0	1.3%
Natural gas	tCO2e	56,257	65,501	80,950.5	-14.1%
Other**	tCO2e	89,906	3,917	2,522.9	2195.2%
TOTAL scope 1	**tCO_2e**	**596,515**	**513,967**	**563,804**	**16,1%**
TOTAL scope 1 + 2 (location-based)	**tCO_2e**	**2,235,461**	**2,003,617**	**2,074,259**	**11.6%**

(*) Electricity for LPT and company cars, district heating and cooling

(**) Petrol, LPG, fuel oil, HVO, pellets, fugitive and land-use change emissions

	Unit of Measurement	2023	2022	2021	%Δ 23/22
Total indirect CO_2e Scope 3 emissions	**tCO_2e**	**5,116,694**	**4,071,521**	**3,939,342**	**26%**
Indirect CO_2e scope 3 emissions (relevant categories - GHG Protocol)	tCO_2e	5,037,957	4,009,868	3,881,342	26%
- Purchased goods and services	tCO_2e	11,138	4,674	59,435	138%
- Capitalised assets	tCO_2e	4,012,866	3,173,003	2,985,375	26%
- Upstream energy supplies	**tCO_2e**	**416,992**	**282,765**	**302,057**	**47%**
- Use of railway infrastructure by other railway companies	tCO_2e	596,961	549,426	534,474	9%
Indirect CO_2e scope 3 emissions (non-relevant categories - GHG Protocol)	**tCO_2e**	**78,737**	**61,652**	**58,000**	**28%**
- Generated waste management	tCO_2e	13,133	15,050	12,504	-13%
- Business trips (including air travel and hotels)	tCO_2e	7,231	5,115	3,329	41%
- Home-work commutes	tCO_2e	49,743	30,834	29,928	61%
- Leased real estate assets (tenant)	tCO_2e	8,629	10,653	12,239	-19%

With regard to scope 1 and 2 emissions, in order to understand the reasons for this increase, a distinction must be made between internal and external factors that actively contribute to the emission profile. The former are related to strategic interventions, such as an organic growth of the mobility offer, with a consequent increase in traffic and the inclusion of new companies in the consolidated perimeter of environmental data; the latter are those that cannot be directly governed by the organisation, such as the composition of the national energy mix, which has worsened slightly in recent years due to climate and geopolitical instability[4].

The following greenhouse gas sources have been added to the **scope 1** greenhouse gas emission accounting in 2023:

- Loss of refrigerants (HFCs and SF6) from stationary sources and transport services
- Assessment of land use change, considering the impact of new infrastructure (railways and roads) on natural soil

Breakdown of scope 1+2 location based emission variations
2023 vs 2022 [tCO_2e]

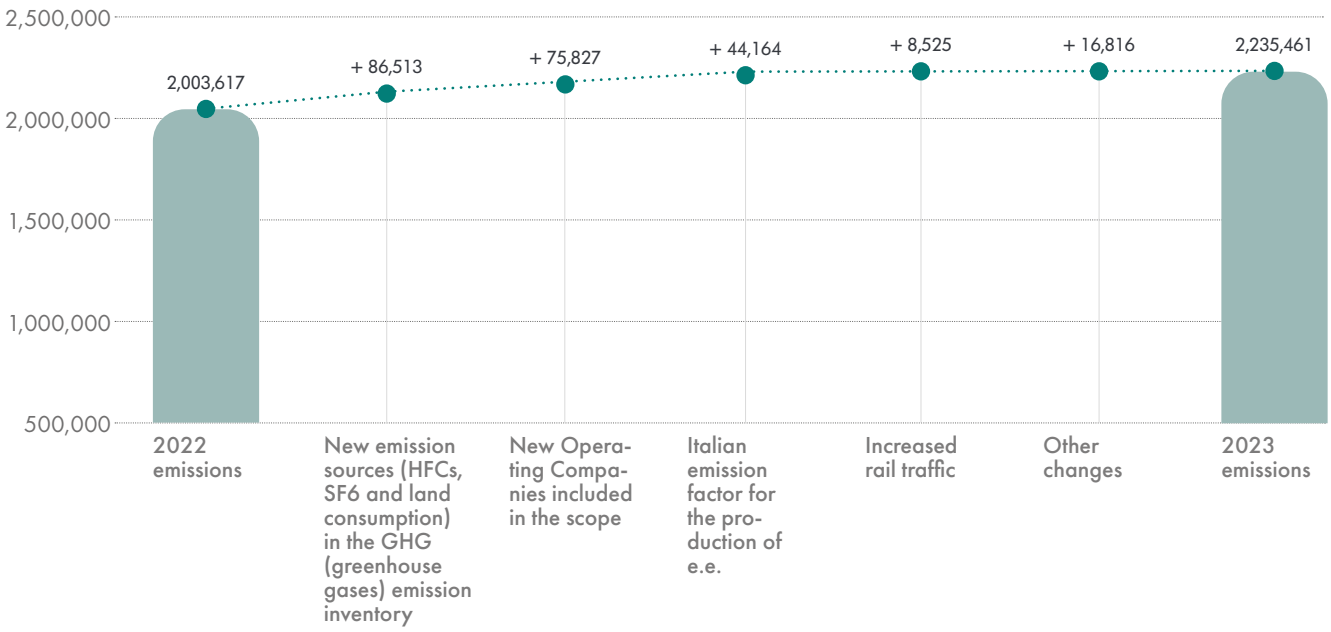


Figure 7 - Breakdown of scope 1+2 location based emission variations

For Scope 3 emissions, the main increase in 2023 was due **to greater activities at the** RFI construction sites, including those to complete the works set out in the NRRP. Further increases in emissions can be attributed to **energy supplies** (related to the deterioration of the national energy mix), the purchase of **new rolling stock**, and increases in business travel and employee home-work trips.

4. The national energy mix has deteriorated mainly due to two causes: a **global energy crisis**, due to rising prices of natural gas and other fossil sources, largely caused by the Russian-Ukrainian war and the resulting economic sanctions, which has led to increased dependence on more polluting energy sources such as coal; a r**eduction in renewable energy production** due to unfavourable weather conditions, such as droughts, which have reduced hydropower production in many Countries (wind and solar energy have also experienced fluctuations in production due to weather variations).

Breakdown of scope 3 2023 vs 2022 emission variations

2023 vs 2022 [tCO_2e]

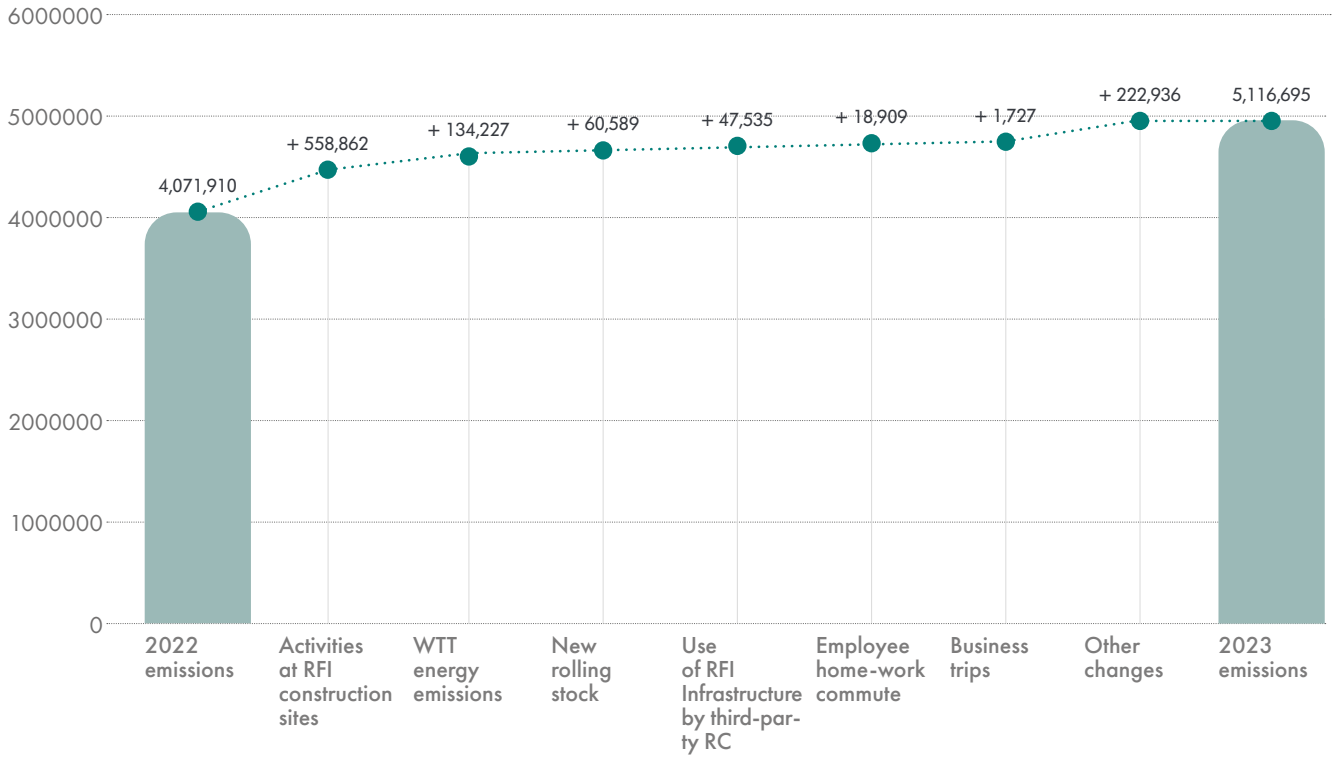


Figure 8 - Breakdown of scope 3 2023 vs 2022 emission variations

In 2023, the Group's total emission output, considering all three scopes (scopes 1, 2 and 3) amounts to over 2.2 million tonnes of CO_2 equivalent for the first two scopes, and 5.1 million tonnes of CO_2 equivalent for scope 3.

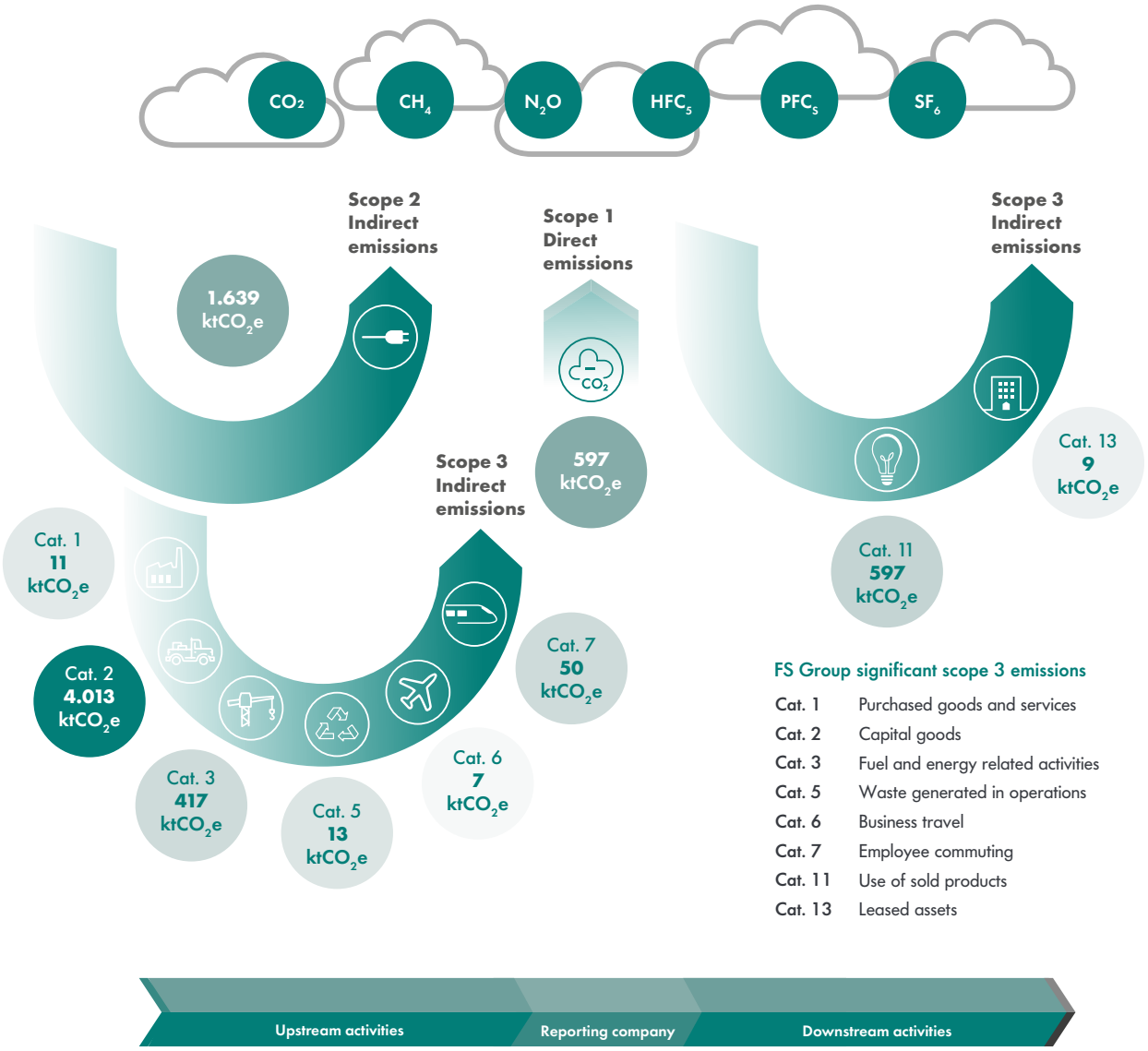


Figure 9 FS Group emissions breakdown (scope 1,2,3)

The commitment to a transparent climate emission reporting has led the FS Group to explore **a new way of quantification**. In 2023, Standard **UNI EN ISO 14083** was published, which defines a common method for quantifying and reporting greenhouse gas emissions from passenger and freight transport chain operations. At EU level, this standard is under consideration to become the shared reference for regulating the **EU Count Emission** framework, with the ambition of defining a common and transparent scheme, and allow stakeholders to make a fair comparison between different means of transport.

In anticipation of EU requirements, in May 2024, **the FS Group decided to apply the requirements of ISO 14083 to its transport chain**, and to avail itself of third-party compliance assessment.
Climate-changing gas emissions were divided into four transport chains: passenger by rail, road and ship; freight by rail. These emissions also include transport service activities carried out at terminals and stations.

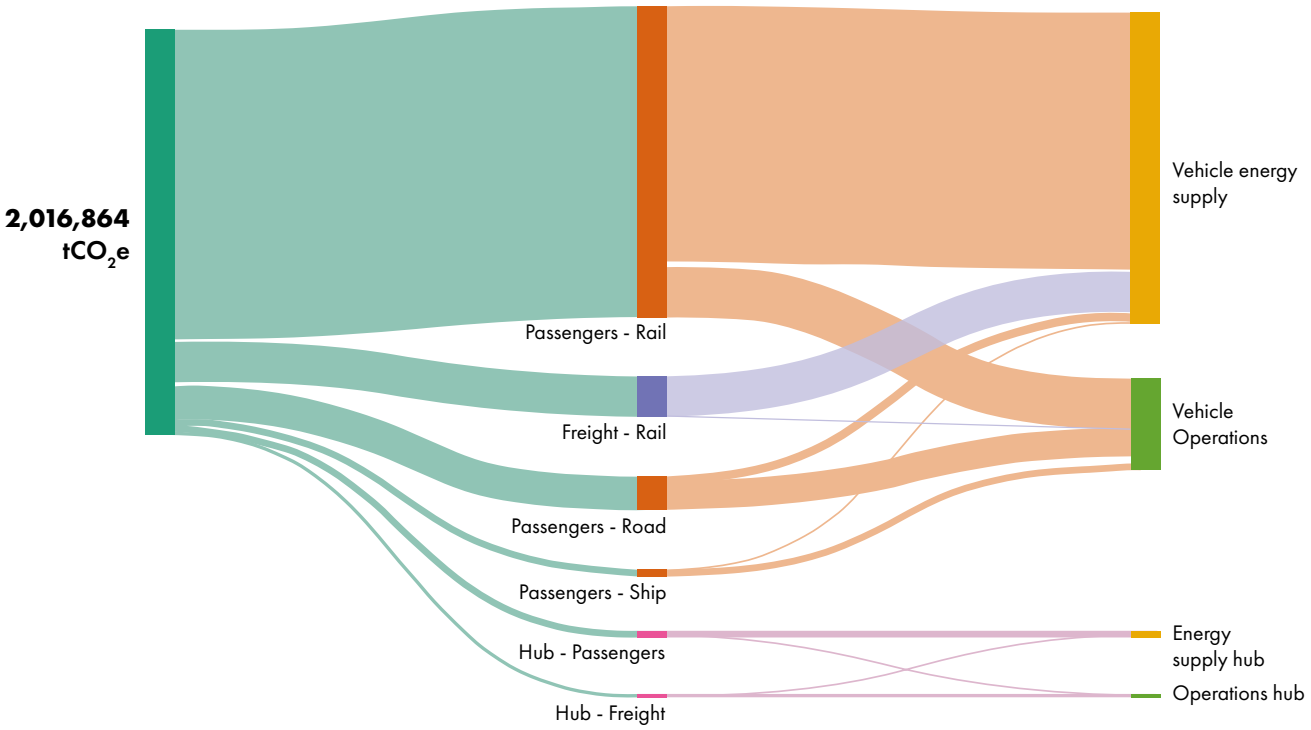


Figure 10 Breakdown of total emissions according to ISO 14083

In contrast, the overall difference estimated by calculating emissions resulting from the use of the FS Group's public transport vehicles for passenger transport by rail and road and for freight transport by rail, compared to the emissions estimated by simulating the use of private cars and heavy goods transport vehicles, amount to approximately **5.7 million tonnes of CO_2** equivalent avoided. The trend is growing over the three-year period, due to two factors: the increase in demand for passenger transport on both buses and trains and the progressive reduction of specific emissions for domestic and foreign passenger transport through FS Group's collective transport services.

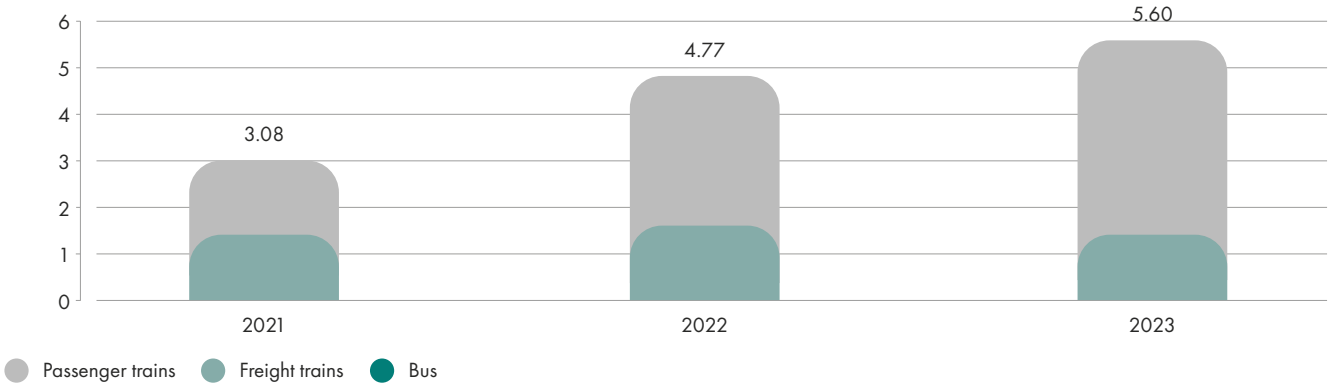


Figure 11 - Avoided emissions. FS Group transport vs road transport emission difference

Direct **pollutant emissions** related to rail transport can be considered relatively **less relevant**, given the widespread use of electrified trains, compared to the emissions related to road and ship transport services offered by the Group. However, all types are carefully managed by the respective companies, which have implemented various containment measures, such as:

- Adoption of **sustainable driving practices**;
- **Management measures** to reduce fuel consumption, atmospheric and noise emissions (e.g. smart parking functions that optimise vehicle performance before and after the start of the service);

- **Renovation campaigns** on existing fleets (e.g. Euro 6 engines, diesel/battery and diesel/electric hybrid technologies, etc.).

The commitment to **environmental protection** is also evident from the values shown in the following table: in the face of a significant upturn in passenger traffic, these emissions remain low, comparable to the levels of the two previous years.

OTHER EMISSIONS	Unit of Measurement	2023	2022	2021	% Δ 23/22
NO_x	t	5,840	5,848	6,128	-0.1%
SO_2	t	149	155	179	-3.3%
PM_{10}	t	153	154	163	-0.7%

Methodology: measuring emissions to evaluate the distance to net zero

The data collected and analysed on **scope 1, 2 and 3** emissions refer to the organisational boundary defined for consolidating environmental data, identified according to materiality and control criteria. The former concern the actual or potential impact, with reference to material issues and the nature of the companies' business; while the (direct and indirect) control criteria include, in addition to the Parent Company, the companies consolidated on a line-by-line basis, over which FS Italiane SpA exercises direct control (with the exclusion of the companies that perform financial and certification/inspection activities in the rail transport sector, for which the impact is not considered material) and those over which it exercises indirect control through its subsidiaries.

Infrastructure Business Unit

- Rete Ferroviaria Italiana S.p.A. and its subsidiaries (Terminali Italia S.r.l., Blu Jet S.r.l., Grandi Stazioni Rail S.p.A.)
- Anas S.p.A.
- Italferr S.p.A.
- Passenger Business Unit
- Trenitalia S.p.A. and its subsidiaries (Hellenic Train, Netinera group, Trenitalia c2c Limited, Trenitalia France, ILSA SA)
- Ferrovie del Sud Est and Servizi Automobilistici S.r.l. Busitalia - Sita Nord S.r.l. and its subsidiaries (Busitalia Campania S.p.A., Busitalia Veneto S.p.A., Busitalia Rail Service Srl, Qbuzz BV)
- Logistics Business Unit
- Mercitalia Logistics S.p.A. and its subsidiaries (Mercitalia Rail S.r.l., Mercitalia Intermodal SpA, Mercitalia Shunting & Terminal S.r.l., Bluferries S.r.l., TX Logistik AG)
- Urban Business Unit
- FS Sistemi Urbani S.r.l. and its subsidiaries (FS Park SpA)
- Other
- Ferservizi S.p.A.

The remaining companies included in the full consolidation perimeter are excluded, because they are considered negligible for the purposes of the analysis (for GHG - location-based emissions, these companies, for example, contribute a total of less than 1% of scope 1 and scope 2 emissions).

For **scope 1** emissions, activity data were mainly extracted from invoices to assess both stationary and non-stationary combustion (company fleet consisting of trains, buses, cars, ships, etc.) and the most suitable emission factors were selected, e.g. distinguishing between diesel for train traction and heating oil. For fugitive emissions, measured data or data calculated from values based on historical or literature series were used where available, while for land use change, the data required is project information on construction sites started in the year of calculation.

Sources of emission factors are the Italian annual greenhouse gas inventory NIR & CRF 1990-2019; DEFRA; SINAnet (ISPRA, 2019); IPCC Sixth Assessment Report; Frank S. et Al, Documentation for estimating LULUCF emissions/removals and mitigation potentials with GLOBIOM/G4M, 2020. To use emission factors correctly, certain conversion factors such as LHV (lower heating value) were used to translate physical consumption (e.g. kilograms, litres) into energy consumption.[5]

With regard to the method used to quantify **scope 2** (market-based), activity data were mainly extracted from utility bills to assess both purchased electricity (regardless of end use) and heat (district heating and cooling).

5. Sources: Fiche 330 (UIC, 2008); Energy Statistics Manual (IEA, 2005); JEC WTW report v5; Conversion Factors (Department for Environment, Food & Rural Affairs - DEFRA UK).

For electricity, a distinction was made between the share of energy purchased with a Guarantee of Origin and that supplied without specific renewable energy contractual instruments: for the former, appropriate emission factors were applied based on renewable energy sources, for the latter, data were taken from the AIB (Association of Issuing Bodies).
The emission factors for district heating and cooling were obtained from ISPRA.

Given the complexity, **variability and type of energy consumption of FS Group operations**, both methodologies, location-based and market-based, are used.
It should be noted that, at present, due to regulatory constraints, the infrastructure manager (RFI) cannot use traction electricity supplies with mechanisms linked to low-carbon solutions (see Guarantee of Origin).

The **Market Based** approach assigns a CO_2 emission factor of zero for energy consumption from certified renewable sources.

The **Location Based** approach considers an average CO_2 emission factor in the calculation based on the national energy mix.

There is a further methodological aspect to quantifying scope 2 emissions. The **source of the production data used** to process the share of electricity consumption for the railway traction of the Italian infrastructure (by RFI) and to be attributed to the Railway Undertakings of the FS Group, **is no longer the train-km but a data from a virtual metering system** that takes into account **various parameters related to railway traffic**, such as the number of stops, the average gradient, the weight of passengers or goods transported, the train configuration, the lines used.
According to the GHG Protocol[6], **scope 3** emissions related to the FS Group's supply chain were calculated by applying the most appropriate and consistent factors according to the category they belong to.

A CERTIFIED ROUTE

Also in 2024, FS Group has obtained certification attesting to the quality of the inventory and methodology for calculating GHG emissions, in accordance with ISO 14064-1:2018 for the carbon footprint of the year 2023 under both the location-based and market-based approaches, with a level of assurance for the emissions inventory defined as reasonable.
The result obtained reaffirms the solidity of the decarbonisation process undertaken by the Group, and demonstrates how the great attention paid to sustainability issues is accompanied by maximum transparency, to the benefit of all stakeholders. The certificate, issued by the independent body SGS Italia accredited by Accredia (the single national accreditation body appointed by the Italian government) was obtained following audits carried out on the Parent Company with specific audits at FS Group operating sites.

6. The Corporate Value Chain (scope 3) Accounting and Reporting Standard

Energy consumption

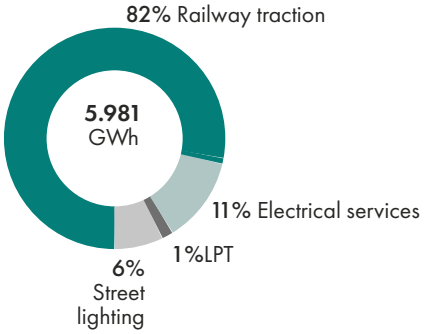
The Group's energy consumption is significant: monitoring is carried out with great care and considerable investments are made to improve energy efficiency. Energy consumption remains **one of the main items in the FS Group's environmental balance sheet** and is monitored in relation to both sources and end uses. Over the entire three-year period from 2021 to 2023, the FS Group's energy requirements will gradually increase by 2.2% between 2022 and 2021 and 5.1% between 2023 and 2022, bringing total energy consumption to 28.5 million GJ in 2023. The reasons for the increase are, to a large extent, related to the entry of new companies into the Group's consolidated scope.
The first consumption item is **electricity**, which totalled 5,980,635 MWh in 2023. This is a remarkable value, which explains FS Italiane's commitment to projects aimed at self-production of electricity from renewable sources.
Other types of consumption follow, first and foremost **oil**, but other natural sources, such as **biomass, hydrogen** and **methane**, are also emerging.

ELECTRICITY	Unit of Measurement	2023
Railway traction	MWh	4,919,242
Electrical services	MWh	670,182
Local Public Transport	MWh	36,601
Street lighting	MWh	354,610
TOTAL	**MWh**	**5,980,635**

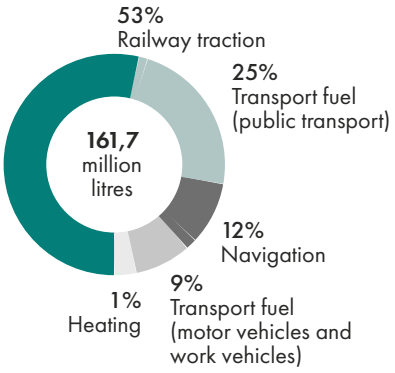
DIESEL	Unit of Measurement	2023
Railway traction	l	86,027,639
Autotraction (public transport)	l	39,957,900
Navigation	l	18,879,866
Autotraction (motor vehicles and work vehicles)	l	14,080,779
Heating	l	2,502,531
Generator sets	l	254,486
TOTAL	**Litres**	**161,703,201**

NATURAL GAS	Unit of Measurement	2023
Heating	scm	23,593,021
Autotraction (public transport)	scm	4,078,598
Industrial activities, automotive (motor vehicles and work vehicles)	scm	207,362
TOTAL	**scm**	**27,878,981**

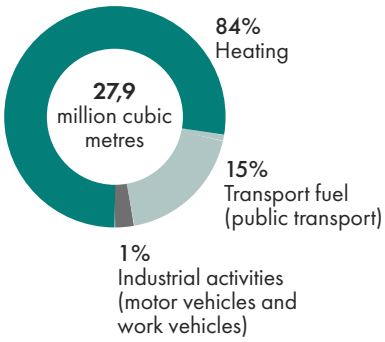
Electricity



Diesel



Natural Gas



In order to quantify the performance of the services offered, the **specific final consumption** is monitored, calculated as the **ratio between the energy used for railway operations**, electric and diesel trains, buses and the reference traffic units for passenger and freight rail transport, passenger-km and tonne-km respectively. This performance indicator, which is affected by various aspects (speed, elevation, vehicles, load factor, weight transported, weather conditions), decreased for all types of transport analysed between the years 2021 and 2022, while the decreasing trend in specific consumption did not affect freight transport: in 2023 there was a slight increase (+2.9%) in consumption per tonne-kilometre (107 kJ/tonne-km) due mainly to a reduction in the load factor of goods trains.

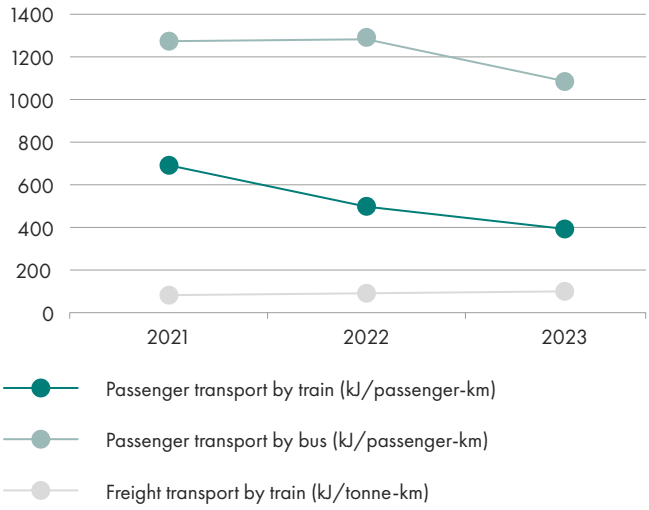


Figure 12 - FS Group Specific Final Consumption

Biofuel consumption

In 2023, the company **Qbuzz** consumed approximately 42,819 MWh of supplier-certified HVO biodiesel and approximately 5,137 MWh of green hydrogen produced from renewable sources[7] for a part of its bus fleet in the Netherlands to provide passenger transport services.
The company **Trenitalia**, in the same period, consumed approximately 2,907 MWh of supplier-certified HVO biodiesel, starting a trial of its transport service in the Calabria region.
The Group's commitment to an increased use of biofuels for a sustainable energy transition is evidenced by the three-year Letter of Intent for the procurement of HVO, for passenger and freight transport signed in June 2024.

ENERGY: AGREEMENT BETWEEN FS GROUP AND ENI

In June 2024, the **FS Group** signed an agreement with **Eni** to identify and develop new opportunities, including the use of **alternative fuels** for transport, such as HVO, intermodal **logistics solutions** and energy efficiency best practices. The document regarded also the identification of **standards**, **methods** and **technical standards** and the testing of new technologies related to **sustainability** and **circular economy**.

BIODIESEL HVO

42,819 MWh
Qbuzz

2,907 MWh
Trenitalia

GREEN HYDROGEN

5,137 MWh
Qbuzz

7. Green hydrogen technology uses energy from renewable sources to electrolyse water, producing carbon-neutral hydrogen that can be used as fuel on properly equipped systems.

THE WATER RESOURCE
Withdrawals and Water Security

The FS Group measures **water withdrawals** using flow meters.
The mechanical or electronic meters are placed upstream of the water distribution networks at the company sites, and their presence is guaranteed both when the water resource is supplied **from the municipal aqueduct** and when it is drawn from **surface or underground water bodies**. In the second case, since water is a public resource, its withdrawal must always be authorised and monitored, according to the law.
All Group companies **monitor the volumes of water employed at their sites** (offices, workshops, warehouses, etc.) for any use (production, administrative, commercial, etc.) through meter readings, taken by qualified internal or external personnel, or through smart technologies.

84% of water use is civil.

Total withdrawals in 2023
16,109.53 megalitres/year

Water withdrawals per source 2023 (megalitres)	
Fresh surface water, including rainwater, river and lake water	*83.03*
Groundwater - renewable	*5,977.13*
Third-party sources (municipal waterworks)	*10,049.37*

The quality of the water at the point of delivery is guaranteed by the operators of the external water supply network (e.g. public waterworks), or even internal network, for asset owners or operators. Routine quality analyses are carried out at all sites to protect workers and customers. Certified laboratories carry out analyses and **monitor legally required parameters**, such as pH, colour, odour, conductivity, ammonium, legionella spp, escherichia coli, residual disinfectant.

Drains and Water Security

The total volume of domestic and technological process water, aggregated at Group level, discharged both in the public sewerage system and in other destinations (e.g. surface water body or consortium collector), in 2023 was 14,518.93 megalitres/year.

The Group monitors water discharge volumes at all sites, and the data collected is recorded by the operating units on a monthly basis, and aggregated at Group level on a half-yearly basis for water accounting purposes.

14,518.93 megalitres/year
Volume of water discharged

93% of the Group's total discharge volumes are channelled into public sewers.
The remaining 7% is channelled into consortium collectors serving industrial areas, or into surface water bodies.

-7%

Comparison with the volume discharged in the previous year shows a **reduction of approximately 1150 megalitres**. In the future, we expect withdrawals to decrease through increased investments in smart water technologies, water efficiency measures and water circularity.

The quantity of discharged and purified water, which has been monitored for some time now, is one of the **main environmental performance indicators** the Group takes into account, when defining its environmental policies and objectives. The information acquired is valuable and used periodically at territorial level, to monitor **discharges and water efficiency or any circularity actions undertaken**. Half-yearly reports are compiled centrally to draft the Half-Yearly Financial Report, and annually to publish the Group Sustainability Report, which is disseminated externally.

Operational sites that use **products containing hazardous substances** in technological processes and generate industrial discharges, are constantly monitored according to the water accounting policy and for authorisation purposes with a frequency that depends on various factors. The average frequency of discharge quality checks at operational sites is usually monthly.
Water is analysed both internally and by sampling by external authorities, which monitor its **quality parameters**, such as the presence of pesticides (always absent), nitrates, phosphates, solvents, cadmium, lead, chromium, nickel, mercury etc.

Water consumption

The Group's water consumption in 2023 was estimated at approximately 1,591 megalitres/year.
This figure represents the total volume of water consumed, aggregated at Group level, calculated and consolidated based on the difference between the total volume withdrawn and the total volume discharged. Consumption also takes into account the share of wastewater volumes removed and purified as liquid waste off-site, rather than being discharged or immediately returned to the environment. Data also include hidden losses in water networks.

Total consumption 1,591megalitres/year

Recycling and Water Security

As the topic of recycled and reused water is relevant to the Group, it has already set in place several initiatives to **reduce water consumption and use it more efficiently, to recover rainwater and reuse purified wastewater** for technological uses.
In some sites, trial projects have been launched to assess the technical and economic feasibility of technological water recovery. These projects mainly concern companies for which the water aspect is relevant, considering the amount of the water balance of each within the water accounting of the Group.
Water recycling and reuse is monitored at the operational site level with special flow meters at plants that recover wastewater from technological processes or rainwater that has washed off paved surfaces. Information is recorded locally and aggregated at least once a year, at Group level.

TECHNOLOGICAL WATER
This water originates from technological processes operated in areas where industrial processing takes place; therefore, it is classified as an industrial discharge, according to Italian regulations.

Photography
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Illustrations
Andrea Scoppetta

Graphic design, realisation and printing
GRAFICANAPPA
PRINTING | PACKAGING | IML
via A. Gramsci, 19 - 81031 Aversa (CE)

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Creative and Editorial Coordination
Communication - Prodotti editoriali

FERROVIE DELLO STATO ITALIANE

Piazza della Croce Rossa 1 - 00161 Roma

November 2024

FSC
MISTO
Carta | A sostegno della gestione forestale responsabile
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