NS Futureproof Index Report

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Executive Summary

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This report analyses the Integrated Value and Futureproofing Ratio of Nederlandse Spoorwegen (NS). Because traditional financial metrics alone are insufficient for long-term corporate valuation, Professors Dirk Schoenmaker and Willem Schramade developed the Integrated Value (IV) methodology. This approach includes not only financial value (FV), but also social value (SV) and ecological value (EV). The Integrated Value is defined as the sum of these three elements:

> **Integrated Value (IV) = Financial Value (FV) + Social Value (SV) + Ecological Value (EV)**

The Futureproofing Ratio (IV/FV) is introduced as a key metric. A ratio greater than 1 signifies a net positive social and ecological contribution, while a ratio between 0 and 1 indicates a net negative social and ecological value, with financial value compensating. A ratio below zero indicates an unsustainable business model, where the negative social and ecological value outweighs the financial value. This ratio helps assess a company's long-term value potential, transition risks, and opportunities.

To ensure transparency and comparable outcomes, the research for this report is based on publicly accessible data and the same methodology as applied to the recently published AEX Futureproof Index Report[1]. Some key findings are outlined below:

Key Findings

1. NS has an **integrated value (financial + social + ecological) of €72.8 bn, much larger than its financial value of €6.4 bn. This means that NS has a futureproofing ratio of 11.3.** Comparing it to the AEX Futureproof Index[2], for which the same methodology was used, NS scores considerably higher than Philips (Futureproofing Ratio: 4.7), meaning it significantly exceeds all of the 23 AEX companies analysed[3].

2. NS operations in 2024 generated a social and ecological value of around 8.4 euro cents per passenger kilometer, while the NS received subsidies of around 1.3 euro cents per passenger kilometer. Therefore, the **social and ecological value generated by NS is six times greater than the subsidies it receives.**

1. *AEX Futureproof Index*, Schoenmaker, Schramade and Marijnissen, *2025*
2. *AEX Futureproof Index*, Schoenmaker, Schramade and Marijnissen, *2025*
3. A degree of caution is warranted when comparing this analysis to the AEX Futureproof Index ranking. First, this report focuses on 2024 data, whereas the *AEX Futureproof Index* is based on 2023 figures. Second, the financial value of NS is based on the book value of equity due to its non-listed status, while the Index uses market capitalisation for publicly traded companies.
4. *NS annual report 2022*, 2023
5. *NS annual report 2024*, 2025
6. *NS annual report 2023*, 2024

3. NS's large positive social value (€77.5 bn) — which amounts to 12.1 times NS's financial value — **is mainly due to social inclusion (€33.8 bn)**; The railways enable people to get to work and/or school every day and offer accessible options for those with disabilities. In addition, the railway network brings additional value to well-connected villages and cities (€17.6 bn), reflected in appreciation of houses. Other elements include positive employment wellbeing of NS' employees (€8.8 bn), people being able to work or study during their travel time on the train (€8.2 bn), and a large consumer wellbeing for its passengers (€7.6 bn).

4. NS's social value was negatively impacted primarily by the significant loss of time experienced by passengers due to delays. **The value of lost time due to said delays represents a negative value of €6.8 bn.** To put this into perspective: the societal cost of travel delays by car is twice as high per kilometer travelled. Overall, 5 minute punctuality and 15 minute punctuality show a downward trend, highlighting that delays are becoming a larger issue for NS. The HSL 5 minute punctuality, which went down from 82%[4] in 2022 to 69%[5] in 2024, is of particular cause for concern. Reducing delays could significantly enhance NS's integrated value.

5. Despite NS using 100% renewable energy for its train operations since 2017[6], **its entire operations are not yet 100% emission free.** At this time, their current and projected GHG emissions and PM10 (finedust) emissions still account for a negative environmental value of €1.9 bn and €0.3 bn respectively. Evaluating **absolute emissions** — the total emissions produced by NS operations, rather than the emissions avoided compared to other modes of travel — resulted in a negative ecological value. Note that train travel produces significantly fewer GHG and PM10 emissions than car travel, making it a more environmentally sustainable alternative.

6. Overall, NS has a significant social and ecological impact, both positive and negative, that far exceeds its financial value alone. This is reflected in €77.5 bn of positive social value compared to €8.4 bn of negative social value, and a negative environmental value of €2.8 bn. Understanding NS's integrated value profile is essential, as these impacts are highly material and must be central to its strategic decision-making.

Figure 1: IV Components

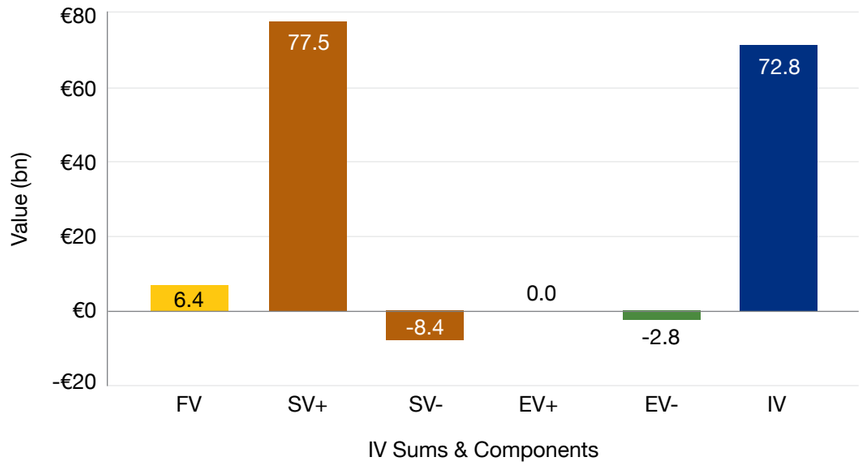
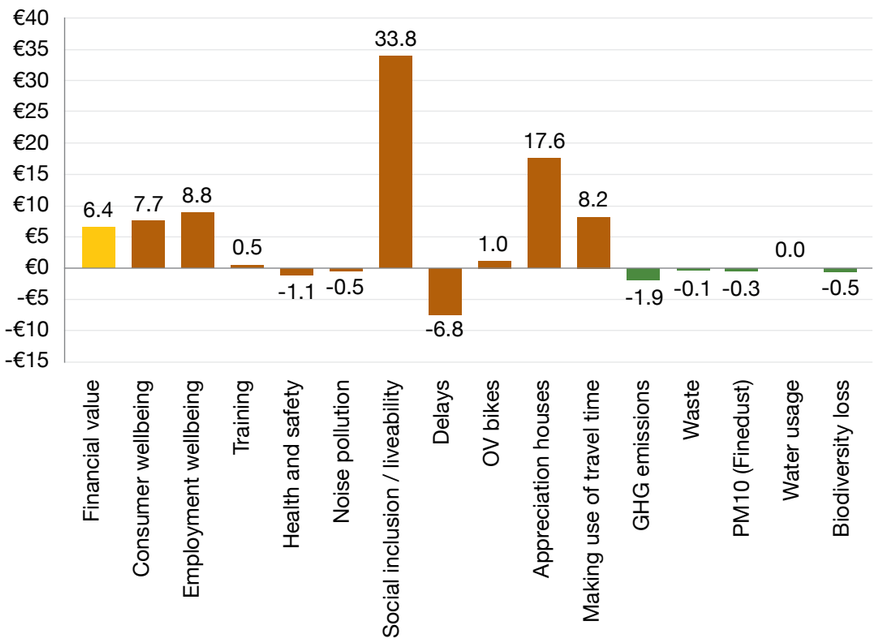


Figure 2: Values per Issue (bn)



7. *NS Annual Report 2024*, 2025.

Both Figure 1 and Figure 2 diagrams represent the overall value profile of the NS. Figure 1 titled “IV Components” visualises the different components of integrated value — that is financial, social (positive and negative), and ecological (positive and negative) — and the overall integrated value furthest to the right. Clearly, positive social value is the main contributing factor to the highly positive integrated value. Figure 2 titled “Values per Issue” visualises the value based on each issue, which allows one to identify the largest social and ecological issues. Social inclusion (€33.8 bn), Home Value Appreciation with access to the train (€17.6 bn), and Making Use of Travel Time (€8.2 bn) provided the largest contributions to the highly positive social value of the NS.

Reflecting on the findings from NS Futureproof Report, it’s paramount to recognise that measuring impact is the first step to addressing it. NS is an integral part of the Netherlands as we know it: Serving a country population of 18 million, NS counted 15.9 bn passenger kilometers in 2024[7], an average of nearly 900 kilometers per person.

From lowering emissions and improving public health to enabling economic participation and social inclusion, NS plays a key role in shaping a sustainable and cohesive society.

This analysis shows that the Netherlands is better off with a strong, well-funded NS. Strengthening awareness of the benefits of NS will build societal support and secure its licence to operate. A futureproof NS is not only essential for today’s mobility and wellbeing — it’s key to keeping the Netherlands moving for generations to come.

Introduction

Nederlandse Spoorwegen

Nederlandse Spoorwegen (NS) is the principal train operator in the Netherlands, providing comprehensive passenger rail services across the country for 10.121 million people per year.[8] As a state-owned enterprise, NS plays a vital role in the Dutch public transport system, focusing on delivering reliable, sustainable, and customer-centric mobility solutions. Furthermore, it is the largest passenger rail transport company in the country, with more than 1 million people taking the train per day. NS operates train services on over 2,100 kilometres of railway lines, and to accommodate that many passengers, the organisation has almost 3,000 railway cars with seating for more than 260,000 passengers.[9]

Organisational Structure

NS employs over 22,000 individuals both domestically and internationally. Its operations are organised into several key business units:

NS Operations: Responsible for rail transport on the Dutch main rail network, including the high-speed line (HSL). This unit encompasses train drivers, guards, mechanics, service staff, and operational management teams.

Commerce & Development: Focuses on timetable design, customer service, marketing, strategic projects, and sustainability initiatives. It also oversees ticket sales and NS International services.

NS Stations: Manages a network of approximately 400 stations, working to enhance passenger experiences and promote area development around stations in collaboration with partners like ProRail and local authorities.[10]

Sustainability Initiatives

NS is committed to environmental sustainability. Since 2017, all NS trains have been powered by 100% green electricity sourced from Dutch and Swedish wind farms. The company aims to achieve entirely fossil-free operations by 2040, encompassing trains, buildings, and offices.

Recent Developments

In December 2023, NS was awarded the main rail network franchise for the period of 2025 through 2033 by the Ministry of Infrastructure and Water Management. This new franchise agreement provides NS with the opportunity to continue enhancing its services and infrastructure to meet future mobility needs.

One of the main issues facing NS is its operational costs. In 2024, the organisation reported a net loss of €141 million, marking its fifth consecutive year of financial losses. This represents an improvement from the €380 million loss in 2023, yet the company continues to face significant financial challenges.[11]

The primary factors contributing to the ongoing losses include rising operational costs and lagging passenger numbers. Expenses increased by 8% to €3.84 billion, which was driven by higher energy prices, increased infrastructure fees, and investments in staffing and service quality.[12] Also, fewer passengers have returned to taking the train post-COVID-19. Despite a 4.3% increase in train travel compared to 2023, passenger levels remained at 92% of pre-pandemic figures from 2019.

8. *Dutch Railways (NS)*, Mendix, 2025
9. *NS Responsibilities*, NS, 2025
10. *NS Annual Report 2023*, 2024
11. *NS posts fifth loss in a row says 90% of trains are on time*, NL News, 2025
12. *Jaarcijfers NS: 141 miljoen euro nettoverlies over 2024*, Mobiliteit.nl, 2025
13. *NS Annual Report 2024*, 2025
14. *The NS presents a final collective bargaining proposal to the unions*, NL Times, 2025
15. *Radio West*, Liveblog. 2025
16. *Pinksterdrukte op de weg*, Hart van Nederland, 2025
17. *Tweede staking NS legt spoor opnieuw plat, weg en bus voelen gevolgen*, Mobiliteit.nl, 2025
18. *In bijna hele land geen NS-treinen door grote staking, zware spits blijft uit*, AD, 2025

In response to these financial pressures, NS announced plans to cut 500 office jobs through natural attrition and reduce expenditures on train refurbishments. These measures aim to achieve annual savings of approximately €200 million. Additionally, NS postponed a proposed 8.7% fare increase in 2024 due to a one-time €120 million subsidy from the Dutch government. However, this support will not be available in 2025, necessitating the implementation of the deferred fare hike alongside adjustments for inflation.[13]

While NS has made strides in improving its financial performance, the company continues to grapple with the challenges of balancing operational costs and revenues in a post-pandemic environment. Still, the railway network remains integral to the way of life in the Netherlands: recent labour strikes in June 2025 focused on getting better wages for workers.[14] While negotiations have continued, the system ground to a halt, proving that without NS, traffic congestion greatly increased in cities like Amsterdam and fewer people were able to get to work or school.[15] [16] [17] [18]

Integrated Value: A New Way

Large corporations hold immense potential to address global challenges such as climate change and social inequality. By driving positive social and environmental impact, companies contribute to societal wellbeing and enhance both trust in the company and the continuity of its business model long-term. However, traditional performance benchmarks often fail to capture the full picture, focusing primarily on financial indicators such as market capitalisation, Return on Equity (RoE), profit or Price-to-Book ratio. Risks are typically assessed using backward-looking measures like stock return volatility or profit variability.

To shift this paradigm, we asked ourselves a critical question: To what extent do large companies create and destroy value for society? This report evaluates NS not only on its financial performance but also on its ability to manage transition risks and generate positive social impact (while reducing negative social and environmental impact). Our methodology introduces two indicators to complement traditional financial valuation:

1. **Risk** is switched from a backward-looking perspective based on historical data to forward-looking transition risk, assessing the company's resilience to sustainability transitions.
2. **Impact** is measured as the monetised positive social and environmental externalities.

Together, these indicators provide an integrated overview of financial viability, transition risk, and impact—offering an extensive lens for understanding a company's true or integrated value.

To make these insights actionable, we developed an integrated benchmarking approach. Companies are assessed on integrated value, which is the present value of future projections of cash and value flows. Table 1 shows how we calculate integrated value.

At the core of this methodology lies the Futureproofing Ratio,[19] a novel metric calculated as the ratio of a company's integrated value (the sum of financial, social, and environmental value) relative to its financial value.

We are excited to share how we've applied this new approach to value to NS, which highlights how the railway company performs today and evaluates its preparedness for the changes of tomorrow.

19. "Futureproofing" business means to equip a company for future developments (*Future-proofing*, Oxford English Dictionary, 2024).

Table 1: Integrated Value

Dimension	Absolute	Relative
Financial: financial viability	Financial value = enterprise value = equity	Price-to-Book (P/B) ratio
Risk: transition risk	Negative externalities (based on discounted negative value flows)	Negative externalities / financial value
Impact: contribution to society	Positive externalities (based on discounted value flows)	Positive externalities / financial value
Integrated value	Integrated value = financial + social + environmental value	Futureproofing Ratio: IV/FV

Methodology for Integrated Value

Integrated value calculates the value for all company stakeholders. The integrated value IV of company i combines financial value FV, social value SV, and environmental value EV (Schoenmaker and Schramade, 2023):

$$IV_i = FV_i + SV_i + EV_i$$

Whereby FV_i refers to the financial value of company i's activities (also called enterprise value) financed by equity and debt. SV_i and EV_i are explained below.

The methodology for calculating integrated value is based on the Impact-Weighted Accounts Framework (IWAF), developed by the Impact Economy Foundation (IEF, 2024) and Harvard Business School (Serafeim et al., 2019). Impact valuation has been further elaborated in academia (Pastor et al., 2024; Schoenmaker and Schramade, 2024a, 2024b). Recent advances in impact valuation enable companies to measure social and environmental effects and monetise these via cost-based pricing techniques.
Impact valuation starts by describing the social and environmental impacts j of the company i in its units $Q_{i,j}$. For example, carbon emissions can be expressed in tonnes of CO_2. The next step is to monetise each factor with its shadow price SP_j, which reflects the social cost (Pastor et al., 2024; Schoenmaker and Schramade, 2024b).
As we deal with social and environmental externalities, market prices tend to underestimate the social and environmental value from a welfare perspective. The principle of remediation can be used to derive the remediation costs of social and environmental impacts. While the market price of carbon emissions fluctuated around €70 per ton of CO_2 in the EU Emissions Trading System in 2024 (European Commission, 2024), the shadow carbon price to restore the original situation is estimated at €214 per ton of CO_2 (IEF, 2024).

Using the Discounted Cash Flow (DCF) model, the social value SV_i and the environmental value EV_i of company i can be calculated as follows:

$$SV_{i,t} = \sum_{t=0}^{T} \frac{Q_{i,j,t} \cdot SP_{j,t}}{(1+r)^t}$$

$$EV_{i,t} = \sum_{t=0}^{T} \frac{Q_{i,j,t} \cdot SP_{j,t}}{(1+r)^t}$$

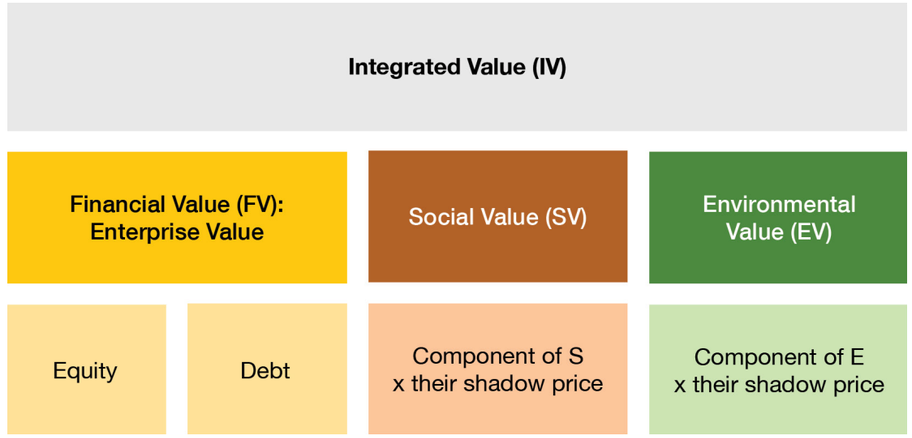
Whereby r reflects the social discount rate and t the number of periods over which the impacts are discounted. Social and environmental impacts are discounted at the social discount rate (Dasgupta, 2021; Pastor et al., 2024; Schoenmaker and Schramade, 2024a). The social discount rate is applied for impacts on society and is a single rate for all impact factors Q_j. Pastor et al. (2024) and Schoenmaker and Schramade (2024a) find a consensus among experts on a social discount rate of 2.2%. The time horizon for calculating impacts is infinite. The size of the environmental value depends critically on the pathway for reducing negative externalities (in particular carbon emissions). We apply a leading scenario of net zero by 2050.

A detailed working methodology is explained in the Impact Accounts Framework (IEF, 2024) and in Chapter 5 and Chapter 11 of *Corporate Finance for Long-Term Value* (Schoenmaker and Schramade, 2023). Here, we provide the main steps; the annex contains notes on integrated value accounting policies.

Integrated Value Calculation

The individual components of integrated value $IV_i = FV_i + SV_i + EV_i$ are calculated and aggregated in the final step. Figure 3 provides an overview.

Figure 3: Integrated Value and its Components[20]



20. *Corporate Finance for Long-Term Value*, Schoenmaker and Schramade, 2023.

A) Financial value
The enterprise value measures the financial value FV_i of company i's activities, which are financed with equity and debt (see Figure 3). From a stakeholder perspective, the equity and debt capital providers are a company's financial stakeholders. On the other hand, only shareholders' equity is typically considered in shareholder analyses.

For NS, we use the book value of equity and debt rather than market-based figures, as NS is not publicly listed and therefore has no available market capitalisation. In such cases, book values provide the best available estimate of the company's financial position.

B) Materiality of social and environmental factors
The calculation of social and environmental value starts with the question: What are the most material social (S) and environmental (E) factors j? What issues are sufficiently crucial regarding relevance to the business model or size of impact?

Table 2 (page 21) contains the standard S and E factors to be calculated with standard shadow prices (Schoenmaker and Schramade, 2023). Other relevant S and E issues for the company at hand are added (e.g. social inclusion) as explained in the Annex 'Integrated Value Methodology Notes.'

C) Quantification (historical fiscal year 2024)
The material factors j are expressed in their own units $Q_{i,j}$ (e.g., life satisfaction points, life years saved, CO_2 emissions in tons, waste in tons) for company i in Table 2. The quantities are estimated over the last reporting period (fiscal year 2024). Most company data is taken from annual and/or sustainability reports and can thus be derived objectively.

If company data is unavailable, industry estimates or other sources are used. Assumptions used for making these approximations are specified. In note 3 of the Annex 'Integrated Value Methodology Notes', some guidelines for specifying assumptions and estimations are given.

D) Monetisation
The relevant shadow price SP_j is applied for each material issue j in Table 2. The Box on shadow prices explains how shadow prices work. The shadow prices from Impact Economy Foundation (IEF, 2024) and CE Delft (CE Delft, 2023) are used to monetise social and environmental impact.

Shadow prices SP_j are constant over time, except for the carbon shadow price. The 2024 shadow carbon price is $236 / 1.105 = €214 per ton CO2 (IEF, 2024); it grows by 3.5% per year to reflect the rising cost of abating carbon emissions.

An intermediate step of attribution is needed to arrive at final value flows. The impact can be directly or indirectly attributed to companies. Internal effects (that is, effects happening in or at the company) are directly attributed 100% to the company. External effects happen elsewhere in the supply chain: upstream at suppliers or downstream at consumers (and local communities). These external effects are attributed pro rata over the value chain (see note 1 of the Annex).

The value flow $VF_{i,j}$ is calculated by multiplying the Quantity, the Shadow Price, and the Attribution Factor $AF_{i,j}$: $VF_{i,j} = Q_{i,j} * SP_j * AF_{i,j}$.

The value flows $VF_{i,j}$ are summed over all factors j to obtain total positive and negative social and environmental flows for 2024.

Table 2: Integrated Value Calculation Scheme (2024 fiscal year)

Material issue	Quantity $Q_{i,j}$ (2024)	Shadow Price SP_j (2024)	Attribution factor $AF_{i,j}$ (2024)	Value flow $VF_{i,j}$ (2024)
Social factors				
Consumer wellbeing				
Employment wellbeing				
Training				
Health & safety				
Noise pollution				
Social inclusion / liveability				
Delays				
OV Bikes				
Appreciation / increase in value of villages / cities with good connections				
Making use of travel time (studying / work)				
Environmental factors				
GHG emissions				
Waste				
PM10 (finedust)				
Water usage				
Biodiversity loss				
Aggregating social and environmental externalities				
Total positive social				
Total negative social				
Total positive environmental				
Total negative environmental				

E) Valuation and aggregation
The final step is to transform the 2024 value flows from Table 2 into social and environmental values: SV_i and EV_i with the DCF model. The social discount rate r is used to discount social and environmental value flows $VF_{i,t}$. The individual SV_i and EV_i components are calculated for each company i, showing positive and negative values separately.

To calculate the present value of value flows, we need to make assumptions for future growth of value flows. To avoid overstating externalities, we are cautious in our assumptions about the development of externalities. These assumptions can be replaced with actual developments in future impacts when companies report their material impacts (performance and targets).

A neutral position is taken on the social side by assuming that social externalities remain constant. On the environmental side, it is assumed that companies want to reduce their negative environmental values. The most important environmental factor is carbon emissions. Companies are assumed to follow a net zero strategy, whereby carbon emissions are reduced in equal steps towards 2050. Companies are assumed to reduce the other negative environmental externalities by 2% per year. The technical box shows how these assumptions work out for the valuation of SV and EV.

We are now ready to fill in Table 3 to obtain the Integrated Value. FV is taken from Step A; positive and negative SV and EV are taken from step E.

Interpretation of Integrated Value
The Price-to-Book (P/B) ratio is used to compare a company's market value to its book value, to assess whether a company stock is undervalued or overvalued relative to the company's assets. Risks are typically assessed using backward-looking measures like stock return volatility.

With the integrated value, we introduce new metrics and ratios to interpret a company's value and risk. The Futureproofing Ratio (IV/FV) can be used to assess a company's integrated value in relation to its financial value. The Futureproofing Ratio is made up out of an transitional opportunity ratio (positive externalities by financial value) and a transitional risk ratio (negative externalities divided by financial value):

Futureproofing Ratio = Transitional Opportunity Ratio – Transitional Risk Ratio + 1

Table 3: Integrated Value

IV calculation (equal weights)	Value (billions)	2024 Value flows (bn)
FV (enterprise value)		
Positive SV		
Negative SV		
Positive EV		
Negative EV		
IV (integrated value)		

Table 4: Interpretation of Integrated Value

Dimension	Ratio	Value
Financial: financial viability	P/B ratio	
Impact: transitional opportunity	Positive externalities / FV	
Risk: transitional risk	Negative externalities / FV	
Integrated Value	Futureproofing Ratio (IV/FV)	

Technical Box – Shadow Prices Demystified

Shadow prices is an important concept that is not well-known outside academic circles. The shadow prices reflect the 'true scarcity' of resources to stay within planetary boundaries, or the 'true price' of human rights breaches to stay within social boundaries. Using shadow prices is thus a tool for companies to stay within social and planetary boundaries. The term shadow prices illustrates that these prices don't reflect current market prices but 'shadow' true prices (Galgani et al., 2021). Shadow prices are derived from scientific studies. The Impact Economy Foundation (2024) and CE Delft (2023) provide a regularly updated list of impacts and shadow prices for a whole range of social and environmental impacts.

The theoretical underpinning of shadow or true prices for social and environmental impact is based on welfare theory (e.g., Bosselmann, 2016), whereby welfare is defined as the current and future value enjoyed by a company's stakeholders. Shadow prices are based on two welfare categories: respect of rights and wellbeing. The first category of rights includes (Galgani et al., 2021):

- **Human rights:** these refer to the rights of any individual as stated in the International Bill of Human Rights of the United Nations, such as the rights to life, liberty, and personal security, to freedom from slavery or degrading treatment;
- **Labor rights:** these are the rights in the Fundamental Conventions of the International Labour Organisation, such as the rights to freely chosen work, to fair wages, to a safe and healthy workplace, to unionize and to freedom of discrimination;
- **Environmental rights:** these refer to the right to a healthy environment and to natural resources, as enshrined in international agreements of the United Nations, such as the Paris Climate Agreement.

In the latter case, for example, air, land, and water pollution and depletion of natural resources can be seen as breaches of environmental rights. The shadow price reflects the cost to restore the original situation or the cost to compensate for the damage by the unsustainable impacts.

The second category is based on the wellbeing of stakeholders. Wellbeing, also known as quality of life, refers to what is intrinsically valuable for someone. This includes the wellbeing of employees, customers, and communities (social cohesion). Employment wellbeing refers to additional wellbeing experienced by employees resulting from their employment and education at the company; this wellbeing is in addition to the salary received. Employment wellbeing is measured by life satisfaction points on a scale of 0 to 100. The shadow price of one life satisfaction point is estimated at €2,395 (IEF, 2024). Consumer wellbeing is calculated as the consumer surplus, which is the difference between the price of a product and what consumers want to pay for it. Consumer surplus is a measure of consumer welfare.

Technical Box – Calculating SV and EV

Starting with social value SV, the formula is $SV_{i,t} = \sum_{t=0}^{T} \frac{Q_{i,j,t} \cdot SP_{j,t}}{(1+r)^t} = \sum_{t=0}^{T} \frac{VF_{i,j,t}}{(1+r)^t}$.

It is assumed that social externalities remain constant. Using the perpetuity formula, the value becomes:

$SV_{i,2024} = \sum_{j} \frac{VF_{i,j,2025}}{r}$ whereby $r = 2.2\%$.

For environmental value EV, the formula is similar $EV_{i,t} = \sum_{t=0}^{T} \frac{Q_{i,j,t} \cdot SP_{j,t}}{(1+r)^t} = \Sigma \frac{VF_{i,j,t}}{(1+r)^t}$.

By contrast, it is now assumed that companies want to reduce their negative environmental values. On carbon, companies are assumed to follow a net zero strategy, whereby carbon emissions are reduced in 26 equal steps towards 2050 *(reduction* $= \frac{100}{26} = 3.8$ *percentage points per year)* in the main scenario. This means that emissions are reduced evenly compared to the base year of 2024.

$Q_{2025} = (100\% - 3.8\%) \bullet Q_{2024}$; $Q_{2026} = (100\% - 2 \cdot 3.8\%) \bullet Q_{2024}$; etc.; $Q_{2050} = (100\% - 26 \cdot 3.8\%) \bullet Q_{2024} = 0$.

Please note that the shadow price for carbon is increasing (see step D).

For the other negative environmental values, companies are assumed to reduce their negative impacts by 2% per year, $g = -2\%$.

The value becomes: $EV_{i,2024} = \sum_{j} \frac{VF_{i,j,2025}}{r-g}$, whereby $r = 2.2\%$ and $g = -2\%$. This gives $(r - g) = 4.2\%$.

Assessment Process

The NS Futureproof Index assessment consisted of two research phases. During the initial phase, which began May 1st, 2025, the research team, including three analysts, reviewed publicly available information such as company annual reports, sustainability reports, fact sheets, website(s), financial information, non-financial data such as Glassdoor reviews, and other public documents for NS. In addition, NS provided data that was previously private that we could publish along with our report, which is displayed in NS Additional Data Issuance. This combination of public and private data allowed us to create a more complete picture of NS's integrated value. This first phase ended on June 6th, 2025, with a draft assessment of the railway company, including an initial integrated value.

The second research phase focused on refinement. The research team once more reviewed the analyses performed by the analysts and calculated NS's Futureproofing Ratio. Extra attention was paid to understanding NS's highly positive social impact while understanding the financial losses and other negative factors that garner attention.

The final publication in August 2025 includes both the integrated value and futureproofing ratio for NS, our methodology, and the insights from doing this analysis for NS.

Results

Results

OVERVIEW	
COMPANY NAME	NS (Nationale Spoorwegen)
FINANCIAL VALUE	€6.4 bn[21]
INTEGRATED VALUE	€72.8 bn
FUTUREPROOFING RATIO	11.3

To calculate the Integrated Value of NS, we analyzed the social and environmental factors. Please find those values, calculations, and explanations below:

SOCIAL FACTORS

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Consumer Wellbeing			330.54	50%	165.27	**7,662.4**
Input factors: Sales: €3.7 bn[22], price elasticity: 1.2[23] *Calculation:* Correction Factor = 1 + [(10 – *price elasticity) * partial factor] / price elasticity* = 1 + [(10 – 1.2) * 0.5] / 1.2 ≈ 4.67 Corrected consumer surplus value flow = *sales / (price elasticity * correction factor)* * 0.5 = 3.7 bn / (1.2 * 4.67) * 0.5 = €330.54 mn				*Explanation:* For its customers, NS provides a practical and accessible way to travel across the Netherlands, especially for commuting, education, and visiting family or friends. While challenges like delays and busy trains can occur, NS generally offers a reliable and sustainable alternative to driving. Customers benefit from frequent service on major routes, an extensive network, and the ability to use travel time to work, read, or relax. With digital tools like the NS app and options like the OV-fiets and subscriptions, NS aims to make public transport more convenient and affordable for everyday travel needs.		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Employment Wellbeing	79,333 Life Satisfaction Points	2,395 euros / Life Satisfaction Point[24]	189.27	100%	189.27	**8,775.0**
*Calculation: Employment wellbeing = Number FTEs * life satisfaction points * shadow price* *Life satisfaction points* = 3.1 + (*Glassdoor* (X) – 3.4) * 1.5 Number FTEs = 20,526[25] Life satisfaction points = 3.1 + (3.9[26] - 3.4) * 1.5 = 3.85 Employment wellbeing value flow = 20,526[27] * 3.85 * €2,395 = €189.27 mn				*Explanation*: The NS offers its employees more than just a job—it provides meaningful work that contributes to sustainable mobility and the daily lives of millions of passengers. Employees benefit from a strong sense of purpose, working for a company at the heart of Dutch society. NS offers stability, diverse career paths, personal and professional development opportunities, and attractive employment conditions. With a focus on inclusion, innovation, and work-life balance, NS supports its people in growing both individually and collectively working for a vital public service.		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Training			11.30	100%	11.30	**523.9**
Calculation: Training expenditure: €11.30 mn[28]				*Explanation*: NS invests a significant amount of resources in training and developing its staff. In 2024, €11.3 million was spent on education through initiatives like the NS Learning Center, the TechniekFabriek, and partnerships with vocational schools (ROCs). Employees received training for roles such as train driver, conductor, service and retail staff, and were supported in their continuous development through career platforms, a dedicated onboarding program for managers, and tools like the Development Desk and LearnXpress.[29]		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Health and Safety	Fatal incidents: employees: 0 non-employees[30]: 11[31] Non-fatal incidents: employees: 1,095 non-employees: 7[32]	Fatal incidents: €3,348,416[33], Non-fatal incidents: €3,946[34]	Employee incidents: -4.32 Non-employee incidents: -36.86	Employee incidents: 100% Non-employee incidents: 50%	-22.75	**-1,054.8**
*Calculation: Health and safety value flow = (fatal incidents employees + 50% * fatal incidents non-employees) * shadow price + (non-fatal incidents employees + 50% * non-fatal incidents non-employees) * shadow price* = (0 + 50% * 11) * €3,348,416 + (1,095 + 50% * 7) * €3,946 ≈ €22.75 mn (–)				*Explanation*: As a public transport provider, NS bears a significant responsibility for ensuring the safety of both its employees and the millions of passengers that use its railways every day. In 2024, 11 fatal non-employee incidents (not including suicides) and over 1,100 non-fatal incidents were reported. While NS invests in risk prevention, employee training, and safety infrastructure, these numbers reflect the remaining burden of its operations on physical wellbeing. The value flow caused by incidents with employees is 100% attributable to NS, the incidents with non-employees are attributable for 50%.		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Noise Pollution	Noise: 126,500 people Vibrations: 126,500 people	Noise: €93 / person affected[35] Vibrations: -	-11.76	100%	-11.76	**-545.4**
Calculation: Noise = *number of people living within 300 meter of rails * shadow price* *Vibrations = number of people living within 300 meter of rails * shadow price* Value flows: Noise: Number of people living within 300 meter of rails = 126,500 people[36] Shadow price: average Lden (day-evening-night equivalent level) for people living within 300 meters of train tracks = 54.5 dB Lden.[37] This falls within the 50-55 dB range of the shadow price for people impacted by railway noise as defined by CE Delft: taking the lower value the shadow price is €93 per person per year.[38] Value flow = 126,500 * €93 = €11.76 mn (-)				*Explanation:* People living close to a railroad experience the negative effects of noise coming from the passing trains. Based on scientific estimates and Dutch shadow prices, we calculated the costs of noise exposure for people living within 300m of railways. The calculated value captures the societal cost of the noise exposure, which is fully attributable to NS.		

Vibrations:
Number of people living within 300 meter of rails = 126,500 people[39]
The shadow price for vibrations is not yet defined, therefore it is not possible to calculate the value flow.

Noise pollution value flow = €11.76 mn (-)

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Social Inclusion / Liveability			1,457.89	50%	728.95	**33,796.6**

Commuting
Input factors:
Full working-age population of the Netherlands by education level[40]:
- Low educated: 1,036,757 (15.6%)
- Middle educated: 2,881,186 (43.2%)
- High educated: 2,745,830 (41.2%)

Employment elasticity with respect to public-transport-and-bicycle job accessibility[41]:
- Low educated: 0.0003 (10% increase in PT-and-bicycle job accessibility leads to a 0.3% increase in employment)
- Middle educated: 0.0002
- High educated: 0.0001

NS share in PT-and-bicycle job accessibility: 10% (assumption)[42]
GDP to unemployment elasticity Netherlands (Okun's Law): -0.309[43]
Netherlands GDP level 2024: €1,068 bn[44]

Calculation:
Increase in employed people = *NS share in PT-and-bicycle job accessibility * Employment elasticity with respect to PT-and-bicycle job accessibility * Working-age population of the Netherlands* = (1,036,757 * 0.3% + 2,881,186 * 0.2% + 2,745,830 * 0.1%) ≈ 11,618

Increase in life satisfaction due to work = *number of workers * The average increase in life satisfaction due to work * shadow price of one life satisfaction point* = 11,618 * 3.1 * €2395 ≈ €86.26 mn

Increase in GDP due to work = *Increase in employed people / total working population * (-) GDP to unemployment elasticity * GDP Netherlands 2024* = 11,618 / (1,036,757 + 2,881,186 + 2,745,830) * 0.309 * €1,068 bn ≈ €578.30 mn

Total added value of work: €86.26 mn + €578.30 mn ≈ €664.56 mn

Study
Input factors:
Lifetime value of one additional year of schooling: €36,222[45]
Students living at home: 376,039 + 334,400 = 710,439[46]
% students living at home that travel to university by train: 25% (assumption)[47]
% study passengers that would not be able to study without trains: 10% (assumption)[48]

Calculation:
Students enabled by NS = *students living at home * % of students travelling by train * % study passengers that would not be able to study without trains* = 710,439 * 25% * 10% = 17,707

Total value of study: = *students enabled by NS * the lifetime value of one additional year of schooling* = 17,706.975 * €36,222 ≈ €641.38 mn

Explanation: NS plays a vital role in the Netherlands by providing accessible and sustainable transport that connects people to jobs, education, and social life. By enabling millions to commute efficiently, NS helps reduce regional disparities and supports higher employment levels, which contributes to GDP growth as lower unemployment is strongly linked to economic expansion. Reliable access to work also improves wellbeing and happiness among employees since commuting options influence job opportunities, work-life balance, and overall life satisfaction. Furthermore, by facilitating access to education, NS contributes to long-term societal value: Research shows that each additional year of schooling significantly increases a person's lifetime earnings and generates substantial public returns through higher productivity, better health outcomes, and civic engagement. For people with a disability, accessible train services offer the freedom to travel independently, increasing their social inclusion and participation in education and the labour market. NS has made significant efforts to improve accessibility for people with disabilities, such as offering travel assistance services like 'NS Reisassistentie'. These initiatives reflect a strong commitment to inclusivity in public transport. However, due to limited data, it's difficult to gain a clear picture of their impact on the number of disabled people travelling by train.

Accessibility for people with a disability
Input factors:
Total NS passengers 2024: 10.121 mn[49]
Total inhabitants in the Netherlands: 18,066,249[50]
Number of people in the Netherlands with a mental disability: 440,000[51] (≈ 2.4%)
% people in the Netherlands with a physical disability: 14.5%[52]
%people in the Netherlands with a (mental or physical) disability: 14.5% – 16.9%
Assumed % of NS passengers with a (mental or physical) disability: 5%[53]

Estimated number of people with a disability travelling with NS: 10.121 mn * 5% (*mental and/or physical disability*) = 506,500

Shadow price: Ministerie van BZK (MKBA Toegankelijkheid Bouwbesluit) assume a quality-of-life gains from public accessibility: improved public accessibility valued at €2,000–€4,000 per disabled person per year (10–20% of a €20k QALY).[54] For our estimations we take the average of this shadow price: €3,000.
NS share in public accessibility: 10% (assumption)[55]

Value flow = *number of people with a disability travelling with NS * NS share in public accessibility * shadow price* = 506,500 * 10% * €3,000 ≈ €151.95 mn

Total Value = Total value of work + total value of study + total value of accessibility for disabled people = €664.56 mn + €641.38 mn + €151.95 mn ≈ €1,457.89 mn

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Delays	4.83 mn hours	Recreative: €25.21 Commuting: €34.03 Business: €54.88	-146.44	100%	-146.44	**-6,789.4**

Input factors:
HRN (Hoofdrailnet) passenger punctuality **5 minutes**: 89.4%
HRN passenger punctuality **15 minutes**: 97.1%
HSL-Zuid (Hogesnelheidslijn) passenger punctuality **5 minutes**: 69.0%[55]

5-15 minute delay HRN: 97.1 - 89.4 = 7.7% of train travels
15+ minute delay HRN: 100 - 97.1 = 2.9% of train travels
5+ minute delay HSL-Zuid: 100 - 69 = 31% of train travels

Number of passenger journeys NS in 2024: 346 mn in 2023[57]

Number of passenger journeys on HSL-Zuid: 8.5 mn per year[58]

HRN ex. HSL-Zuid = 346 - 8.5 = 337.5 mn passenger journeys

Nature of train trip[59]:
- Recreative (non-essential) (48%)
- Commuting (47% of train trips)
- Business (4% of train trips)

Shadow prices per hour, converted to Euro and inflation adjusted is presented in the table below[60,61]
Waiting time is valued higher than journey time due to its more unexpected, unproductive and less comfortable nature.
Inflation 2005 - 2025 in the UK[62]: 76.30%

Explanation: Even though the NS is attempting to match the set standards by the State, punctuality has been far off its goal in 2024, especially when it comes to the HSL-Zuid. Whereas passengers are able to anticipate longer travelling time when it's communicated beforehand, sudden delays lead to greater frustration, which then leads to a higher shadow price compared to regular longer travel times.
As small delays up to 5 minutes are anticipated in any traffic, we take delays beyond 5 minutes. To put this into perspective: The societal costs resulting from traffic jams and delays on the Dutch main road network were estimated at €2.7 to €3.5 bn for 2022[63]. This considers the value of lost time, not including additional environmental damage. Taking the conservative estimate for the value flow of €2.7 bn, this leads to a total negative present value of €125 bn, more than 18 times that of the NS delays. And that while the amount of passenger-kilometers by car (136 bn[64]) is only 8.6 times larger than the passenger kilometers by train (15.9 bn[65]). This means that the negative value of delay is about twice as large for travel by car compared to by train.

	Journey Time	Waiting Time
Recreative	10.10	25.21
Commuting	20.52	34.03
Business	54.88	54.88

Calculation:
*Delays = HRN passengers * (>5 minutes delay % - >15 minutes delay %) * 5 minutes + HRN passengers * >15 minutes delay % * 15 minutes + HSL-Zuid passengers * >5 minutes delay % * 5 minutes*
=
235.5 mn * (10.6% - 2.9%) * 5 + 235.5 mn * 2.9% * 15 + 8.5 mn * 31% * 5 = 181,34 + 136.59 + 26.35 = 290.07 mn minutes = 4.83 mn hours

Delays value flow: 4.83 mn * (48% * €25.21 (recreative) + 47% * €34.03 (commuting) + 4% * €54.88 (business)) = 4.83 mn * €30.29 ≈ €146.44 mn (-)

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
OV Bikes	5.9 mn bike trips	€7.32 / trip	43.19	50%	21.59	**1,001.2**

Calculation: The value flow of OV bikes will be conducted through a relative comparison/valuation of the benefits of other shared bicycle schemes. Based on the studies of London and Dublin schemes, the average benefit per bike journey will be calculated, adjusted for inflation, and scaled by the number of OV bike trips.

Number of OV bike trips = 5.9 mn[66]

London: monetised benefits (2014): journey time savings £26 mn, health benefits £22.5 mn, and ambiance benefits £7.4 mn[67]
Total benefits = £55.9 mn per year for 10.8 mn[68] trips in 2014
Benefit per trip (2014) = £5.18
Benefit per trip (in 2024 euros[69]) = £6.94 (2024) * 1.25€/£[70] = €8.68

Dublin: monetised benefits (2015): journey time benefits €6.06 million per year, and wider economic benefits €6.79 million per year[71]
Total benefits = €12.85 mn per year for 2.8 mn journeys in 2015
Benefit per trip (2015) = €4.59
Benefit per trip (in 2024 euros[72]) = €5.95

Average benefit per trip (in 2024 euros) = (€5.95 + €8.68) / 2 = €7.32

OV bike value flow = €7.32 * 5.9 mn trips * 50% ≈ €21.59 mn

Explanation: Bike sharing initiatives provide many benefits such as health, ambiance, and journey time savings. Although the study of Dublin bikes reported that health benefits to users were likely to be minimal given the significant modal shift from walking[73], bike sharing reduces traffic fatalities due to car substitution[74], resulting in lower costs of healthcare. A recently conducted study[75] on bike sharing pointed in the same direction. However, the way the results were presented made it difficult to isolate the value per trip by OV bike.

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Appreciation / increase in value of villages / cities with good connections				50%	378.75	**17,560.2**

Input factors:
Median increase in property prices for houses within a 15 km radius of a station: 17.5%[76]
Median decrease in property prices for houses that are too close (within 250 meters) of a train station: 5%[77]
People that live within 15 minutes biking of a train station: 11.7 mn[78]
Average household size: 2.11[79]
Average housing price: €422,000[80]
%houses assumed to be 'too close': 10% (assumption)
Contribution of railway station to increase in property prices: 0.1 (assumption)

Calculation PV:
Number of houses within the 15 minutes biking of a train station = number of people living within 15 minutes of a train station / average household size = 11.7 mn / 2.11 = 5.54 mn

*Increase in property value attributable to NS: Houses within 15 minutes biking of a train station * average housing price * (90% * 17.5% + 10% * (-5%)) * contribution of railway station to increase in property prices * attribution factor*

= 5.54 mn * 422,000 * (90% * 17.5% + 10% * (-5%)) * 0.1 * 0.5 ≈ €17,831.94 mn

Calculation annual value flow (inverse PV):
Value Flow 2024 = (Sum of PV * r) / (1 + g)

Sum of PV = €17,831.94 mn
g = 2%[81]
r = 2.2%[82]

P = (17.56 * 2.2%) / (1 + 2%)
P = €378.75 mn

Appreciation in value of villages / cities with good connections value flow = €378.75 mn

Explanation: In the assessment of railway projects, several external benefits are hard to quantify or are missed. One of these is the appreciation in housing prices surrounding houses with a good train connection. The NS has a positive impact on the housing prices in the Netherlands by increasing the value of houses in the vicinity, only not for houses that are too close (< 500m), which are taken into account in the noise pollution aspect.

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Making use of travel time (studying / work)	Work: 23.05 mn hours Study: 9.49 mn hours	Work: €21.82 / hour[83] Study: €21.56 / hour[84]	353.78	50%	176.89	**8,202.1**

Input factors:
Total passenger minutes spent in the train each day: 30 mn[85]/ 60 = 500,000 hours per day
500,000 * 365 = 182.5 mn hours annually
74.3% are able to spend time usefully, out of which 17% worked and 7% studied[86]

Correction factor for working or studying on the train being less productive than time spent at home: 0.5 (assumption)[87]

Shadow price of work = €21.82 / hour
Shadow price of study = €21.56 / hour

Calculation:
Hours usefully spent: 182.5 mn * 74.3% = 135.60 mn
Hours spent on working: 135.60 mn * 17% = 23.05 mn hours
Hours spent on studying: 135.60 mn * 7% = 9.49 mn hours

Making use of travel time value flow = (23.05 mn hours * €21.82/hour + 9.49 mn hours * €21.56/hour) * 0.5 = (€502.95 mn + €204.60 mn) * 0.5 ≈ €353.78 mn

Explanation: On the train, people do not have to actively drive; therefore, they can spend their time on different activities such as work or study. It has been found that a bigger share of people report using their time usefully on a train, compared to a car.[88] It has also been found that travel comfort and length of in-vehicle time affect the participation rates of different types of activities.[89] It is important to note that value of time spent recreationally during travel (e.g. talking with friends, listening to music, reading) is not included, as the value of such activities is more difficult to quantify.

21. NS Jaarverslag 2024, 2025.
22. NS Jaarverslag 2024, 2025.
23. The Demand For Public Transport, Paulley et al., 2004.
24. Impact-Weighted Accounts Framework (IWAF), Impact Economy Foundation, 2024. (Exchange rate of 1.105)
25. NS Jaarverslag 2024, 2025.
26. Werken bij NS, Glassdoor, 2025.
27. NS Jaarverslag 2024, 2025.
28. NS Jaarverslag 2024, 2025.
29. NS Jaarverslag 2024, 2025.
30. The term non-employees was introduced here, as this encompasses not just NS passengers, but also individuals crossing the railways (suicide excluded).
31. NS Jaarverslag 2024, 2025.
32. NS Jaarverslag 2024, 2025.
33. Impact-Weighted Accounts Framework (IWAF), Impact Economy Foundation, 2024. (Exchange rate of 1.105)
34. Impact-Weighted Accounts Framework (IWAF), Impact Economy Foundation, 2024. (Exchange rate of 1.105)
35. Environmental Prices Handbook 2024: EU27 version, CE DELFT, 2024.
36. Hinder en slaapverstoring door trillingen van treinen, RIVM, 2023.
37. Hinder en slaapverstoring door trillingen van treinen, RIVM, 2023.
38. Environmental Prices Handbook 2024: EU27 version, CE DELFT, 2024.
39. Hinder en slaapverstoring door trillingen van treinen, RIVM, 2023.
40. The relationship between individual employment probabilities and accessibility to matching jobs: A study of the Netherlands, Bastiaanssen et al., 2025.
41. The relationship between individual employment probabilities and accessibility to matching jobs: A study of the Netherlands, Bastiaanssen et al., 2025.
42. We assume that trains contribute roughly 10% to overall job accessibility by public transportation and bike because their stations are relatively sparse and primarily serve longer-distance travel. Job accessibility mostly depends on shorter, local connections, where bikes, buses, trams, and metros offer more granular coverage. As a result, trains play a smaller role in direct, door-to-door job access despite their speed and capacity.
43. Okun in the Euro: New Evidence from Structural Okun Law's Estimates for the Euro Area, 1979-2019, Campos et al., 2024.
44. Nederland in Cijfers 2024, Centraal Bureau voor de Statistiek, 2024.
45. The private average global return to a year of schooling is 9% a year (Returns to investment in education: a decennial review of the global literature, Psacharopoulos & Patrinos, 2018). On average, students in the Netherlands study for 5-6 years. The average career length is 43.7 years (Duration of working life - statistics, Eurostat, 2024). For the average person, we assume an annual starting salary of €30,000 (estimate based on SEO Economic Research, n.d.), which linearly increases to the median salary of €44,520 (Netherlands Gross Monthly Income, Trading Economics, n.d.) after 20 years, and continues to increase linearly afterwards. The average student is midway through their 5–6 year study period and is therefore expected to enter the workforce in approximately three years. In the meantime, we apply an 80% reduction in salary expectations to account for limited working hours during their studies. While students may still hold side jobs, their capacity to work is significantly lower compared to full-time non-students. Extrapolating the initial 80% decrease and eventual 9% increase to the yearly salary for the average career length of 43.7 years for people that study (Duration of working life - statistics, Eurostat, 2024), and assuming the discount rate of 3.22% (long-term average for the Netherlands) (Netherlands Long Term Interest Rate, YCharts, n.d.), the lifetime value of one year of studying comes down to approximately €36,222.
46. Landelijke Monitor Studentenhuisvesting 2024, Monitor Studentenhuisvesting, 2025.
47. We assume that 25% of students living at home travel by train based on the idea that a significant portion commutes longer distances to their place of study. For many of these students, especially those living outside urban centers, the train is the most efficient and reliable mode of transportation.
48. We assume that 10% of students that travel to their place of study would not study if the train were not available to them, as most would likely find alternative transportation or choose a closer institution. While the train increases accessibility, especially over longer distances, it is rarely the sole enabler of higher education. The 10% accounts for those in remote areas or with limited alternatives who might genuinely be unable to pursue studies without it.
49. Annex: NS Additional Data Issuance
50. Bevolkingsteller, CBS, 2025
51. Ministerie van Volksgezondheid, 2018
52. Ministerie van Volksgezondheid, 2020
53. There are between 2,619,606 to 3,059,606 people with a physical and/or mental disability in the Netherlands. That is between 14.5% to 16.9% of the total population. It is assumed that people with a disability are less likely to travel than the general population and therefore we assume that 5% of total passengers have a physical and/or mental disability.
54. MKBA Toegankelijkheid, RIGO Research en Advies BV, 2013.
55. We estimate that trains contribute around 10% to overall public accessibility because their stations are relatively sparse and primarily support longer-distance travel. In contrast, local accessibility depends more on dense networks of buses, trams, metros, and bikes that offer finer coverage. Additionally, public accessibility is a broad concept that also includes how easily people can access services, buildings, and spaces — not just how they get there.
56. NS Annual Report 2024, 2025.
57. Annex: NS Additional Data Issuance
58. Ministerie van Infrastructuur en Waterstaat, 2021
59. Annex: NS Additional Data Issuance
60. Time is Money, Oxford Economic Forecasting, 2005.
61. Converted from Pound to Euro: GBP 1 = EUR 1.1930 Pound sterling (GBP), European Central Bank, n.d.
62. Monetary policy, Bank of England, 2025
63. Mobiliteitsbeeld 2023, Kennisinstituut voor Mobiliteit (KiM), 2023.
64. Reizigerskilometers in Nederland door de Nederlandse bevolking, 2018-2023, Compendium voor de Leefomgeving, 2024.
65. NS Annual Report 2024, 2025
66. Travel without barriers, NS, n.d.
67. Cycle Hire Implementation – Phase 2 and CHEI Project Close, Finance and Policy Committee (Transport for London), 2014.
68. Cycle Hire Implementation – Phase 2 and CHEI Project Close, Finance and Policy Committee (Transport for London), 2014. (9 mn trips for 10 months of 2014 was scaled to a full year of 10.8 mn trips)
69. Inflation calculator, Bank of England, n.d.
70. Pound sterling (GBP), European Central Bank, n.d.
71. The economic contribution of public bike-share to the sustainability and efficient functioning of cities, Bullock et al., 2017.
72. Harmonised Indices of Consumer Prices (HICP), Eurostat, n.d.
73. The potential modal shift and health benefits of implementing a public bicycle share program in Montreal, Canada, Fuller et al., 2013.
74. Health impacts of bike sharing systems in Europe, Otero et al., 2018.
75. Societal costs and benefits analysis of integrating bike-sharing systems with public transport: A case study of the public transport bike ('OV-fiets') in the Netherlands, Watetu et al., 2025
76. The Impact of Rail Transport on Real Estate Prices: An Empirical Analysis of the Dutch Housing Markets, Debrezion et al., 2006.
77. The Impact of Rail Transport on Real Estate Prices: An Empirical Analysis of the Dutch Housing Markets, Debrezion et al., 2006.
78. Two-third of Dutch people live within 15 minutes cycling distance of railway station. Argaleo, 2021.
79. Household size in the Netherlands, CBS, 2023.
80. Average purchase price of residential property in the Netherlands, Statista, 2024.
81. Consistent with the AEX Futureproof Index, a growth/ reduction rate of 2% for material issues is assumed in present value calculations.
82. As mentioned in the methodology for integrated value, the academic consensus for an appropriate social discount rate is 2.2% (Pastor et al., 2024; Schoenmaker and Schramade, 2024a). Therefore, this rate is used in the present value calculation of a social value element.
83. Netherlands Gross Monthly Income, Trading Economics, n.d. (3,710 gross salary a month, divided by an average 170 hours of work in a month).
84. The private average global return to a year of schooling is 9% a year (Returns to investment in education: a decennial review of the global literature, Psacharopoulos & Patrinos, 2018). On average, students in the Netherlands study for 5-6 years. The average career length is 43.7 years (Duration of working life - statistics, Eurostat, 2024). For the average person, we assume an annual starting salary of €30,000 (estimate based on SEO Economic Research, n.d.), which linearly increases to the median salary of €44,520 (Netherlands Gross Monthly Income, Trading Economics, n.d.) after 20 years, and continues to increase linearly afterwards. The average student is midway through their 5–6 year study period and is therefore expected to enter the workforce in approximately three years. In the meantime, we apply an 80% reduction in salary expectations to account for limited working hours during their studies. While students may still hold side jobs, their capacity to work is significantly lower compared to full-time non-students. Extrapolating the initial 80% decrease and eventual 9% increase to the yearly salary for the average career length of 43.7 years for people that study (Duration of working life - statistics, Eurostat, 2024), and assuming the discount rate of 3.22% (long-term average for the Netherlands) (Netherlands Long Term Interest Rate, YCharts, n.d.), the lifetime value of one year of studying comes down to approximately €36,222. Since one year of studying in the Netherlands corresponds to 1,680 hours (The Dutch Way of Education, University of Amsterdam, n.d.), the value of studying is €21.56 an hour.
85. Annex: NS Additional Data Issuance.
86. Value of travel time as a function of comfort, Kouwenhoven and De Jong, 2018. Since the seat probability between 2018 and 2024 has remained relatively equal, we assume the same numbers still hold.
87. We assume that working or studying on the train is 50% less effective than at home due to frequent distractions, limited space, and less stable internet connectivity. The environment often lacks the focus, comfort, and resources typically available at home, making it harder to concentrate for extended periods. As a result, productivity during train travel is generally lower, even if some tasks can still be performed.
88. Value of travel time as a function of comfort, Kouwenhoven and De Jong, 2018.
89. How different are activities while commuting by train? A case in Tokyo, Ohmori and Harata, 2008. 85.

ENVIRONMENTAL FACTORS

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
GHG Emissions	838 kt CO2eq[90]	214[91] / ton CO2eq	-179.33	Scope 1 + 2: 100% Scope 3: 50%	-126.05	**-1,896.6**
Calculation: Scope 1 + 2: 12 ktCO2eq + 328 ktCO2eq = 340 ktCO2eq Scope 3: 498 ktCO2eq GHG emissions value flow: (Scope 3 * 50% + Scope 1 + Scope 2) * 214/tonCO-2eq = (498 ktCO2eq * 50% + 12 ktCO2e + 328 ktCO2eq) * €0.214/ktCO2eq = €126.05 mn (-)				*Explanation:* NS plans to achieve net-zero emissions in 2050. Although it experienced a 0.9% increase in 2024 emissions, compared to 2023, the firm has been on track to achieve its reduction goals.[92] NS also plans to track the emissions it helps avoid through having passengers travel by train rather than by car.[93] Since 2017, all NS trains have been powered solely by green electricity coming from wind power.[94] In addition to using green energy, NS has also been implementing various energy-saving measures to reduce their total energy consumption.		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Waste	Total net waste (non-hazardous): 6,267.05 t Total hazardous waste: 1,010.95 t	€180 / ton waste[95] €1,780 / ton hazardous waste[96]	-2.93	100%	-2.93	**-69.7**
Calculation: 16,573 ton of waste, out of which 9,295 ton were reused and recycled[97] Total hazardous waste = 6.1%[98] * 16,573 ton of waste ≈ 1,010.95 ton Total net waste generated (non-hazardous): 16,573 - 9,295 - 1,010.95 (hazardous) ≈ 6,267.05 ton Waste generation value flow: 6,267.05 t * €180/ton + 1,010.95 t * €1,780/ton hazardous waste = €2.93 mn (-)				*Explanation*: NS aims to make circular purchases by 2030 to (re)use materials as much as possible and no longer create waste in offices, from workshops, and from trains. Together with ProRail and the Ministry of Infrastructure and Water Management, among others, the NS is working on the joint ambition of Waste-free station 2040[99].		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
PM10 (finedust)	259,650 kg PM10	€41.40 / kg PM10[100]	-10.75	100%	-10.75	**-256.0**
Calculation: 16.33 PM10 mg/rkm[101] Rkm = reizigerskilometer (passenger kilometer) 15.9 billion rkm for NS in 2024[102] 16.33 * 15.9 billion = 259.65 billion mg PM10 = 259,650 kg PM10 PM10 value flow: 259,650 * €41.40 ≈ €10.75 mn (-)				*Explanation*: PM10 refers to particulate matter with a diameter of 10 micrometers or less, small enough to be inhaled into the lungs. These particles can come from sources like dust, pollen, vehicle emissions, and industrial processes, and may affect human health and air quality. In the past few years, there has been increased attention for PM10 and its effect on humans. The NS is striving to be the most sustainable travelling method and is proactively trying to decrease its PM10 emissions and still has less PM10 emissions per km compared to a car.[103] The NS is a member of multiple organizations to decrease its PM10 emissions and is currently investing in new technologies that decrease these emissions.		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Water Usage	Water usage attributable to NS: 900,241 m3[104]	€1.41 per m3 of fresh water usage[105]	-1.27	100%	-1.27	**-30.2**
Calculation: Water usage attributable to NS: 900,241 m3 Water usage value flow: 900,241 m3* 1.41 = €1.27 mn (-)				*Explanation*: The NS is using increasingly more water over the past few years based on information of its internal water usage.[106] It is important for the NS to realise its role in the consumption of water and potential future shortages. Therefore, the NS should consider embracing methods to decrease its water usage.		

Material issue	Quantity (Q) (2024)	Shadow Price (SP) (2024)	Value Flow (€ mn) (2024) (=Q*P)	Attribution factor	Value Flow (€ mn) Attributable to the company (2024)	Sum of PV (€ mn)
Biodiversity Loss	Habitat damage: high speed rail: 96 km, other railways: 2,004 km Wildlife collisions: 993.75 animals	Habitat damage: high speed rail: €93,100 / km / year, other railways: €15,500 / km / year Wildlife collisions: €1,809.95 / animal	Habitat damage: -40.00 Wildlife collisions: -1.80	Habitat damage: 50% Wildlife collisions: 100%	-21.80	**-519.0**
Calculation: **Habitat damage** Amount of km of high speed railways = 96 km[107] Amount of km of other railways = 2,100[108] - 96 = 2,004 km Shadow price high speed railways for the Netherlands = €93,100 / km / year[109] Shadow price other railways for the Netherlands = €15,500 / km / year[110] Habitat damage value flow = 96 * €93,100 + 2,004 * €15,500 ≈ €40 mn **Wildlife collisions** Number of collisions with animals = average over 2017-2020 = (1,035 + 1,024 + 982 + 934) / 4 = 993.75[111] Shadow price = shadow price of a deer * 50% correction for the size of animals as collisions mostly include smaller animals such as dogs, sheep, foxes, birds, other than cows and deer[112] = €3,619.91[113] * 50% = €1,809.95 Wildlife collisions value flow = 993.75 * €1,809.95 ≈ €1.8 mn Biodiversity value flow: 50% * €40 mn + €1.8 mn ≈ €21.80 mn (-)				*Explanation*: As a major rail operator, NS impacts biodiversity in several ways. Train traffic generates noise and vibrations that affect both people and ecosystems. NS also contributes to habitat fragmentation and wildlife collisions due to the presence and use of railway infrastructure. Based on scientific estimates and Dutch shadow prices, we calculated the biodiversity-related costs of habitat damage (which includes habitat loss and habitat fragmentation) and animal collisions. Since the railways are primarily responsible for habitat fragmentation, these impacts are 50% attributable to the NS, whereas wildlife collisions are fully attributable to NS operations. Noise and vibration from rail traffic are known to disturb biodiversity but are not yet monetised in CE Delft's habitat damage values.[114]		

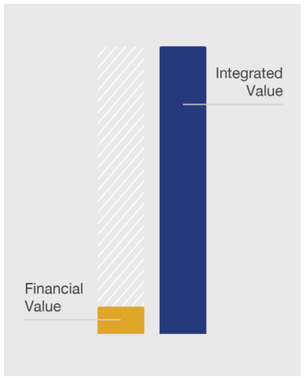
Integrated Value is the sum of the Financial Value (FV), Social Value (SV), and Environmental Value (EV). Please find the overview of the Integrated Value and its components below:

INTEGRATED VALUE (IV)		
IV calculation (equal weights)	Value (mld)	2024 Value flows (bn)
FV (enterprise value)	6.4[115]	N/A
Positive SV	77.5	1.67
Negative SV	-8.4	-0.18
Positive EV	0	0
Negative EV	-2.8	-0.16
IV (integrated value)	72.8	N/A
Transition Opportunity ratio	12.1	N/A
Transition Risk ratio	1.7	N/A
Futureproofing Ratio (IV/FV)	11.3	N/A

90. NS Annual Report 2024, 2025.
91. Impact-Weighted Accounts Framework (IWAF), Impact Economy Foundation, 2024. (Exchange rate of 1.105).
92. NS Annual Report 2024, 2025.
93. NS Annual Report 2024, 2025.
94. NS Annual Report 2024, 2025.
95. Handboek Milieuprijzen 2023, CE DELFT, 2023.
96. Milieuprijzen afval, CE DELFT, 2022.
97. NS Annual Report 2024, 2025.
98. NS Annual Report 2024, 2025.
99. NS Annual Report 2024, 2025.
100. Handboek Milieuprijzen 2023, CE DELFT, 2023.
101. Annex: NS Additional Data Issuance
102. NS Annual Report 2024, 2025.
103. Annex: NS Additional Data Issuance
104. Annex: NS Additional Data Issuance
105. Impact-Weighted Accounts Framework (IWAF), Impact Economy Foundation, 2024. ($1.560 / 1.105 = €1.41)
106. Annex: NS Additional Data Issuance
107. Dutch High Speed Rail Link, The Netherlands, HICL, 2024.
108. Responsibilities, NS, 2025.
109. Handbook on the External Costs of Transport, CE DELFT, 2023.
110. Handbook on the External Costs of Transport, CE DELFT, 2023.
111. Incidenten met dieren op het spoor met 10 procent gedaald, Nieuwe Oogst, 2021.
112. Incidenten met dieren op het spoor met 10 procent gedaald, Nieuwe Oogst, 2021.
113. Impacts of Roads on Wildlife, The Nature Conservancy, 2022. Exchange rate of 1.105.
114. Rail Environmental Report, European Union Agency For Railways, 2024.
115. NS Annual Report 2024, 2024.

Key Findings

Key Findings



Key Finding 1

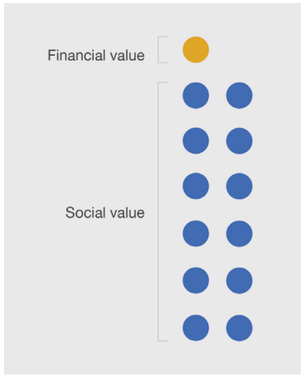
NS has an integrated value (financial + social + ecological) of €72.8 bn and a futureproofing ratio of 11.3

The Futureproof assessment of NS was quite eye opening when it came to understanding just how much of a public good the railway company provides. NS has an integrated value (financial + social + ecological) of €72.8 bn, which is much larger than its financial value of €6.4 bn. Comparing it to the AEX Futureproof Index,[116] for which the same methodology was used, NS scores considerably higher than Philips (Futureproofing Ratio: 4.7), meaning it would rank above all the 23 companies analysed.[117]

Key Finding 2

The social and ecological value generated by NS is six times greater than the subsidies it receives

NS operations in 2024 generate a social and ecological value of around 8.4 euro cents per passenger kilometer, while the NS receives subsidies of around 1.3 euro cents per passenger kilometer. Therefore, the social and ecological value generated by NS is six times greater than the subsidies it receives.

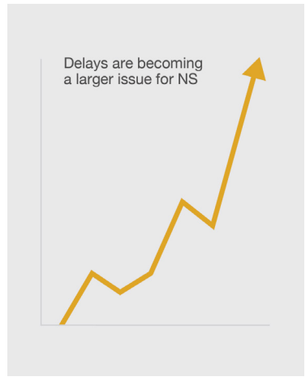


Key Finding 3

NS's very large positive social value is mainly due to social inclusion

NS's very large positive social value (€77.5 bn) – which amounts to 12.1 times NS's financial value – is mainly due in part to social inclusion (€33.8 bn); The railways enable people to get to work and/or school every day and offer accessible options for those with disabilities. Furthermore, the railway network brings additional value to well-connected villages and cities (€17.6 bn), reflected in the appreciation of home values. Other elements include positive employment wellbeing of NS's employees (€8.8 bn), people being able to work or study during their travel time on the train (€8.2 bn), and a large consumer wellbeing for its passengers (€7.6 bn).

116. *AEX Futureproof Index*, Schoenmaker, Schramade and Marijnissen, 2025.
117. A degree of caution is warranted when comparing this analysis to the *AEX Futureproof Index* ranking. First, this report focuses on 2024 data, whereas the AEX Futureproof Index is based on 2023 figures. Second, the financial value of NS is based on the book value of equity due to its non-listed status, while the Index uses market capitalisation for publicly traded companies.
118. *NS annual report 2022*, 2023
119. *NS annual report 2024*, 2025
120. *NS annual report 2023*, 2024



Key Finding 4

The value of lost time due to delays represents a negative value of €6.8 bn

NS's social value was negatively impacted primarily by the significant loss of time passengers experience due to delays. The value of lost time represents a negative value of €6.8 bn. To put this into perspective: the societal cost of travel delays by car is twice as high per kilometer travelled. Overall, 5 minute punctuality and 15 minute punctuality show a downward trend, highlighting that delays are becoming a larger issue for NS. The HSL 5 minute punctuality, which went down from 82%[118] in 2022 to 69%[119] in 2024, is of particular cause for concern. Reducing delays could significantly enhance NS's integrated value.

Key Finding 5

Despite NS using 100% renewable energy for its train operations, its operational chain is not yet 100% emission free

Despite NS using 100% renewable energy for its train operations since 2017, its entire operations are not yet 100% emission free.[120] At this time, their current and projected GHG emissions and PM10 (finedust) emissions still account for a negative environmental value of €1.9 bn and €0.3 bn respectively. Evaluating absolute emissions—the total emissions produced by NS operations, rather than the emissions avoided compared to other modes of travel—resulted in a negative ecological value. However, it is important to note that train travel still produces significantly fewer GHG and PM10 emissions than car travel, making it a more environmentally sustainable alternative.

Key Finding 6

NS has a significant social and ecological impact that far exceeds its financial value alone

Overall, NS has a significant social and ecological impact, both positive and negative, that far exceeds its financial value alone. This is highlighted by €77.5 bn in positive social value compared to €8.4 bn in negative social value. On the contrary, while not contributing to positive environmental value, the NS produces a negative environmental value of €2.8 bn. Understanding NS's integrated value profile is essential, as these impacts are highly material and must be central to its strategic decision-making.

Putting Things Into Perspective

Putting Things Into Perspective

In line with the methodology of our AEX Futureproof Index, we conduct an absolute analysis. However, it's equally important to place these outcomes in a broader context and to acknowledge both the relevance and the complexity of making comparative assessments and exploring different scenarios. This section highlights some illustrative examples.

How do the benefits compare to the costs?

The integrated value analysis proved that NS continues to add value to the Netherlands and provides valuable social benefits. The negative ecological value flow is subtracted from the net social value flow, to arrive at the net social and ecological value flow. The net social and ecological value flow of NS for 2024 was €1.33 bn, which translates to a net social and ecological value of €0.084 (8.4 euro cents) per passenger kilometer. Meanwhile, €0.013 (1.3 euro cents) per passenger kilometer is subsidised. Therefore, the social and ecological value generated by NS is six times greater than the subsidies it receives.

How did we calculate this? Dividing the total social and ecological value flow of the NS in 2024 (€1.33 bn) by the total number of passenger kilometers of the NS in 2024 (15.9 bn[121]) leads to a net social and ecological value of €0.084 per passenger kilometer. In 2024, NS received a total of €304 mn in government contributions. Of this amount, only €207 mn (€304 mn minus €97 mn for the student travel product) is considered a subsidy to NS, which includes compensation for a missed fare increase and other arrangements.[122] This corresponds to a subsidised cost per kilometer of €0.013 (1.3 euro cents). It is important to note that the amount of subsidy NS receives may vary from year to year, and that the annual report may not provide the full picture of the subsidies.

How do trains compare socially and ecologically to cars?

Although not part of the absolute analysis of NS, comparing the impact of train travel to car travel reveals important differences in both ecological and social value. From an ecological perspective, trains—particularly electric ones running on renewable energy—emit significantly fewer greenhouse gases and particulate matter (PM10) per passenger-kilometer than cars, especially fossil-fueled vehicles. Trains also make more efficient use of space, requiring less land per transported person and causing less spatial fragmentation than road infrastructure.[123] In contrast, the expansion of roads and parking facilities to accommodate car traffic contributes to habitat disruption and urban sprawl.[124]

Socially, trains tend to score higher on inclusion, as they are accessible to individuals who cannot drive due to age, income, or physical ability. They also offer a more affordable transportation option for many users, especially when accounting for the full cost of car ownership such as maintenance, insurance, fuel, and so on. Cars, in turn, are associated with a higher rate of traffic incidents and fatalities, impose significant parking burdens in urban areas, and contribute to congestion and lost productivity through traffic jams. According to our analysis, delays experienced by NS passengers resulted in a negative societal value of €146 mn in 2024, representing a negative total present value of €6.8 billion. To put this into perspective: The societal costs resulting from traffic jams and delays on the Dutch main road network were estimated at €2.7 to €3.5 bn for 2022.[125] This only considers the value of lost time, not including additional environmental damage. Taking the conservative estimate for the value flow of €2.7 bn, this leads to a total negative present value of €125 bn, more than 18 times that of the NS delays. And that while the amount of passenger-kilometers by car (136 bn[126]) is only 8.6 times larger than the passenger kilometers by train (15.9 bn[127]). This means that the negative value of delay is about twice as large for travel by car compared to by train.

What if remote areas were even better connected?

If remote areas were better connected by train, the social and ecological value of rail transport would increase even further. Enhanced connectivity would improve access to jobs, education, and healthcare for people in rural regions, strengthening social inclusion and reducing dependency on private cars. It could also help counter regional inequality by making peripheral areas more attractive for both living and working, supporting demographic balance and local economic resilience.

Ecologically, shifting more long-distance and regional trips from cars to trains would reduce total emissions, air pollution, and land use pressures. Fewer car trips mean fewer traffic incidents, less congestion, and lower demand for parking infrastructure. Moreover, strategic rail investments in underserved areas could prevent further road expansion, helping to preserve natural landscapes and biodiversity. In this way, improved rail connectivity to remote regions would amplify the integrated value created by the train system as a whole.

As a whole, further research on the value added of train accessibility is required, especially the value added in remote areas.

What if NS did not exist?

Recently, the Netherlands experienced NS strikes across the country. On June 6th, 2025, the start of Pinksterweekend, which is historically a very busy spring holiday, NS workers went on strike. According to numbers of the ANWB, 600 kms of congestion could normally be expected, but over 1000 km of congestion were reported that day.[128,129] This pattern of increasing congestion continued during a subsequent strike on June 10th: instead of the usual 450 there was 650 km of congestion.[130,131] Only the strike on June 13th was not found to have significant congestion impact, though this day fell on a Friday, and it's likely there was less commuter traffic due to people working from home.

Congestion is costly: a Belgian study derived a total negative value of congestion of around €216,600 on 610 km in Flanders, Belgium.[132] This study takes into account all elements of congestion, including additional environmental costs, time costs, usage costs, and more. The shadow price based on this study is €356 per kilometer of congestion. Therefore, the negative value of the additional congestion on account of the strikes on June 6th (400km) and June 10th (200km) could be estimated at €213,400. That's just for two days: extending the possibility of heightened congestion levels for weeks, or even months, and the costs begin to add up.

121. *NS Annual Report 2024*, 2025
122. *NS Annual Report 2024*, 2025
123. *Space consumption, an important factor in the development of transport systems*, Turcu, 2011
124. *How does transport affect the natural environment?*, PCC Greenline, 2023
125. *Mobiliteitsbeeld 2023, Kennisinstituut voor Mobiliteit (KiM)*, 2023.
126. *Reizigerskilometers in Nederland door de Nederlandse bevolking, 2018-2023, Compendium voor de Leefomgeving*, 2024.
127. *NS Annual Report 2024*, 2025
128. *Radio West*, Liveblog. 2025
129. *Pinksterdrukte op de weg*, Hart van Nederland, 2025
130. *Tweede staking NS legt spoor opnieuw plat, weg en bus voelen gevolgen,* Mobiliteit.nl, 2025
131. *In bijna hele land geen NS-treinen door grote staking, zware spits blijft uit*, AD, 2025
132. Struyf, E., Sys, C., Van De Voorde, E., & Vanelslander, T. (2020) Calculating the cost of congestion to society: A case study application to Flanders. Research in Transportation Business & Management, 44, 100573. *https://doi.org/10.1016/j.rtbm.2020.100573*

What's Next

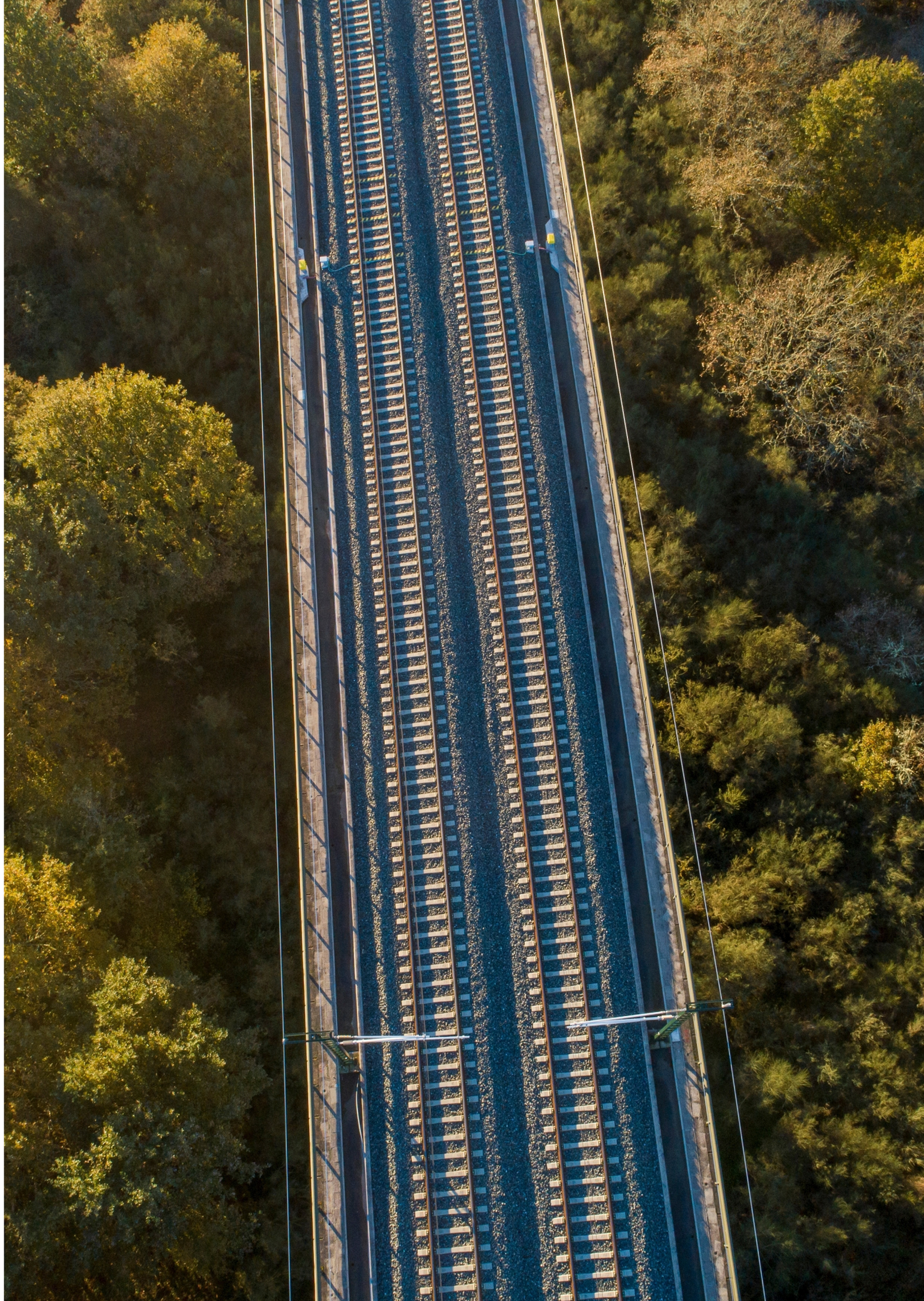
What’s Next

NS is an integral part of the Netherlands as we know it. Serving a country population of 18 mn, NS counted 15.9 bn passenger kilometers in 2024[133], an average of nearly 900 kilometers per person. Without NS, daily life would be slowed by car congestion, reduced accessibility, and increased inequality in mobility, especially for those unable to drive or commuting from rural areas. The value of the NS surpasses financial performance: Its social and ecological contribution is of significant value. From lowering emissions and improving public health to enabling economic participation and social inclusion, NS plays a key role in shaping a sustainable and cohesive society.

This analysis shows that the Netherlands is better off with a strong, well-funded NS. Future research should focus on identifying where investments in NS generate the greatest returns in terms of integrated value. Should they be put towards improvements in service to underserved regions, shorter travel times and fewer delays, or are there other areas where the impact is even greater? In addition, it is important to explore how much additional funding NS would need to fully realise its societal potential, and whether such investments could lead to savings elsewhere, such as reduced traffic congestion, lower carbon emissions, or improved public health outcomes. Asking these questions allows for a fundamentally different perspective on investment decisions, one that goes beyond financial efficiency, and considers creating lasting value for society as a whole. Moreover, this type of information offers a concrete basis for action. With clearer insight into where value is created, NS can set more effective strategies, make targeted improvements, and evaluate progress over time.

Looking ahead, it is crucial to ensure that NS's business model is aligned with long-term value creation. Strengthening awareness of the benefits of NS will build societal support and secure its licence to operate. A futureproof NS is not only essential for today’s mobility and wellbeing, it’s key to keeping the Netherlands moving for generations to come.

133. NS Annual Report 2024, 2025.



Annex: Integrated Value Methodology

Notes on Integrated Value Methodology

The integrated value calculations have been prepared in accordance with the Impact-Weighted Accounts Framework (IWAF) of the Impact Economy Foundation (IEF, 2014), ensuring consistency and reliability.

The numbers are presented consolidated, combining the performance and impact of the parent company and its subsidiaries as a single entity, with intercompany transactions eliminated.

The policies related to calculating integrated value are explained in the notes below.

Note 1: Attribution

Impact can be directly or indirectly attributed to companies. The Impact-Weighted Accounts Framework (IEF, 2014) is followed for attributing impact.[134]

IWAF distinguishes three attribution categories

1. Predominantly internal effects: 100% attribution to the company.
2. External effects with primary responsibility to company: 50% attribution to company.
3. External effects without a primary responsibility: attributed over the value chain.

Internal vs external effects
Following IWAF, we distinguish between internal and external effects to determine attribution. Carbon emissions are used as an example. Scope 1 and 2 are internal effects and fully attributed to the company. Scope 3 emissions are external effects happening in the value chain (up- or downstream). Other examples of external effects are consumer wellbeing, health effects of consumers, and pollution.

Sometimes, the effects can be split. For Health & Safety, there is a split between injuries to employees (100% attribution) and injuries at contractors or passengers (X% attributed). For employment wellbeing, own employees (100% attribution) and employees at suppliers (X% attributed). The overall quantity is thus a combination: 100% * own employees / injuries + X% * employees / injuries at suppliers.

Primary vs non-primary companies
Attribution category 2 (primary companies) versus attribution category 3 companies (non-primary companies) can be calculated on the basis of value added. The share of value added is [(sales, gross revenue or turnover) – (costs of goods/product/materials used/sold)] divided by [sales]. If a company's value added is more than 50% of sales, then it is a primary company (category 2). If it is less than 50%, it is not a primary company (category 3). The costs of goods/products/materials used/sold can be derived from the breakdown of sales and costs by nature in the annual report (AR).

134. The IWAF document 'A Guide to Impact Accounting' specifies how attribution can be determined; see Step 6 and Appendices A and G of the IWAF document.

Table 5: Example Companies and Their Attribution Categories

Company	Sales	Costs	Share of value added	Attribution category	Page AR 2024
Company A	18,169	4,626	74.6%	2	...
Company B	88,649	61,174	31.0%	3	...
Company C	59,604	25,084	57.9%	2	...

So, Company A and Company C are attribution category 2, and therefore, get 50% of Scope 3 emissions (consumer wellbeing, etc) attributed, while Company B is an attribution category 3 company and gets 31% of Scope 3 emissions (consumer wellbeing, etc).

As NS is the primary company in the value chain, an attribution factor of 50% is applied.

Note 2: Valuation—updated guidelines for calculating positive social value

Chapter 5 and 11 of *Corporate Finance for Long-Term Value* (CFLTV) (Schoenmaker and Schramade, 2023) contain the guidelines for valuation. We provide here an update on calculating social and environmental value. Positive social value is based on wellbeing economics, where assumptions and extra data (e.g., price elasticity; employment satisfaction points) are needed to perform the analysis and calculations.

The guidelines for calculating negative social and environmental value remain the same as provided in Chapter 5 of CFLTV. These negative values are based on the cost of restoration, which is reflected by shadow prices.

Overview

1. **Consumer surplus**: consumer surplus is partly related to a company's market power. We provide a correction factor for market power, as market power-related consumer surplus should not accrue to a company's integrated value. We also provide data on price elasticity for several industries ('Research on the price elasticity of demand for AEX Companies', n.d.).
2. **The wellbeing of employees**: employee satisfaction is based on a European Social Survey and measured by the Impact Institute. These are average figures. Depending on a company's employment rating, the average can be corrected upward or downward.
3. **Health effects**: health effects are measured in quality-adjusted life years (QALY). This remains the same as in Chapter 5. Unless in the three-step approach (societal cost, total volume, and volume sold of the company) in Note 3 (method 2 for estimation of externalities).

1. Consumer surplus
The benefits of a company's market power are not included in the company's integrated valuation, as market power can come at the expense of consumers through higher prices or lower-quality products. We include a correction factor for market power in calculating the consumer surplus.

Equation 5.7 in Chapter 5 (CFLTV) calculates the consumer surplus as follows:

$$\textit{consumer surplus} = \frac{\Delta Q \cdot P}{\textit{price elasticity}} \cdot \frac{1}{2} = \frac{\textit{sales}}{\textit{price elasticity}} \cdot \frac{1}{2}$$

The competitiveness of a product market is measured by price elasticity. So, the correction factor is applied to price elasticity:

$$\textit{corrected consumer surplus} = \frac{\textit{sales}}{\textit{price elasticity} \cdot \textit{correction factor}} \cdot \frac{1}{2}$$

We derive the correction factor as follows. Full competition is characterised by a price elasticity of infinity. This means that consumers go directly to one of its competitors when a company increases its price (ceteris paribus). Full market power is reflected in a very low price elasticity close to zero. This means that when a company increases its price, consumers tend to stay (unless they cannot afford the product or don't find it worthwhile anymore) because there are no competitors where consumers can go. We only make a partial correction for market power, as companies still provide goods for which consumers are prepared to pay more (i.e., these goods are wanted by consumers).

We make two assumptions for the correction factor:
1. A market is very competitive at a price elasticity of 10 (so we correct from an elasticity of 10).
2. The partial factor is 0.5 (so we only correct half of the market power).

$$\textit{correction factor} = 1 + \frac{(10 - \textit{price elasticity}) \cdot \textit{partial factor}}{\textit{price elasticity}}$$

Let's illustrate the corrected consumer surplus with an example. A company has sales of 100 and a price elasticity of 2.

$$\textit{consumer surplus} = \frac{\textit{sales}}{\textit{price elasticity}} \cdot \frac{1}{2} = \frac{100}{2} \cdot \frac{1}{2} = 25$$

$$\textit{correction factor} = 1 + \frac{(10 - \textit{price elasticity}) \cdot \textit{partial factor}}{\textit{price elasticity}} = 1 + \frac{(10 - 2) \cdot 0.5}{2} = 3$$

$$\textit{corrected consumer surplus} = \frac{\textit{sales}}{\textit{price elasticity} \cdot \textit{correction factor}} \cdot \frac{1}{2} = \frac{100}{2 \cdot 3} \cdot \frac{1}{2} = 8.3$$

So, the corrected consumer surplus of 8.3 is one-third of the uncorrected consumer surplus of 25. Two-thirds (16.7) of the consumer surplus is not assigned to the company because of undue market power.

Default setting: If no data on a company's price elasticity is available, the price elasticity of a 'similar' or 'adjacent' sector can be taken. Alternatively, the default setting is a price elasticity of 1.

2. Employment wellbeing
Employment wellbeing measures the change in life satisfaction (alongside the financial impact of the salary received) compared to somebody without a job. Employment wellbeing is measured as an average for all employees of a company and is based on a European Social Survey. It is thus applicable to European companies and can be used for employees in developed countries. For employees in developing countries, a lower shadow price may apply (as the cost of living in these countries is lower).

Table 6: Employee Life Satisfaction Data from European Social Survey (Impact Institute, 2020)

Indicator	Unit	Value
The average increase in life satisfaction due to work	Life satisfaction points (0-100)	3.1
Average increase in life satisfaction per unit of employee satisfaction	Life satisfaction points / employee satisfaction points	1.5
Average employee satisfaction	Employee satisfaction points (1-5)	3.4

Glassdoor provides employee ratings of companies. Glassdoor uses a scale from 1 to 5. Most ratings vary between 2 and 4.8, with an average of 3.4. We use the following formula to translate Glassdoor ratings (X) into the employee satisfaction scale.

$$\textit{life satisfaction points} = 3.1 + (\textit{Glassdoor}\,(\mathrm{X}) - 3.4) \cdot 1.5$$

Let's illustrate employment wellbeing with an example. The company has 20,000 employees (in Europe) and a Glassdoor rating of 2.9.

Calculation:
- From IWAF (IEF, 2024), we know that one life satisfaction point is $ 2647, which is € 2395 (=$ 2647/1.105).
- The Glassdoor rating translates into a deviation of -0.75 = (2.9-3.4) * 1.5. The company's employee satisfaction is 0.75 life satisfaction points below average.
- Total employment wellbeing = 20,000 * (3.1-0.75) * € 2395 = € 112.6 million.

Default setting: Other sources are company employment satisfaction surveys or Indeed. If no data on a company's employment wellbeing are available, the default setting is 3.1 life satisfaction points.

Note 3: Estimation of externalities

In some cases, standardised quantities and/or shadow prices are not available for material externalities. Examples are the effects of tobacco, alcohol, obesity, and social media (privacy and psychological effects). These cases require some further analysis. We apply two methods for making estimations in a structured way.

Method 1—when shadow prices and standard units are available (e.g., life satisfaction points, quality-adjusted life years (QALYs))

1. Estimate societal cost based on academic studies;
2. Translate societal cost into standard units for which shadow prices are available.

Method 2 – when shadow prices and standard units are not available

1. Estimate societal cost based on academic studies;
2. Translate societal cost into cost per unit product (e.g. passenger kilometer) or market share;
3. Estimate company share of societal cost based on market share or production of that company.
4. Attribute impact to the company.

Note 4: The value of social inclusion through public transport

A significant social value element of public transport lies in its role in enhancing social inclusion and liveability. This non-standard approach is divided into three main elements; enabling work, study and accessibility for people with a disability.

Work

Public transport allows people to be able to commute to work, whereas they would otherwise not be able to work due to transportation difficulties. How to derive the role of public transport in this:

1. Estimate full working-age population
2. Estimate employment elasticity with respect to public transport accessibility
3. Estimate increase in employed people as a result of public transport (the number of people that are enabled to work that without public transport would not be able to)
4. Calculate increase in life satisfaction due to work for increase in employed people following the methodology of note 2: *employment wellbeing*
5. Calculate the increase in GDP as a result of the increase in employed people

Study

1. Derive the value of one year of schooling from academic studies
2. Estimate number of students living at home
3. Estimate the number of students that would not be able to study without public transport
4. Calculate the value of studying that is enabled by public transport

Accessibility for people with a disability

1. Derive the social value of disabled people gaining public accessibility from academic studies
2. Estimate the number of disabled people making use of public transport
3. Calculate social value by multiplying social value per disabled person gaining accessibility times the number of disabled persons making use of the public transport

Annex: NS Additional Data Issuance

NS Additional Data Issuance

The Integrated Value analysis is based solely on publicly available information to ensure consistency, transparency, and replicability. In line with these principles—and to further enhance the quality and transparency of the analysis—NS has chosen to proactively disclose a number of additional data points and decided to make this information publicly available to be as transparent as possible. These supplementary figures, which are not typically published in standard financial or sustainability reports, are presented in the table below.

Note: NS was fully responsible for providing this previously-private data. Apart from the information presented in this annex, all the calculations, assumptions, methodology were entirely the responsibility of the authors. The analysis and execution of this report was purposefully not done in collaboration with the NS to remain fully independent and objective.

Material Issue	Data
Water Usage	The total water usage of 2023 is 1,194,969 m^3. The NS uses 900,241 m^3 for its own operations. The difference (294,455 m^3) is water usage of rental entities at the station and other real estate related to the NS.
PM10	Emission figure of trains in mg/rkm, TTW (tank to wheel)[135]: Local train *(stoptrein)*, electrical: 29 mg/rkm Intercity, electrical: 9 mg/rkm International: 11 mg/rkm For the NS, only the electrical trains are considered and numbers of 2022 are used based on the CE Delft, STREAM source.[136]
NS PM10 comment	"The NS is striving to be the most sustainable travelling method and is proactively trying to decrease its PM10 emissions and still has less PM10 emissions per passenger kilometer compared to a car".
Total unique Dutch passengers in 2023	10.121 mn
Number of train rides	346.180 mn
Gross estimate of average travel time	Intercity: 36 – 6 = 30 minutes per ride 6 minutes is deducted as not every train travel minute can be used efficiently. Sprinter: 15 minutes

135. CE Delft, *STREAM Webtool*, 2025
136. CE Delft, *STREAM Webtool*, 2025

Annex 1: Specification travel motives

Most important travel motive	# unique individuals (x1000)	% of unique individuals
	10,121	
Commute to work – home	1,656	16%
Business	537	5%
Commute to school – home	850	8%
Social activities	2,883	28%
Recreative	4,175	41%
Unknown	21	0
Total	**10,121**	**100%**

Annex 2: Specification number of trips

Most important travel motive	# of trips (x1000)	% of trips
	346,180	
Commute to work – home	101,278	29%
Business	15,534	4%
Social activities	83,693	24%
Recreative	81,632	24%
Commute to school – home	64,042	18%
Total	**346,180**	**100%**

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Colophon

Colophon

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Disclaimer
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