Dutch State Treasury Agency
Ministry of Finance

State of the Netherlands
Green bond report 2023

29 May 2024

Waal bij Zaltbommel. Photo: Jos van Alphen

Contents

1 Introduction

I am pleased to present to you the 2023 Green Bond Report. For the Dutch State Treasury Agency (DSTA) 2023 was an important year for our green Dutch State Loans. We have brought our Green Bond Framework (GBF)[1] up to the highest standards available under the latest EU Taxonomy Climate Delegated Act (the EU Taxonomy)[2] and issued a new Green DSL 3.25% 15 January 2044 (the "Green DSL 2044"). In line with these developments, we have also further improved our Green Bond Report to keep it at the highest available standard. At the same time, we have updated methods to advance the reporting of the impact of the avoided CO_2 together with Trinomics. As there are now two Green DSLs outstanding, this report indicates on a bond-by-bond basis how the eligible expenditures are allocated. As the proceeds of the Green DSL 2040 were already fully allocated, this report in effect only relates to the Green DSL 2044.

Water management has been and will remain crucial for the very existence of the Netherlands. Therefore I am very pleased that the expenses under our Delta Program adhere to the proposed EU Taxonomy, making this a green bond with a particular focus on 'blue expenses'. This update enabled us to align all our expenses with the EU Taxonomy for the significant contribution criteria, including newly selected expenses for 2023. I am very pleased this is also recognised in the updated SPO we received from Moody's on our updated GBF.

We have issued € 4.98 billion in a new green bond, maturing in 2044, bringing our total outstanding amount in the green bond space to € 20.7 billion at the end of 2023. For 2024 we have announced to re-open the Green DSL 2044 for another € 4 billion. Thereby further extending our presence in the green bond market.

The DSTA remains devoted to improve our reporting, where possible. We would very much welcome feedback or suggestions, so we can together continue to improve for future reports.

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Agent
Dutch State Treasury Agency

[1] Green Bond Framework | Publication | english.dsta.nl
[2] EU taxonomy for sustainable activities (europa.eu)

2 Allocation Report

With its green bonds, the Netherlands intends to finance or refinance expenditures which are part of the Central Government Budget and contribute to Climate Change Mitigation and Climate Change Adaptation. In the current Green Bond Framework, there are four categories of Eligible Green Expenditures that can be used for the allocation of Green Bond proceeds: i) renewable energy, ii) energy efficiency, iii) clean transportation and iv) climate change adaptation & sustainable water management. The 2023 revision of the Green Bond Framework has also been used to assess to what extent eligible expenditures are aligned with the EU Taxonomy. Given that the (then) proposed changes to EU taxonomy published in June 2023 also contains criteria against which the adaptation criteria could be mapped, all expenses in the updated framework adhere to the EU taxonomy for significant contribution criteria.[3] No subsequent amendments have been made to the 2023 Green Bond Framework.

The interdepartmental Green Bond Working Group annually allocates the proceeds of the green bonds to budget items. The Green Bond Working Group is also responsible for ensuring there is no double counting in the allocation proceeds to either of our green bonds. For this purpose, a list of potential Eligible Green Expenditures is proposed by the DSTA, and the Working Party reviews and verifies whether these expenditures comply with the criteria and definition of Eligible Green Expenditures described in the Green Bond Framework. Subsequently, the Working Party approves the final selection of Eligible Green Expenditures. The interdepartmental Green Bond Working Group consists of representatives of the DSTA, the Ministry of Finance, the Ministry of Economic Affairs and Climate and the Ministry of Infrastructure and Water Management.

Proceeds of Green DSL 2040 fully allocated as of 1 January 2023

In June 2022 the Green DSL 2040 was re-opened for an amount of € 4.98 billion bringing the total outstanding amount of the Green DSL 2040 to € 15.69 billion. The proceeds of the Green DSL 2040 have been fully allocated prior to 1 January 2023.
Thereafter in October 2023 a new Green DSL 2044 was issued which raised an amount of € 4.98 billion. This Green Bond report is completely and exclusively related to this new Green DSL.

Since our previous Green Bond Report, there have been no (material) changes that warrant a revision to the allocation of expenses to the Green DSL 2040.

Allocation of proceeds Green DSL 2044, first issued in 2023

On 17 October 2023, the DSTA issued a new Green DSL 3.25% 15 January 2044 for an amount of € 4,981,953,000. According to the 2023 Green Bond Framework, up to 50% of the proceeds may be allocated to eligible expenditures in the financial year preceding the issuance of the green bond. At least 50% of the proceeds will be allocated to expenditures in the year of issuance or future years. Applying these principles to the Green DSL issuance in 2023 at least € 2.5 billion needs to be allocated to expenditures in 2023 or future years.

The DSTA seeks to have a diversified portfolio of allocations. Accordingly, the choice was made to allocate pro rata. Remaining eligible expenditures on railway infrastructure in 2022 have been taken into account, which had not yet been allocated with the funds raised in 2022.
The table sets out how the proceeds of the Green DSL 2044 have been allocated to the relevant government expenditures. The table below shows net expenditures and tax credits which are being financed with the Green DSL. Below the table, the nature of expenditures is explained in detail for each expenditure category.

[3] Onafhankelijke beoordeling (Second Party Opinion) - Green Bond Framework - 2023 | Publicatie | DSTA.nl

Table: Allocation expenditures 2022 & 2023

Annual expenditures category (x € 1 mln)		2022			2023			
Category	**Description**	**Expenses yet to be allocated from Green Bond report 2022**	**Total remaining expenses 2022**	**Expenses allocated in this green bond report**	**Total expenses 2023**	**Expenses allocated in this green bond report**	**Total expenses allocated in this green bond report**	**Expenses yet to be allocated**
Renewable Energy	Stimulation of Sustainable Energy Production (SDE)				-17	-9	-9	-8
	Offshore wind energy					0	0	0
	Onshore wind energy				-17	0	0	-17
	Solar energy				-1	0	0	0
	Tax breaks for energy generated by private solar panels		470	470		0	470	0
	Tennet		996	996		0	996	0
	Hydrogen Backbone			0	-37	-19	-19	-18
	IPCEI Hy2Use					0	0	0
Energy Efficiency	Subsidy on heat networks (WarmtelinQ)				18	9	9	9
Clean Transportation	Maintenance and management of railway infrastructure, development of railway infrastructure for passenger rail	1,081	1,081	671	2,205	1,132	1,803	1,073
	Management, maintenance and replacement	*951*	*951*	*590*	*2,023*	*1,039*	*1,629*	*984*
	Construction	*148*	*148*	*92*	*337*	*173*	*265*	*164*
	Integrated contract forms/PPC	*96*	*96*	*60*	*214*	*110*	*169*	*104*
	Interest and redemptions	*0*	*0*	*0*	*0*	*0*	*0*	*0*
	Receipts	*-113*	*-113*	*-70*	*-369*	*-189*	*-260*	*-179*
	Regional Infrastructure and accessibility Projects	14	14	14	563	289	303	274
	Mega Projects Traffic and Transportation	91	91	91	504	294	384	210
	Tax breaks for electric cars		248	248		0	248	0
Climate Change Adaptation & Sustainable Water Management	Delta Fund				1,548	795	795	753
	Flood risk management Investments				*375*	*193*	*193*	*183*
	Freshwater supply investments				*115*	*59*	*59*	*56*
	Management, maintenance and replacement				*338*	*174*	*174*	*165*
	Experimentation				*286*	*147*	*147*	*139*
	Network related costs and other expenditures				*367*	*188*	*188*	*179*
	Water quality investments				*68*	*35*	*35*	*33*
Total expenditures		**1,186**	**2,900**	**2,490**	**4,784**	**2,491**	**4,981**	**2,293**

* Due to rounding in the table above it could occur that the sum of the categories is slightly different than the total.

I. Renewable energy

To stimulate renewable energy generation, the State of the Netherlands has introduced several successive subsidy schemes over the last few years, including the Stimulation Sustainable Energy Production and Climate Transition (SDE, *Stimulering Duurzame Energie Productie en Klimaattransitie*). SDE expenditures relate to a series of techniques for the generation of renewable energy. The proceeds of green bonds are only allocated to SDE expenditures in the areas of onshore wind energy, offshore wind energy, and solar energy. The SDE scheme compensates additional costs incurred by a producer in the generation of renewable electricity (and biogas) for a period of 12 to 15 years. The SDE scheme is therefore a subsidy focused on operational expenditures (OPEX). This subsidy will compensate for the unprofitable part of renewable electricity generation in order to encourage the development of these kinds of projects. The annual subsidy amount decreases as the electricity price increases (as it is more profitable to generate renewable electricity when electricity prices are higher). The subsidy scheme applies to renewable energy projects which are now operational, but only for which an annual subsidy has been granted for a period of 12 to 15 years. As a result, project developers and investors have gained greater certainty about the profitability of these projects, enabling them to operate their energy generation plants in a responsible manner.

When the SDE scheme was introduced, it was one of the most important instruments through which the State encouraged the energy transition. Many of the SDE features are still present in the SDE+ scheme and its successor, the SDE++ scheme.

TenneT is a 100% state owned company that is responsible for the high voltage electricity grid in the Netherlands and for a large part of the high voltage electricity grid in Germany. TenneT has an important role in the transition to a more sustainable energy system by providing the infrastructure for connecting renewable energies to the network, especially connecting the wind farms in the North Sea, and for transporting electricity from renewable energy sources via its onshore network. In 2022 the Dutch state, as sole shareholder, provided TenneT with a capital injection of EUR 1.2 billion. This capital injection was provided to support TenneT's capital structure and its investments in the energy transition.

Net metering scheme ("salderingsregeling") in energy tax

The Dutch government stimulates solar energy via the net metering scheme in the energy tax. Households and small business can offset self-produced electricity that they are not using at that moment and return it to the electricity grid against their own consumption. This results in a tax benefit for households and small business, and in a tax revenue loss for the government. For example: a household consumes 3500 kWh electricity and feeds 1000 kWh back to the energy supplier. With the net metering scheme, this household only has to pay energy tax on 2500 kWh electricity (3500 – 1000). This financial benefit makes generating solar energy much more attractive for households. In the past years, the net metering scheme was one of the main drivers of the huge increase of solar energy production in the Netherlands. The generated solar energy by households amounted to 7,102 million kWh in 2022.

II. Energy Efficiency

Sustainable heat via WarmtelinQ

Warmtelinq is an underground main transport pipeline for warm water in order to heat houses in the province of Zuid-Holland. The water is warmed by using the residual heat from e.g. industry in the Port of Rotterdam-area. WarmtelinQ ensures that residual heat that is currently unused can be put to good use. It is also possible to use heat from other sources, provided that they meet the technical requirements set by WarmtelinQ. The Warmtelinq-project contributes to the overall goal to become climate neutral in 2050 as fossil fuels, currently a main source for heating houses and businesses, are replaced by heating via this network.

III. Clean transportation

The Dutch railroads facilitate safe, sustainable, cost- and area efficient transport of passengers. In 2023, 15.5 billion passenger kilometres travelled via train. This is a 18.2% decline in comparison with 2019 before COVID-19. The number of passengers during the weekends almost equals pre-COVID numbers. Yet during the week the number of passengers still falls short. Passengers choose to travel mainly on Tuesdays and Thursdays during rush hour. The spreading of passengers remains difficult.

The largest Dutch railtransporter – de Nederlandse Spoorwegen – uses 100% green energy and 92.9% of the railroad is electrified. Next to that, railroad manager ProRail focuses on minimising the carbon footprint during maintenance and construction, for instance by constructing with natural materials (see case study station Ede-Wageningen).

Since rail expenditures are the largest expense category and the DSTA wants to have a diversified portfolio of allocations, it was decided to apply a selection to the rail expenditure item. The table is adjusted for the relevant receipts on the items used to finance the selected

expenditure of the items outside the green bond. The table above provides insight into how the funds have been allocated to the relevant government expenditure.

Where possible, we have aligned green spending with the EU green taxonomy. The screening criteria for clean transportation have electrified track 'in scope'. To this end, we have made a correction to rail expenditure of 7.1%, equal to the percentage of passenger rail that is not electrified.

ProRail operates commissioned by the Ministry of Infrastructure and Water Management. Through the management concession, ProRail receives a subsidy from the Mobility Fund of the Ministry for the management, maintenance and replacement of the track. ProRail also receives resources from the Mobility Fund for the construction of government infrastructure projects by ProRail on the railways. Expenditure specifically intended for freight traffic has not been taken into account in the allocation of the green bonds.

Exemption motor vehicle tax

In order to achieve the climate targets for road transport, it is the ambition of the Dutch government for all new cars to be emission free by 2030 at the latest. A comprehensive package of measures has been agreed on in the Dutch climate agreement (2019) to accelerate the selling of new and second-hand zero-emission cars. One of these measures is a temporary exemption in the motor vehicle tax. Zero-emission vehicles will remain exempt from the national component of the motor vehicle tax up to 2025. In 2025, zero-emission vehicles will be subject to a percentage of the national component of the motor vehicle tax of 25%. The exemption in the motor vehicle tax is for households the most important incentive to buy an electric car: a recent survey has shown that 18% of the households driving an electric car would switch to a fossil fuel car, if the exemption would be abolished[4]. Looking at the whole lifecycle, the carbon emission of an electric car is about 60 percent lower compared to a fossil fuel powered car[5].

[4] https://open.overheid.nl/documenten/ronl-163faaf2c477258569a30a2eb1aec2f1e740f2ea/pdf
[5] https://www.rvo.nl/onderwerpen/elektrisch-rijden/milieu-en-elektrisch-vervoer

IV. Climate change adaptation and sustainable water management

The year 2023 was the hottest year in the Netherlands and worldwide since measurements started in 1901. It was the wettest year on record for the Netherlands as well since measurements started in 1906. In the last half of 2023 the sunny weather led to a lot of evaporation, little precipitation and a large precipitation deficit.

The latest KNMI'23 Climate Scenarios confirm the trend for both the Netherlands and the Caribbean Netherlands in which the average temperature is rising and drought, as well as extreme precipitation, are occurring more often. Sea levels also continue to rise. This has consequences for water safety, freshwater availability, water quality and the supply of drinking water, amongst other things.

Four of the past six years have been dry, with 2018 and 2022 being extremely dry. In very dry years, providing all sectors with sufficient freshwater and flushing the water system to prevent salinisation is already a problem. The KNMI'23 Climate Scenarios show that in all scenarios the temperature and the variability of the weather increase and droughts occur more often. Limited water supply from the rivers and rising sea levels make the water availability and salinisation problems in the coastal regions even worse. Regarding rivers, the dialogue with neighbouring countries on drought has been intensified since 2022 and the effect on salinisation is also being studied in the Sea Level Rise Knowledge Programme.

The insights from the Climate Scenarios once again show that it is necessary to take measures to improve freshwater availability and that all water users are preparing for more frequent periods of water shortages. A bottleneck analysis will be completed at the end of 2024 to indicate where and to what extent water shortages and salinisation will occur. By the end of 2025, a first draft of various scenarios for freshwater distribution in Dutch rivers and lakes will be ready. The strategic Delta Decision on Freshwater Supply will be reviewed in 2026. At the same time as this recalibration, a new package of measures will also be compiled, which aims to make the Netherlands resilient to freshwater shortages in 2050.

As a low-lying delta, the Netherlands is vulnerable to flooding. Approximately 8 million people are protected by a primary flood defence. Due to climate change, sea levels are rising, extreme discharges are occurring more often, and the risk of flooding is increasing. Despite this, the Netherlands is the best protected delta in the world. This is possible because the government is continuously working together with the water boards and Rijkswaterstaat on the water safety goals.

3 Impact Report

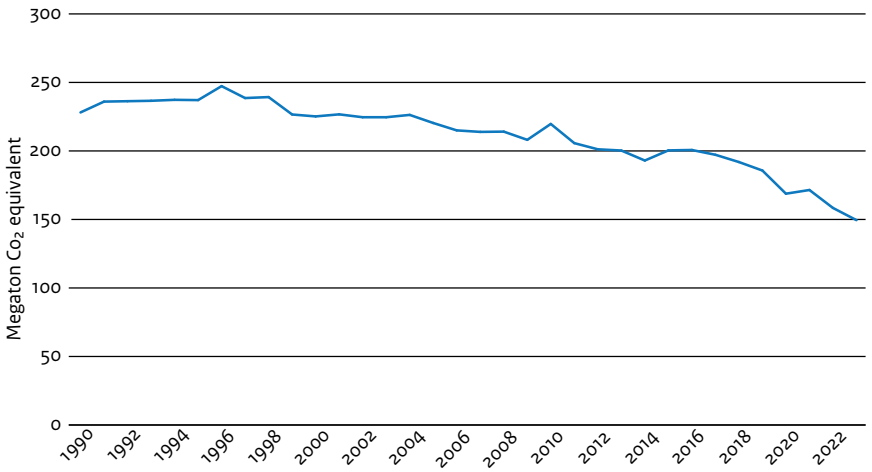
The methodologies for the estimation of impacts on avoided CO_2 emissions and related indicators relevant for climate change mitigation impacts are presented in the Methodological Annex (annex 2 to this report). The reader should bear in mind that the eligible proceeds are used for EU taxonomy aligned activities and that they respect the principles of Do Not Significant Harm.[6] Aligned expenditures are assumed to have a significant contribution to the mitigation of and/or adaptation to climate change. Additional reporting of impacts is to enhance transparency of the reporting, including an explanation of the calculations and a discussion of the limitations to the methodologies applied. The Green Bond Report also reports on the impact that has been made with the expenditures financed with the green bond proceeds. Where feasible and available, specific impact results are presented in relation to green expenditures allocated to the green bonds. The emphasis here is on the projections of avoided carbon emissions for each expenditure category.

The estimation of such impacts is guided to some extent by reporting frameworks - on the basis of which DSTA also developed its own Green Bond Framework. However, there is no detailed prescribed methodology for these impact assessments, and the methodologies need to consider national differences and local or temporal circumstances (like emission factors evolving over time with changes in the composition of the national electricity mix).

Like many other debt management offices, the DSTA uses its green bonds to fund activities or projects of others, or even to support a part of the operations of (public) companies as a whole. For example, this is the case for its support to publicly owned rail infrastructure. This is in contrast with organisations that issue green bonds for their own activities, and who thus have greater control over the data regarding these projects. For consistency, the methodologies for estimation of impacts on avoided CO_2 emissions have been kept close to those reported by supported organisations (like TenneT) or to those of leading organisations in a particular sector (like Gasunie). Furthermore, the methodologies presented in the Methodological Annex make use of average emission factors relevant for an expenditure category, rather than detailed project-specific calculations of impacts. These average emission factors are subject to approximations and assumptions. A detailed discussion of such limitations is provided in the Methodological Annex.

As with last year's green bond report, social indicators and adverse indicators have been included where possible. Examples of social indicators are the number of social housing units that were made more sustainable, the availability of public transportation and avoided deaths by water protection measures. Examples of adverse indicators are noise complaints near railways or loss of biodiversity.

Greenhouse gas emissions in accordance with the IPCC guidelines



The greenhouse gas emissions diagram shows that emissions in the Netherlands in 2023 were 6% lower than in 2022, mainly due to lower emissions from electricity generation. Emissions in 2023 were 34.5% lower than in 1990. The ambition of the Dutch Coalition Accord of 2021 is to reduce greenhouse gas emissions by 60% by 2030 in comparison to 1990, with the legal target of at least 55% reduction laid down in the Climate Act. The largest reduction in emission in 2023 was in the electricity category, with a 22% reduction compared to the previous year due to lower natural gas consumption.

[6] Only for the category "Tax relief and subsidies for electric and plug-in hybrid electric vehicles" we have not been able to determine whether the DNSH principle of pollution prevention and control has been respected due to data limitations.

The production of renewable electricity in 2023 amounted to 48% (57 billion kWh) of the total electricity production in the Netherlands, which is 21% more than in 2022.[7] Growth in the renewable electricity production can mainly be attributed to wind (a 35% increase compared to 2022 amounting to 29 billion kWh) and solar (a 24% increase compared to 2022 amounting to 21 billion kWh). The increase in wind was partly due to the increased installed capacity, reaching 11 GW in 2023. Finally, biomass represents 7 billion kWh in the renewable energy production, a drop of 20% compared to 2022.

I. Impact of the Dutch State Green Bond

The impact table on the next page shows an overview of the impact of the green bond issued in relation to eligible expenditures in 2022 and 2023. The avoided CO_2 always relates to the joint impact of all the expenditures and investments of all actors for the underlying projects, with the exception of clean transportation, where the avoided CO_2 is calculated on the part financed by the green bonds. The share or ratio of the government's expenditures compared to total expenditures can be found in paragraph IV.

[7] Renewable electricity production 2023, Statistics Netherlands

Impact table expenditures financed with the Green DSL 2044

		2022			2023		
Category	**Category description**	**Impact metric avoided CO_2**	**Result indicators**	**Impact metric other**	**Impact metric avoided CO_2**	**Result indicators**	**Impact metric other**
Renewable Energy 	Stimulation of Sustainable Energy Production (SDE)				2.84 Mton	9,703 projects; 1,729 MW subsidized power	19.63 PJ sustainable production; 5,453 mln kWh
Clean Transportation 	Maintenance and management of railway infrastructure, development of railway infrastructure for passenger rail Regional Infrastructure and accessibility Projects Mega Projects Traffic and Transportation	0.08 Mton	5 developed railwayprojects 7,023 km maintained railway Invested in 26 projects	13.325 bln. passengerkilometers on the railways in 2022.	0.20 Mton	No railway project completed 7,002 km Maintained railway Invested in 37 projects.	15.563 bln. Passenger-kilometers on the railways in 2023.
Climate Change Adaptation & Sustainable Water Management 	Delta Fund: • Flood risk management investments • Freshwater supply investments • Management, maintenance, and replacement • Experimentation • Network related costs and other expenditures • Water quality investments		In 2022 there is 196 kilometers of safe dykes, based on the newest norms. This is 13.1 % of all dykes to be improved. The target is 100 % safe dykes in 2050. In 2021 51 flood defence works meet the new standards. This is 12.0 % of all works identified to be improved. The target is 100 % safe flood defence works in 2050.	The target value is a mortality risk of 1:100,000 per year, in 2050. The standards for dykes and weirs have been adjusted accordingly. The availability of storm surge barriers in 2022 was 83 %. The target value is 100 %.		In 2023 there is 219 kilometers of safe dykes, based on the newest norms. This is 14,6% of all dykes to be improved. The target is 100% safe dykes in 2050. In 2023 138 flood defence works meet the new standards. This is 36,32% of all works identified to be improved. The target is 100% safe flood defence works in 2050.	The target value is a mortality risk of 1:100,000 per year, in 2050. The standards for dykes and weirs have been adjusted accordingly. The availability of storm surge barriers in 2023 was 100%. The target value is 100 %.

II. Social indicators

Clean transportation – access to rail mobility

Proximity to a railway station is an important factor in the choice between public transportation or transportation by car. On average, Dutch citizens lived 5.3 kilometres from the nearest railway station in 2022, this is an increase of 0.2 kilometres compared to 2021. The distance to a main hub station slightly increased to 10.8 kilometres from 10.7 in 2021. However, this has shown a significant decline from 13.5 kilometres in 2020.[8]

Flood Defences – people protected by flood defence work

The goal for 2050 is for every citizen living behind a primary flood defence in the Netherlands, currently around 8 million people, to have at most a 1 in 100,000 chance of dying due to flooding. As of 2020, 78% of the Netherlands met this target, with the expectation this will increase to 81% in 2028. [9]

Grid availability - percentage downtime of main gridlood Defences – people protected by flood defence works

For 2023, the total availability of the main high voltage electricity grid was 99.99993% (down 0,00007% of the time). This compares favourably with a target availability of 99.99962%.[10]

III. Adverse indicators

Renewable energy – Use of Space by Offshore wind parks

The Dutch sector of the North Sea amounts to 57,800 square kilometres. In 2019, 0.23% of the area was covered by offshore wind parks. Due to the construction of new wind parks, the area covered by offshore wind parks increased to 1.65% in 2023, and is expected to increase to 4.5% in 2030. This will result in space in the North Sea becoming more occupied by windmills in the future.

Clean transportation – Noise pollution of railways

ProRail monitors the noise pollution generated by rail traffic through reference points along the Dutch railway infrastructure. In 2022 there were 56,893 reference points. At 198 reference points (0.3% of the total) the noise level exceeds the maximum allowed limit. This is much lower than in 2021, when this number was equal to 411 reference points, i.e., 0.7% of the total. [11]

IV. Renewable energy

The renewable energy generated by projects financed with the SDE scheme is measured on the basis of actual meter readings and can therefore be determined with a relatively high level of accuracy. The conversion of generated energy to avoided carbon emissions is based on Statistics Netherlands (CBS) figures. The granted subsidy was measured on the basis of realised cash expenditures.

Over time, the number of relevant projects has reduced, as no new SDE subsidy decisions have been issued. Part of the current subsidy decisions are fully disbursed and are no longer taken into account in the charts below. Below are two charts presented that reflect the aggregated figures per year. The further details for 2018-2023 are reflected in the charts on the next page.

[8] StatLine - Nabijheid voorzieningen; afstand locatie, regionale cijfers (cbs.nl)
[9] Delta program 2024
[10] Grid Integrated Annual Report 2023
[11] Geluidregisterspoor Nalevingsverslag 2022

Graph: SDE Production Summary Chart

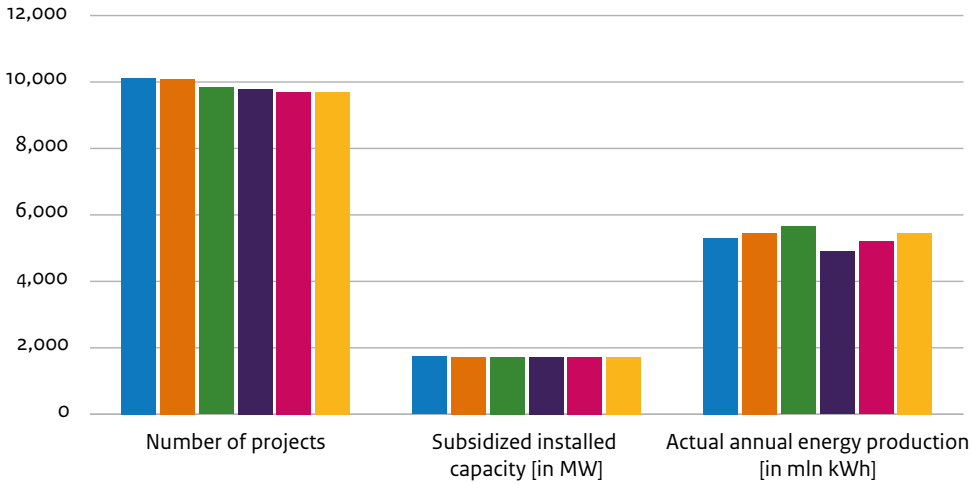


Table: Cash expenditure and avoided CO_2 emissions per year regarding SDE

Year	2018	2019	2020	2021	2022	2023
Cash expenditures [EUR/million]	528	495	520	521	172	-17
Avoided CO_2 in million tons	3.13	3.22	2.77	1.80	2.65	2.84

For 2023, there was a negative expenditure of € 17 million on the SDE (i.e. a revenue for the Dutch State) as previously paid out subsidy was repaid.

With the SDE subsidy scheme, projects financed in the solar energy, offshore wind energy, and onshore wind energy categories are included in the Dutch Green Bond. In total, 5,453 million kWh of renewable energy was generated in 2023 as a result of this subsidy. The generated renewable energy is equal to 2.84 megatons of avoided carbon emissions. In 2023, the avoided carbon emissions per generated volume of renewable energy was higher than in 2022. At the end of 2023, 9,703 projects received the SDE subsidy. These projects generated a total capacity of 1,729 megawatts.

Table: Number of projects SDE resulting in annual energy production

	Number of projects	Subsidised installed capacity [in MW]	Actual annual energy production [in million kWh]
2018	10,113	1,734	5,308
2019	10,088	1,730	5,462
2020	9,830	1,730	5,645
2021	9,782	1,730	4,903
2022	9,703	1,729	5,195
2023	9,703	1,729	5,453
2023 (SDE+)	19,490	13,590	25,859
2023 (SDE++)	772	269	400

There are many parties involved in projects subsidised with the SDE scheme, such as equity financiers, debt financiers, the government, local and regional authorities and project developers. All these parties have a unique role in the realisation of the project and thus the CO_2 impact achieved with the projects cannot be specifically divided among the various parties involved. To illustrate this, the SDE scheme covers the unprofitable top, which depends on, among other things, the electricity price. Projects that are otherwise exactly the same but only started at a different point in time will have the same CO_2 impact. The SDE subsidy received for the two projects differs due to changing electricity prices. The role of the government and the (subsidy) instrument used does not differ between the two projects. As a result, the calculation of the avoided CO_2 in the impact table is based on the total renewable electricity generation of the underlying projects and the amount of carbon emissions that this has avoided.

Renewable energy reported through the energy grid

The percentage of energy from renewable sources has risen to 48% in 2023[12]. In July this percentage was even at 57%.

[12] Source: Statistics Netherlands, preliminary data 7 March 2024, Link to Statistics Netherlands site

V. Energy Efficiency

Sustainable heat via WarmtelinQ

Warmtelinq is an underground main transport pipeline for warm water in order to heat houses in the province of Zuid-Holland. Impact indicators have been defined[13] in the green bond framework, i.e. number of houses connected, annual energy savings in Mwh and Avoided CO_2. As the heat network is not yet operational, the numbers reported are nil.

VI. Clean transportation

By investing in management, maintenance, renewal and expansion of the track (for passenger transport), travellers in the Netherlands are provided with a mode of transport that has very few CO_2 emissions. The Ministry of Infrastructure and Water Management invested in 37 rail projects, for instance the Brainport Eindhoven. The railway manager ProRail managed and maintained 7,002 kilometres of track in 2023.

The estimation of the avoided CO_2 as a result of investments and maintenance in rail infrastructure required more effort than the above categories of expenditure as there is no existing data for rail infrastructure suitable for the impact reporting of the green bond. In France, Carbone 4 has developed a method for SNCF-Réseau in which the avoided CO_2 is calculated based on the expected change in passenger behaviour as a result of investments and maintenance in rail. This method has also been used by the Spanish carrier ADIF-Alta Velocidad. At the time of the first Green Bond Report with the Ministry of Infrastructure and Water Management and ProRail, the DSTA concluded that this method cannot be applied to the Dutch situation. For example, there is no "degeneration curve" available for the Netherlands that indicates how the infrastructure deteriorates if year after year no investments would be made in the management, maintenance and replacement of rail infrastructure.

In 2020, the DSTA has therefore commissioned Significance, an independent research agency focusing on mobility and transport, to develop a variant in which the change in passenger behaviour without the availability of rail infrastructure is the starting point. If no railway infrastructure were available, the public would make other choices with regard to transport modality, need to travel, home/work location, etc. These other choices can be partly estimated with the National Model System (LMS), although the LMS is not developed for this purpose. The LMS is a forecasting model of Rijkswaterstaat that predicts mobility in the Netherlands in the medium and long term and that is primarily used for capacity analysis, the consideration of different alternatives in projects and the consequences of other policy measures. Although the use of LMS for the calculation of avoided CO_2 due to the situation with and without the availability of rail infrastructure is a prognosis, in our opinion, this currently provides the best estimate for the avoided CO_2 as a result of investments and maintenance of rail infrastructure in the Netherlands.

In 2023 there were 15.5 billion passenger kilometres on the rail, which would disappear completely if there were no investments in rail. Every year, approximately EUR 6 billion is spent on the train system, to be divided into the costs of rail infrastructure (State/ProRail) and the costs of rolling stock (NS/regional carrier). Based on the above method, Significance calculates that the total amount of avoided CO_2 in 2018 was approximately 776,000 tons.

Avoided CO_2 and clean transportation

Significance's research focuses on two scenarios: (1) where the train is not available as a means of transport and (2) where the train is available. ProRail has indicated that without expenditure on management, maintenance and replacement of the track, it is no longer justified to allow trains to run in the first year. In the first scenario, there are alternatives to the train, such as working from home more often, taking the car or bicycle or moving house.

Passenger numbers were 18.2% lower in 2023 compared to 2018, before COVID-19. The main reason for this is the changed passenger behaviour after COVID-19. Even though the last lockdown ended in March 2022, passenger numbers did not fully return. Working from home has lowered the number of passengers during weekdays mostly. The number of weekend travellers almost equals pre-COVID numbers.

[13] Appendix 1 Green Bond Framework 2023

The train is less used as a mean of transport, just like any other means of transport, apart from the (e-)bike and walking. In addition, there have also been far fewer movements. The number of passenger kilometres by rail has been reduced to 15.5 billion in 2023, a reduction of 18.2% compared to 2019. As a result, emissions in the scenario without train (1) have been reduced by 18.2%, assuming that the choices continue to emit the same emissions.

In the Significance report of 2020 the basis for the avoided CO_2 due to train transport was set at 141 tons of avoided CO_2 emissions per million euros in investments in rail. For the calculation of avoided CO_2, we assume a one-off decrease of 18.2% in 2023 due to the decrease of railway passenger kilometres. For the expenditure on sustainable transport allocated to the green bond in 2023, this amounts to 0.10 Mtonnes avoided CO_2 in 2020, 0.04 Mtonnes avoided CO_2 in 2021, 0.08 Mtonnes avoided CO_2 in 2022 and 0.20 Mtonnes avoided CO_2 in 2023 respectively.

CO_2 emissions from electric cars

Over its entire life cycle, an electric car emits approximately 60% less CO_2 than a fuel car. This includes the production of the car and the battery and the total kilometres driven. The CO_2 emissions from electric cars arise both during the production of the car and the generation of electricity. Charging an electric car with green energy makes using the car even more environmentally friendly. Electric transport will continue to develop in the coming years. As a result, the energy efficiency of electric transport is increasingly improving. Electricity also comes more often from sustainable sources. You can read more information about the positive effects of the electric car on the environment in the study by Milieu Centraal[14].

VII. Climate change adaptation and sustainable water management

Over the past few years, the Delta Plan on Spatial Adaptation has created awareness amongst layers of government of the adaptation task. Significant steps have therefore been taken in recent years to accelerate and intensify the approach to climate adaptation. In addition, the Ministry of Infrastructure and Water Management finished one project in 2023 and invested in twenty-eight projects in 2023, such as the Vismigratierivier where the national government, the region and civil society organisations have worked together.

In total, 219 of the 1500 kilometres of identified dykes to be improved are declared safe in 2023 (14.6%). This means that they meet the flood protection standard for 2050. In 2023, 138 flood defence works of the 380 identified to be improved have been restored to a safe level. All primary defences (dykes and dunes) have been assessed on the basis of the new standards in the Water Act.

Next to water safety, the Dutch government invests in fresh water supply and water quality projects. Several Delta Plans are imbedded in the Delta Program to facilitate the achievement of mentioned policy goals. The government works together with several layers of government and other stakeholders to protect Dutch citizens against floods and droughts; supply fresh water; and ensure water quality in an effective, efficient and sustainable manner. As an EU member state, the Netherlands must comply with directives such as the 'Water framework directive' and 'Natura 2000'. The projects ensuring water quality and safety have high standards in restoring or maintaining the ecological value.

[14] Elektrische auto: schoner en klimaatbewust | Milieu Centraal

4 Case study ‘Sustainable foundations by ProRail’

The overhead line along the railway between Hoorn and Enkhuizen, as well as between Obdam and Hoorn, will be supported by sustainable concrete foundations. The existing 90 foundations have reached the end of their lifespan and are being replaced. They are being replaced by foundations made of recycled concrete, ensuring longevity for years to come.

John Nieuwstad, construction manager at ProRail, explains, “Not only are the new foundations made of circular concrete, but the existing foundations are also being given a second life. After removal from the track, they are taken to the company GBN.”

GBN’s mission is to keep the earth inhabitable and ensure a sufficient supply of resources for current and future generations. GBN processes the material to its full extent into coarse Circugrind, finer Circuzand, and ultra-fine Circument. These are high-quality, fully circular raw materials applicable in concrete for new portals, poles, foundations, and other applications.

Overhead line portals can also be made from circular concrete. With circular foundations and overhead line poles, ProRail is on track with the targets for 2030 set out in the Concrete Agreement, including a 30 percent reduction in CO_2 emissions in the concrete chain and 100 percent high-quality reuse of released concrete.

The task is clear: a fully carbon-neutral footprint of the rail sector by 2050 concerning emissions, energy, and materials. By 2030, all infrastructure projects must be climate-neutral and circular. Therefore, we must be more conscious of available materials. That is why ProRail is committed to fully circular material usage in railways and stations.

5 Case Study ‘The new Ede-Wageningen station’

New bicycle storage facility

As of February 2023, the new guarded bicycle storage facility in the Ede-Wageningen station building is in operation. It accommodates nearly 5,500 bicycles and the first 24 hours of parking are free. Travellers can access this bicycle storage facility with their public transport chip card. Access can also be obtained with a bicycle tag, which the employee at the facility can attach to the bicycle. This enables travellers to enter and exit directly without having to search for their public transport chip card. An unguarded bicycle storage facility with approximately 1,800 spaces will also be established on the city center side in early 2025.

Transformation of station surroundings

In late 2020, excavation and remediation of areas on the north and south sides of the tracks began. This was followed by work on the train station and the tracks in 2021. The surroundings of Ede-Wageningen station have undergone a significant transformation. EdesPoort removed 21 switches and laid eleven new ones. Nine kilometres of track were demolished and almost eight kilometres of new track were built. A section of platform 1 and the roof of the old central platform were also demolished. The 8,000-ton new East Tunnel was slid into place within twelve hours: the heaviest object ever slid in the Netherlands. Furthermore, a new bicycle and pedestrian viaduct was completed in 2023. Additionally, the new bus station with access roads was constructed, and bicycle and pedestrian paths were laid. The wooden roof of the renovated Ede-Wageningen station is iconic and gives the station a grand appearance. The track canopy is a remarkable structure, weighing over 1,400,000 kilograms. The entire structure, approximately 50 meters wide and 180 meters long, was completed in July 2023.

Unique design

During the last weekend of March 2023 EdesPoort attached the final steel columns of the total of 20 columns to the previously installed foundations of the new Ede-Wageningen station. The steel columns support the entire new station canopy. The roof structure consists of 23 triangles. Each triangle comprises three wooden beams, each 27 meters in length. Within such a large triangle, 36 smaller triangles are incorporated. The laminated fir wooden beams each weigh 9,000 kilograms. The total new track canopy will be approximately 50 meters wide and 180 meters long. Each triangle weighs over 65 tons, resulting in a total roof weight of over 1,400,000 kilograms.

Station ready for the future

Ede-Wageningen has evolved into a crucial transportation hub. The modified rail infrastructure enables high-frequency rail transport on the Schiphol-Utrecht-Nijmegen route. The old station was not designed for large numbers of passengers, especially not for an increase in traffic.

Photo: Esther Diebels

6 Case Study ‘The Ooijen-Wanssum Area Development’

The Ooijen-Wanssum Area Development project is a comprehensive initiative that combines several objectives. Led by the province of Limburg, the project contributes to both short and long-term water safety goals in the northern Maas Valley. Additionally, it involves constructing a bypass road and developing nature areas to support the Ecological Main Structure (EHS). The project's goals included achieving legal safety standards, improving water levels, developing nature and landscape, enhancing livability in Wanssum, and creating space for new economic developments. To address the risk of Maas River flooding between Ooijen and Wanssum, a 10-kilometer-long old Maas arm was reactivated, embankments were removed, and two flood channels were excavated. Dykes were constructed and improved to meet the safety standard.

This solution significantly enhances water safety in the northern Maas Valley. The collaboration involves not only the national government but also the province of Limburg, the Limburg Water Board and the municipalities of Horst aan de Maas and Venray. A governance agreement between the national government and the region was signed in November 2012, followed by the signing of the implementation agreement for the Ooijen-Wanssum construction phase on 12 October 2016. The work on the project was completed in 2021, and the project was officially handed over to nature management in 2023.

The Ooijen-Wanssum project offers valuable lessons for future river projects and educational endeavors. Emphasising engagement with local communities and the natural landscape from the project's inception fostered a strong connection with the area's stakeholders, facilitating a coherent decision-making process. Prioritising landscape quality and consistently adhering to the "design according to the river's DNA" principle not only enhanced the area's spatial quality but also guided project logic, fostering trust and enabling better decision-making. Moreover, the project's success was underpinned by a collaborative approach among partners, with a focus on equality and interdependence, ultimately leading to innovative solutions and successful outcomes.

In conclusion, the Ooijen-Wanssum Area Development project serves as a remarkable example of effective collaboration, coherent planning, and innovative problem-solving, contributing significantly to water safety, environmental conservation and community development in the Maas Valley region.

7 Case study ‘WarmtelinQ’

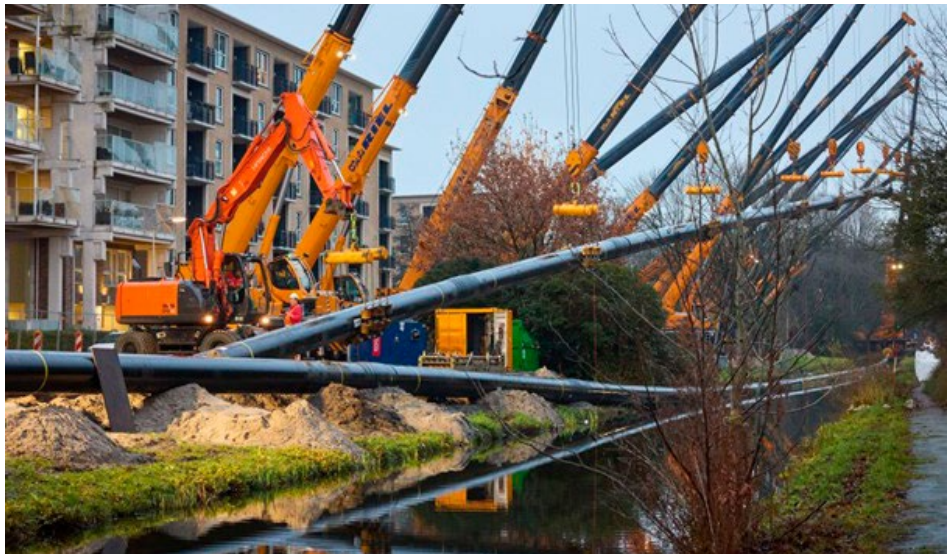
WarmtelinQ is a regional thermal energy transportation system for heat destined for district heating networks in the build environment and greenhouse horticulture. The main source of thermal energy is residual heat from the Port of Rotterdam (PoR) to The Hague, with the possibility to include local (geothermal) sources in the system as well. The transportation system can be considered an 'open system' as it can host a multiplicity of heat sources and users. The operator of the transportation system is a full public entity: N.V. Nederlandse Gasunie. WarmtelinQ is considered a Service of General Economic Importance (DAEB).

The initial scope of WarmtelinQ was to transport residual thermal energy from industry in the Port of Rotterdam to The Hague. In 2023 the province of Zuid-Holland agreed to the planned routes for the expansion of WarmtelinQ to include a route from the city of Rijswijk to the city of Leiden, denoted by adding a '+' to the system's name: *'WarmtelinQ+'*.

The goal of WamtelinQ+ is to provide heat, by the means of the transport of thermal energy, to district heating networks in the province of Zuid-Holland under optimal social conditions and for the lowest efficient costs. To ensure the latter two, the operator of the transport system is a full public entity.

A total thermal power of 248 MW can be transported through WarmtelinQ+, equivalent to the transport of almost 5 PJ of thermal energy annually which results in significant reductions in emissions.

Impact indicators have been defined, i.e. number of houses connected, annual energy savings in Mwh and Avoided CO_2. As the heat network is not yet operational there is no impact yet.

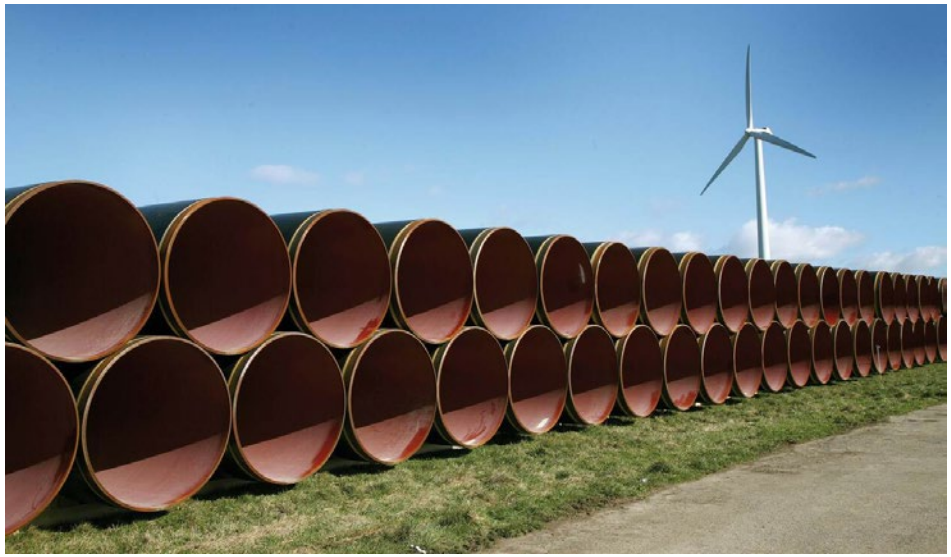


(source: Werkzaamheden De la Reyweg door planningswijziging eerder klaar › WarmtelinQ)
(source: Warmwaterleiding WarmtelinQ onder Erasmusplein door › WarmtelinQ)

8 Case study ‘Hynetwork’

Hynetwork (a 100% subsidiary of Gasunie) is creating a national hydrogen network in the Netherlands that will link the demand for and supply of CO_2-free hydrogen. Five industrial clusters will be connected to each other, to Germany and Belgium and to hydrogen storage facilities and international supply lines. This will primarily be done using existing infrastructure and partly using newly constructed infrastructure. The hydrogen network in the Netherlands is being built in phases. The goal is to have the network fully completed by 2030. By being the first country in Europe to have its hydrogen infrastructure in place, the Netherlands can become an important hub for renewable energy.

Industry in the Netherlands is responsible for about 25% of national CO_2 emissions, and sustainability can be achieved only to a limited extent through electrification. That means CO_2-free gases are indispensable. By using CO_2-free hydrogen as a raw material and fuel, industry can reduce its emissions and make a major contribution to the energy transition. The construction of the national hydrogen network has already started. On 27 October 2023 King Willem-Alexander officially started the construction of the first section of the hydrogen infrastructure at Rotterdam's Tweede Maasvlakte industrial park. The infrastructure will span 1,200 kilometres in total.



9 Green Bond Reporting: other topics regarding green bonds

I. Market developments/liquidity/volume of green bonds

According to S&P, the global issuance of green bonds increased in 2023 to $ 575 billion, up from $ 523 billion in 2022. Additionally, the issuances of other categories of sustainable bonds such as social bonds or sustainability bonds increased compared with 2022. The total issuance of sustainable bonds amounted to $ 984 billion in 2023, up from $ 930 billion in 2022.

With the issuance of the Green DSL 2044, both initially in 2023 and its first re-opening in 2024, the Netherlands has € 22.7 billion of green bonds outstanding spread over two lines as of April 2024. This amounts to 6.2% of the outstanding Dutch State Loans (as at the end of March 2024).[15] In addition to public investments, private investments also need to be mobilised. In the Dutch capital market, since the year of the first issuance by the State, more than € 65 billion has been issued in sustainable bonds by financial institutions and corporates.

II. Investor feedback on previous green bond reporting

During the roadshow for the Green DSL 2044, the DSTA asked investor feedback on its previous green bond reports. In line with previous feedback, investors generally appreciate our combined allocation and impact report as well as the report being condensed.

Previous feedback indicated investors would welcome bond-by-bond reporting in case the DSTA would have two Green DSL's outstanding. This feedback was taken onboard when drafting the September 2023 Green Bond Framework, and of course this 2023 Green Bond Report. The DSTA will continue with bond-by-bond reporting for future Green Bond Reports.

III. Dutch green bonds in the future

After the initial issuance of the Green DSL 2044 for an amount of € 4.98 billion in October 2023, the DSTA announced to re-open this bond for € 4 billion in 2024. As it currently stands, one re-opening for an amount of € 2 billion has been completed in 2024. The DSTA is committed to increase the outstanding amount of the green bond to a minimum of € 10 billion, in line with regular DSLs with a longer maturity.

The importance of the role of public issuers in developing new products should not be under-estimated and the DSTA feels obliged to continue to explore its role in this process. In addition, the DSTA will always be looking into exploring other types of issuances to be used in the future.

IV. The EU green bond standard

The Regulation (EU) 2023/2631 of the European Parliament and of the Council on European Green Bonds and optional disclosures for bonds marketed as environmentally sustainable and for sustainability-linked bonds (also known as the EU Green Bond Standard Regulation) was formally adopted and subsequently published at the end of 2023. This new regulation opens the possibility of issuers coming to the market with a so-called EU GBS bond as of the end of 2024. This voluntary standard will be the highest standard available in the European green bond market.

The State of the Netherlands fully supports the introduction of the EU Green Bond Standard, and is studying the possibilities to issue a bond under this standard. Such possible introduction may not interfere with the DSTA's existing commitment to bring the existing Green DSL 2044 to the committed € 10 billion. Any potential future issuance of an EU GBS aligned bond will be announced in future outlooks, depending on feasibility, market conditions and specific circumstances.

[15] Sustainable Issuance Bonds

V. Climate

The Netherlands is fully committed to the United Nations (UN) 2030 agenda for Sustainable Development and the Paris Agreement on Climate Change (the 'Paris Agreement'). The Netherlands aims to ambitiously contribute to the fight against climate change and is firmly dedicated to the goal set out in the European Green Deal: to reduce carbon emissions by at least 55% by 2030 compared to 1990 levels.[16] [17]The Dutch Climate Act shows a high level of climate ambition and has been updated to reflect this European carbon emission reduction target for 2030.[18]

Dutch climate policy focuses on increased carbon emission reductions, with the objective of achieving at least a 55% reduction by 2030 (from 1990 levels), but striving towards a 60% reduction. For 2050, the ambition is to be climate neutral. In 2022, a Minister for Climate and Energy was appointed to oversee both the climate policy and a Climate Fund amounting to over €30 billion. The Climate Fund was approved by parliament in December 2023.[19] Over a period of 10 years, this fund will help to create the nation's required energy infrastructure, establish a green industrial policy and make transport and the built environment more sustainable.
In addition, extra investments will be made available for research and innovation in climate-neutral technologies.

[16] European Commission – European Green Deal, 14 July 2021 (available here); European Commission – European Climate Law, 30 June 2021 (available here)
[17] Additionally, in 2019 the Supreme Court ruled in the case of the Urgenda foundation against the State of the Netherlands that annual greenhouse gas emissions should be reduced by 25% by the end of 2020 compared to 1990. The government responded with additional measures to ensure this target was met in 2020. Emissions in 2021 were slightly higher, but down to a 30% reduction in 2022
[18] Change to the Dutch Climate Act (available here, in Dutch)
[19] Parliament has passed the act to install the Climate Fund, the Senate passed the act in December 2023

VI. Climate: Dutch vision on global climate action

The Netherlands has major climate ambitions. In 2030, greenhouse gas ("GHG") emissions in the Netherlands must have fallen by at least 55%, as a prelude to a climate-neutral Netherlands in 2050. To achieve this ambition, the government presented the climate policy programme.[20] The programme has been supplemented with proposed additional policy measures in the spring of 2023.[21] Overall, the programme is aimed at a 60% GHG reduction by 2030 and describes the main features of the policy for the coming years. With these features, the government is giving direction to the transitions that are necessary for climate neutrality in 2050.

The largest reductions in emissions are to be made in the sectors 'Electricity production', 'Industry' and 'Mobility'.[22] As part of these efforts, the total capacity for offshore wind energy in 2030 will be doubled to around 21 gigawatts by developing three additional offshore windfarms.[23] In addition, the State of the Netherlands supported the 'Statement on International Public Support for the Clean Energy Transition' at the COP26 (Conference of Parties) conference in Glasgow and has discontinued new direct public support for the international unabated fossil fuel energy sector as of 2023.[24]

In September 2022, the European Commission endorsed the State of the Netherlands' recovery and resilience plan,[25] paving the way for the EU to disburse € 4.7 billion in grants to the Netherlands under the Recovery and Resilience Facility (the 'RRF'). The Netherlands' plan devotes 54.9% of its total allocation to the green transition, substantially exceeding the minimum of 37% required by the RRF Regulation. The plan includes investments and reforms to speed up the deployment of renewable energy sources, investments supporting a sustainable built environment and nature restoration. Additionally, 51.5% of the Dutch measures also contribute to the REPowerEU objectives, which are aimed at approving energy independence throughout the EU and enhancing the green transition.

[20] Climate policy programme (available here)
[21] Letter to Parliament about net climate measures (available here, in Dutch)
[22] Climate Note 2023 (available here)
[23] Climate Policy Programme (available here)
[24] Statement on International Public Support for the Clean Energy Transition, 4 November 2022 (available here)
[25] European Commission – European Commission endorses the Netherlands' €4.7 billion Recovery and Resilience Plan (available here)

The State of the Netherlands also lives up to the commitments of the Paris Agreement by providing financial resources to assist developing countries with respect to both mitigation and adaptation through the Dutch Fund for Climate and Development. The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change. This will be done by keeping the global average temperature rise above pre-industrial levels well below 2 degrees Celsius this century and pursue efforts to limit the temperature rise to 1.5 degrees Celsius. The three pillars of the policy on climate change of the State of the Netherlands are climate change mitigation, adaptation and finance, as outlined in our Global Climate Strategy.[20] The expenditures financed by this Green Bond are mainly focused on mitigation and adaptation. The Netherlands strives to ensure that any action on climate change is fair and inclusive to those most vulnerable to climate change.

Climate change mitigation

The first pillar is climate change mitigation, as the Netherlands has set out a clear and robust framework for the implementation of the Paris Agreement in the Climate Act. Under this Act, the government is required to draw up a Climate Plan setting out measures to ensure that the targets stipulated in the Act are achieved.[26]

The Climate Act requires the Netherlands Environmental Assessment Agency (*Planbureau voor de Leefomgeving*) ('PBL') to publish an annual Climate and Energy Outlook (*Klimaat- en Energieverkenning*, 'KEV'), which is one of the accountability instruments of Dutch climate and energy policy. According to the most recent Climate and Energy Outlook report[27] published in October 2023, the target to reduce GHG emissions with 55% is within reach, but it is towards the upper end of the range of calculated emissions. As of spring 2023, the government has committed to accelerate the implementation of its policies and to introduce additional policies in order to achieve the 2030 reduction target. To reach this target, the government proposed additional measures in spring 2023 that will lead to the desired reduction of 55 to 60%, while making sure the burdens of the transition are shared fairly across all economic actors. To finance these measures, the government currently proposes to mobilise €36.6 billion from the Climate Fund.[28] [29]

Climate change adaptation

The second pillar is climate change adaptation, given that the Netherlands is vulnerable to the physical impacts of climate change. On the national level, climate adaptation policy is laid down in the National Adaptation Strategy (the 'NAS') and the Delta Programme, to ensure a climate-proof and water-resilient country by 2050. The NAS describes the main climate risks facing the Netherlands and sets a course for addressing these risks. The Delta Programme has its legal base in the Delta Act (*Deltawet waterveiligheid en zoetwatervoorziening*). It ensures that flood risk management, freshwater supply and spatial planning will be climate-proof and water-resilient by 2050. As part of the Delta Programme, the national Flood Protection Programme sets out the measures that are required to ensure primary flood defence systems meet the statutory safety standards, now and in the future. The latest climate scenarios developed by the Royal Netherlands Meteorological Institute (KNMI) are continuously incorporated into those standards. Financing is needed to implement the measures contained in the Delta Programme. An amount is set aside annually for this purpose in the Delta Fund. The average annual budget is € 1.5 billion in the period 2023-2036. In addition, the Ministry of Infrastructure and Water Management has made € 200 million available to accelerate implementation of measures for adaptation on a regional and local level, in order to increase resilience and limit the effects of climate related risks, such as flooding, extreme weather and drought. This Impulse Programme[30] started at the beginning of 2021. If measures are not taken, damages are estimated to rise to an amount between € 77.5 and € 173.6 billion by 2050.[31]

The State of the Netherlands is also committed to sharing its expertise on climate adaptation with other countries, for example by hosting the Global Centre on Adaptation in Rotterdam. This Centre was founded by the UN Energy Programme in cooperation with the State of the Netherlands and Japan, and facilitates the sharing of knowledge and expertise on combatting the effects of climate change around the world.[32]

[26] The increased carbon emissions reduction targets are stipulated in the Climate Act, which was accepted by Parliament and Senate in July 2023

[27] Netherlands Environmental Assessment Agency - Climate and Energy Outlook 2022, 26 October 2023 (Dutch version available here, English available here)

[28] Letter to Parliament about new climate measures (available here, in Dutch)

[29] Parliament has passed the act to install the Climate Fund, the Senate passed the act in December 2023. For the current size of the Climate Fund see the draft multi-year plan 2025. This plan is a draft and has not yet been definitely adopted

[30] *Impulsregeling Klimaatadaptatie* (available here, in Dutch)

[31] Public Information Service – Climate adaptation in the Netherlands (available here)

[32] Global Centre on Adaptation (available here)

Annex I

Auditor’s Report by the independent auditor

Attribute: 2024-0000337034

To: The Agent of the Dutch State Treasury Agency

Our opinion

We have audited the Allocation report (chapter 2 of the Green Bond Report 2023 of the Dutch State Treasury Agency based in The Hague). In our opinion the allocation report is prepared, in all material respects, in accordance with the principles as described in the Green Bond Framework of the Dutch State (version September 8th 2023), chapters 2.1, 2.2, 2.3 and 2.4.

Basis for our opinion

We conducted our audit in accordance with Dutch law, including the Dutch Standards on Auditing. Our responsibilities under those standards are further described in the 'Our responsibilities for the audit of the allocation report ' section of our report.

We are independent of the Dutch State Treasury Agency in accordance with the Verordening inzake de onafhankelijkheid van accountants bij assurance-opdrachten (ViO, Code of Ethics for Professional Accountants, a regulation with respect to independence) and other relevant independence regulations in the Netherlands. Furthermore we have complied with the Verordening gedrags- en beroepsregels accountants (VGBA, Dutch Code of Ethics). We believe the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Emphasis of the basis of accounting and restriction on use and distribution

We draw attention to note page 6 of the Green bond report 2023 of the Dutch State Treasury Agency based in The Hague, which describes the basis of accounting. The Green bond report 2023 of the Dutch State Treasury Agency based in The Hague is intended for the investors in de green bonds issued by the Dutch State Treasury Agency and is prepared to assist the Dutch State Treasury Agency to comply with the principles as described in the Green Bond Framework of the Dutch State (version September 8th 2023), chapters 2.1, 2.2, 2.3 and 2.4. As a result, the Allocation report may not be suitable for another purpose. Therefore, our auditor's report is intended solely for the Dutch State Treasury Agency and the investors in de green bonds issued by the Dutch State Treasury Agency and should not be distributed to or used by other parties than the Dutch State Treasury Agency and the investors in the green bonds issued by the Dutch State Treasury Agency. Our opinion is not modified in respect of this matter.

Other information

Besides the Allocation report other information has been added that consists of:

- Introduction
- Impact report
- Case study: Sustainable foundations by Prorail
- Case study: The new Ede-Wageningen station
- Case study: The Ooijen-Wanssum Area Development
- Case study: WarmtelinQ
- Case study: Hynetwork
- Other topics regarding the green bond

Based on the following procedures performed, we conclude that the other information is consistent with the allocation report and does not contain material misstatements.
We have read the other information. Based on our knowledge and understanding obtained through our audit or otherwise, we have considered whether the other information contains material misstatements.

By performing these procedures, we comply with the requirements of the Dutch Standard 720. The scope of the procedures performed is substantially less than the scope of those performed in our audit of the Allocation report.

The Agent of the Dutch State Treasury Agency is responsible for the preparation of the other information in accordance with the principles as described in the Green Bond Framework of the Dutch State (version September 8th 2023), chapters 2.1, 2.2, 2.3 and 2.4.

Responsibilities of the Agent of the Dutch State Treasury Agency for the allocation report.

The Agent of the Dutch State Treasury Agency is responsible for the preparation of the allocation report in accordance with the Green Bond Framework of the Dutch State (version September 8th 2023), chapter2.1, 2.2, 2.3 and 2.4. Furthermore, the Agent of the Dutch State Treasury Agency is responsible for such internal control as she determines is necessary to enable the preparation of the allocation report that is free from material misstatement, whether due to fraud or error.

Our responsibilities for the audit of the allocation report.
Our objective is to plan and perform the audit engagement in a manner that allows us to obtain sufficient and appropriate audit evidence for our opinion.

Our audit has been performed with a high, but not absolute, level of assurance, which means we may not detect all material errors and fraud during our audit.

Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the allocation report. The materiality affects the nature, timing and extent of our audit procedures and the evaluation of the effect of identified misstatements on our opinion.

For a more detailed description of our responsibilities, we refer to https://www.nba.nl/ENG_algemeen_01

The Hague, May 29th 2024

Central Government Audit Services
Drs. A.J.M. van Winden RA

Annex II

Methodology revision by Trinomics

Revision of the Methodology on Avoided CO_2 for Dutch Green Bond Reporting

Methodological annex on impacts on avoided CO2 emissions

Trinomics

Contract details

Ministerie van Financiën
Revision of the Methodology on Avoided CO2 for Dutch Green Bond Reporting
Reference Number (Trinomics): TEC3224NL
Reference Number (DSTA): AGT-W91517-49019

Presented by

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Date

Rotterdam, 31/01/2024

Trinomics

Table of Contents

Preface

Introduction and reading guide to this report

The main objective of this report (part A of a set of two deliverables) is to present a new methodological annex for DSTA's upcoming Green Bond Report 2023 (to be published in May 2024). The annex contains an update of methodologies for assessing impacts of DSTA's green bonds on avoided CO2 emissions, and includes methodologies for new spending categories. Also, further advice on how to report and present methodological aspects within the main report is provided.

The other deliverable (Part B) presents other recommendations and examples on how to improve reporting on Green Bonds impacts in the main Green Bonds report text. These are just recommendations, and are additional to the final deliverable of this study, which is the present proposed new methodological Annex.

Acknowledgements

Inputs from several experts in the field of Green Bond reporting were of great value to the development of the methodologies presented below. Trinomics would therefore like to thank Miguel Almeida of the Climate Bond Initiative, Joop Hessels and Dick Ligthart at ABN AMRO, Daniel Poolen of Rabobank, Peter Anderson and Theodore Charitos of EIB, and Anne Boorsma and colleagues at Gasunie.

Evidently, the content of this document remains fully at the responsibility of the authors, and does not necessarily represent the views of any of the consulted experts.

This report was written by Tatiana Cuervo Blanco, Hans Bolscher, Finn Goodall, Jules Schers and Eleonora van der Steen, all from Trinomics. The report and the methodologies included were developed with the help of valuable feedback from DSTA and Trinomics' colleague João Gorenstein Dedecca.

A. Annex to the GBR 2023: Methodology for estimating the impacts "contribution to avoided CO2 emissions"

A.1. Introduction to this methodological annex

This Annex describes the methodology for estimating the impact of the use of Dutch State's Green Bond proceeds on contributing to avoided CO2 emissions. Besides this main impact relevant for contributing to climate change mitigation, other indicators relevant for the contribution to climate change mitigation and possibly other environmental themes will be presented below.

This annex starts with some general considerations relevant for all technologies discussed in this annex, before presenting the methodology per expenditure category.

A.2. Methodological principles for impact on avoided CO2 emissions

A few general considerations apply to all the methodologies outlined below for climate change mitigation-related Green Bond expenditures.

General considerations

The reader should bear in mind that the key requirement of green bonds from sovereign lenders or investors is that their proceeds are used for the financing of EU taxonomy aligned activities and that they respect the principles of Do Not Significantly Harm. This is the key criteria for a bond to qualify as green.

The estimation of (climate) impacts is guided to some extent by reporting frameworks, on the basis of which DSTA developed its own Green Bond Framework.[1] DSTA's GB framework aligns with the guidelines provided by the International Capital Markets Association's (ICMA), and the methodologies for the Partnership for Carbon Accounting Financials' (PCAF). However, guidelines do not provide detailed prescriptions for methodologies to estimate impacts, and methodologies also need to consider national differences and local or temporal circumstances (like emission factors evolving over time with changes in the composition of the national electricity mix).

Like many other state sovereign actors DSTA uses its green bonds to fund activities or projects of others, or even to support a part of the operations of (public) companies as a whole, for example as it is the case for its support to publicly owned railway infrastructure. This is a contrast with organisations who issue green bonds for their own activities, and who thus have greater control over the data regarding these projects. Due to DSTA only having indirect access to data about the funded projects and to keep the data collection burden of the methodology within reasonable margins, the methodologies presented below make use of average emission factors relevant for a type of green bond support. The provided methodology therefore provides best available estimates, rather than detailed project-specific calculations of impacts. Also, there is an inherent need for approximations and limit to what can be known about environmental impacts, meaning that this really are estimations of impacts and not fully certain and precise impacts. Finally, methodologies were kept close to those of the supported or funded organisations in as far as possible.

Eligible expenditures

To adhere to the updated EU Green Bonds Standard the expenditures need to align for at least 85% to the EU Taxonomy's Technical Screening Criteria (TSC). The alignment with the TSC is elaborated in the impact report. For other categories, the reported impacts should follow an approved methodology and

[1] See: State of the Netherlands, 2023. Green Bond Framework (Sept 2023 update)

second opinion or third party verification should be capable of establishing that these expenditures abided by the principles of DNSH.

Second opinion and evaluation of Taxonomy alignment has been provided by Moody's, who concluded that the Dutch Framework is 'credible, impactful and aligns with the ICMA Green Bond Principles 2021'.[2]

Other considerations for all expenditure categories

Timing of the reported impacts - It is good practice to report the impacts of the funded projects and measures only for the reported year.[3] However, a distinction will be made between the (re-)current impacts of the expenditures for which the Green Bond revenue was used (to which it was allocated), and the expected future impact at, or over, a given time horizon. In case the latter is of relevance, for example in the case of infrastructure investments (grids, or networks) where beneficial impacts are expected rather after the time of the expenditure, separate indicators will be added.

For the *ex-ante* estimates, we cannot guarantee that the expected/reported impact will materialise in practice. Ex-ante estimation (for example in the case of hydrogen) rely on the ex-ante estimation of the physical activity data reported for an average year in the project's lifecycle. Following project implementation activity data might vary. For the time being, MRV of this aspects is out-of-scope for Green Bonds and takes place at the methodological level (see the remarks about second opinion and third-party verification above).

The challenge of **attribution** and the resulting possibility of **double-counting** due to varying allocation methodologies across different actors is a significant concern when estimating emissions reductions in multi-stakeholder projects. The risk exist that the same emissions reductions are claimed by multiple parties due to differing allocation methods or interpretations of impact. DSTA recognises the problems of ex-ante attribution and the possibility that double-counting with other stakeholders could happen in the reported figures and takes this into account wherever feasible. Therefore, we report figures on emissions reductions in a conservative manner.

Additionality: There is an ongoing discussion in the climate finance community on the additionality of the climate impacts of green bonds:. In other words: Would the impact also have occurred without the green bond? For the Dutch government, access to capital is not at stake, and it is therefore highly likely that the activity significantly contributing to mitigating climage change could also have been financed through normal lending in the international market. Up to now, the premiums for *green* bonds are too small to make a difference. The implication is that the lender cannot claim that their investment is directly responsible for the carbon reductions resulting from the final investment, they could say however that they have 'contributed' to these reductions. For the Ministry of Finance the main goal of the green bonds is to contribute to the overall greening of the financial system, and not to obtain cheaper or more access to funding. This is what makes the carbon reduction calculation methodology relevant: To show that we are all together building a transparent and reliable green finance system. The calculations on avoided CO2 emissions are thus relevant, not for the exact amount of tons CO2 reduced, but rather to be as transparent as possible about the use of the revenues of the green bonds

A.3. Process of the Green Bond impact methodology

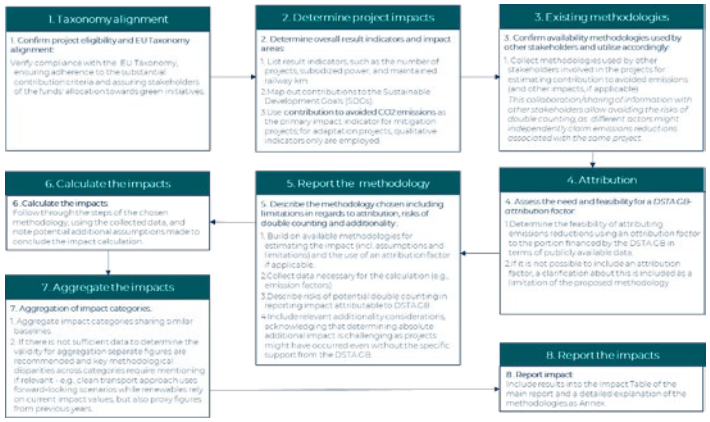
The detailed methodological descriptions below are structured around a few key elements:

- Eligibility
- Indicator choice
- Availability of existing methodologies
- The need for an attribution factor
- The methodology description itself

[2] See p.11 Green Bond Framework September 2023 update
[3] Source: Interview with ABN AMRO green bonds team.

The following scheme (Figure 1) presents how the methodologies were elaborated and provides a basic structure for development of future methodologies.

Figure 1 Structuring elements for the methodological descriptions



A.4. Introductions to the methodological approaches per category

This section presents the principles behind the detailed methodologies for impacts on avoided CO2 emissions per technology category.

Renewable energy

The green bonds revenues are used to finance the Dutch SDE++ subsidy system for renewable energy. The approach for the estimated impact of contributing to avoided CO2 emissions from renewable energy is based on the amount of actual annual subsidised renewable energy produced with the support of SDE++ subsidies and an allocation factor range representing an estimated share of emissions reductions that can be attributed to the GB' support. As most of the funding goes via the Dutch SDE subsidy system, which is an Opex based system with over the years varying contributions, it is for this category particularly difficult to calculate the attribution factor ex ante.

Low carbon hydrogen (production and transport backbone)

For production of low carbon hydrogen, Steam Methane Reforming (SMR) for grey hydrogen is used as a reference case. This is deemed relevant for the first coming years, because green H2 does not yet experience significant demand for substituting other energy carriers, like coal in steel production, or fossil fuels in transport. The methodology uses the maximum value of alternative emission factors (AEFs) and attributes all emissions reductions solely to the DSTA green bonds, overlooking the contributions of other investors involved in these projects. This attribution likely leads to an overestimation of the impact. More precise attribution calculations would demand significant resources, and pose confidentiality challenges. Hence, for the purpose of this report, achieving such precision is not pursued.

For the hydrogen transport backbone the methodology only focuses on domestic demand for renewable hydrogen and considerations for imported hydrogen via the Hydrogen Network Services

(HNS). It does not encompass blue hydrogen. The methodology does not consider an attribution factor linking DSTA's green bonds funds directly to the hydrogen backbone due to challenges in the subsidy structure for the hydrogen backbone project (which are explained with the detailed methodology below). The impacts are based on the assumption that hydrogen replaces natural gas.

District heating/heat networks

The methodological approach is based on Gasunie's own methodology for the estimation of avoided CO2 emissions for investments in heat networks for the residential sector. The reference case for low carbon heat is the use of natural gas.

Electricity Transmission and Distribution

Dutch green bonds revenue is used to capitalize TenneT. TenneT uses these funds to expand the electricity grid thus to facilitate the energy transition away from fossil energy. The main principle is that this use of proceeds is having a considerable contribution to climate change mitigation according to the EU Taxonomy TSC for the category Transmission and Distribution of electricity. The impacts per euro invested are calculated by following TenneT's own reported green bond issuances and estimated impact on avoided CO2 emissions from investment in electricity transport infrastructure.

Clean Transportation[4]

Green Bond proceeds are mainly used to subsidize rail maintenance and to invest in different aspects of new public transport infrastructure. The different public transport expenditure categories have been presented in the Green Bonds report and in DSTA's GB framework.[5,6] The main route through which public transport infrastructure and activity reduces greenhouse gas emissions[7] is through substitution of fossil fuel-based road, water and air transport. Examples of methodologies for the calculation of such avoided emissions exist for example in French[8] and in German green bond reporting.[9] However, the required data and estimates, notably the impact on shifting demand between types of passenger transport (notably from car to public transport) for such methodologies are lacking in the case of the Netherlands. To generate such estimates at the level of a specific supported project is out-of-scope.[10] Trinomics' did not find any feasible alternative, and our evaluation of the emission factors estimated by Significance led to the conclusion that these are the best available values for the impacts of support to rail maintenance.

[4] Support for the development of infrastructure and use of electric vehicles is not yet part of this annex.
[5] See the September 2023 update.
[6] Similar to what is common in other countries, e.g. in Germany, freight rail is not considered for use of GB proceeds.
[7] Avoided greenhouse gas emissions of rail infrastructure are principally CO2 and NOx from substituted road, water and air traffic. For passenger traffic water transport is not relevant, while air traffic is not a substitute for rail in the Netherlands.
[8] As acknowledged in DSTA's Green Bond Framework's May 2022 and Sept 2023 updates.
[9] An example of a more detailed estimate of CO2 emission impacts can be found in: Ulrich et al (2023), Regionalökonomische, verkehrliche und umweltpolitische Effekte des Ausbaus der Rheintalbahn.
[10] Theoretically, an alternatively for DSTA could have been to rely on estimated impacts of contributions to avoided CO2 emissions from the beneficiaries whose projects or organisations are supported by green bond proceeds. However, while public transport and transport infrastructure companies include ESG reporting in their annual reports, this includes at best scope 1 and 2 CO2 emissions of the organisations and not wider or more holistic impacts. E.g., ProRail reports these in the context of the CO2 Performance Ladder See ProRail's annual report: ProRail 2022 (jaarverslagprorail.nl), and see CO2 Performance Ladder for more information.

A.5. Detailed methodological approaches per category

A.5.1. Renewable energy

Category	Renewable energy
Eligible expenditures	Offshore wind energy, onshore wind energy, solar energy • *Stimulation of Sustainable Energy Production (SDE, SDE+ & SDE++)* • *Tax relief for sustainable energy production by households* • *Studies 'Wind op Zee* • *Contribution to avoided CO2 emissions from electricity (tonnes of CO2-eq);* • *Amount of renewable energy (in MWh) produced by projects subsidised with GB proceeds.*
Result indicators	
Detailed methodological approach for quantitative assessment to f the contribution to avoided emissions	*Key inputs, units and sources:* • ***Emission factor electricity*** *(kg CO2e/kWh) Represents the amount of CO_2 emissions produced per unit of electricity generated. It varies based on the energy source. [Source: CBS data].* • ***Subsidised actual annual renewable energy production*** *(kWh). Indicates the actual amount of renewable energy produced annually with the support of SDE subsidies [Source: SDE subsidy].* • ***Allocation factor (lower and upper bound)*** *(X-X%): this factor represents an estimate of the share of emissions reductions that can be attributed to the GB' support. [Source: SDE subsidy ratio].* *Calculation description:* The contribution to avoided emissions in a specific year ('n'), measured in tonnes of CO2 equivalent, is calculated by taking the emission factor for generating electricity during that year (measured in kilograms of CO2 equivalent per kilowatt-hour) and multiplying it by the actual annual production of renewable energy supported by subsidies. This product is then adjusted by an allocation factor expressed as a percentage range, indicating lower and upper bounds, which represents the proportionate impact attributed to the green bonds on emissions reduction. • **Contribution to avoided emissions, in year *n***, (tonnes CO_{2eq}) = *Emission factor electricity generation of year n* (kgCO2e/kWh) x *Subsidised actual annual renewable energy production (kWh) x Allocation factor* (%, lower and upper bounds) The resulting figure for emissions reduction will be a range rather than a single figure *Main assumptions and limitations:* • The formula assumes a direct relationship between the subsidy and emissions reductions, overlooking the multiple stakeholders' roles. It is not feasible to attribute the exact CO_2 impact achieved among various parties involved (equity financiers, loan capital financiers, government, etc.) as each contributes differently to project realisation without a direct correlation to emissions reductions. • The formula's assumption of a straightforward link between emissions reduction and subsidies overlooks market influences, like changing electricity prices. Similar projects starting at different times might have the same CO_2 impact but different subsidies due to market fluctuations. • The ratio of the subsidy does not directly represent the government's investment share. It is only an indication and acknowledges that while the subsidy might not be a direct investment in emissions reduction, it is an essential mechanism for encouraging the development of projects that contribute to emissions avoidance, without this financial support, the project might have been not feasible. • Regarding additionality, it is acknowledged that while these investments in renewable energy generation are aimed at reducing emissions, determining their absolute additional impact solely due to the support provided is challenging. We recognise that these investments might have occurred even without the specific support from the DSTA green bonds. However, it remains indeterminate and difficult to ascertain the precise extent to which the support directly influenced or incentivised these investments.

A.5.2. Low carbon hydrogen

Category	Hydrogen production and transport infrastructure
Eligible expenditures	Manufacture of hydrogen(Manufacture of hydrogen and hydrogen-based synthetic fuels) and Transmission and Distribution networks for renewable and low-carbon gases. The two concrete initiatives that will be funded with the GB are Hydrogen Backbone and IPCEI H2Use (hydrogen production by electrolysis).
Result and impact indicators	• **Contribution to avoided emissions** due to investments in **hydrogen production (tonnes CO2eq)** • **Contribution to avoided emissions** due to investments in **hydrogen networks (tonnes CO2eq)**
Detailed methodological approach - quantitative assessment of the *contribution to avoided emissions of investments in* ***Production of hydrogen***	*Key inputs, units and sources:* • ***Emission factor of the reference application*** *(kg CO2eq/kWh) Steam Methane Reforming (SMR) is used as a reference for grey hydrogen;* • ***Emission factor of the alternative application*** *(kg CO2eq/kWh)* emissions generated by an alternative application where the low-carbon hydrogen produced is used instead of the reference (SMR) method; • ***Volume of H2 production subsidised****(kWh). Indicates the actual volume of low-carbon hydrogen produced annually with the support of the green bonds* o *A supporting input is the* ***Allocation factor*** *(X %): representing an estimate of the share of GB support to overall hydrogen production.* *Calculation approach:* The contribution to avoided emissions in a specific year ('n'), measured in tonnes of CO2 equivalent, is determined by multiplying the volume of hydrogen production subsidized in that year n by the difference between the *emission factor of the reference application* and the *emission factor of the alternative application* (provided under the assumptions which follow below): • **Contribution to avoided emissions,** year n (**tonnes CO_{2eq}**) = Volume of H2 production subsidised (kWh). x (Reference emission factor (gCO2eq/kWh) - Emission factor alternative application (gCO2eq/kWh) / 1,000,000 (for conversion grammes to tonnes of CO2) *Main assumptions and limitations:* • Steam Methane Reforming (SMR) is used as **a reference** for grey hydrogen, which is relevant because green H2 does not yet have significant uptake to substitute other energy carriers (e.g., coal in steel production). The **conservative CO_2 emission factor for SMR H2 production is 276 gCO2eq/kWh H2**.[11] • This methodology uses the maximum value of **alternative emission factors (AEFs)**. The IPCEI H2U predominantly funds projects focused on hydrogen production via electrolysis. Storage and capture components will thus fall outside the immediate scope of this specific segment. Opting for the maximum (conservative) estimation we recommended as AEFs: **Wind + electrolyser: 15 g CO2eq/kWh H2**, and: **Solar PV + electrolyser: 30 g CO2eq/kWh H2**.[12] • The methodology attributes all emissions reductions solely to the DSTA green bonds, overlooking the contributions of other investors involved in these projects. This attribution likely leads to an overestimation of the impact. While achieving precise calculations is plausible, it demands significant resources and poses confidentiality challenges, particularly concerning private investments. Hence, for our purposes, achieving such precision is not pursued. • Regarding additionality, it is acknowledged that while these investments in hydrogen manufacturing contribute to reducing emissions, to determine their absolute additional impact in avoided emissions solely due to the support provided is challenging. We recognise that these investments possibly might have occurred even without the specific support from the DSTA green bonds.[13]

[11] The Hydrogen Council's LCA analysis *(see the next footnote)* reports 9.2 kg CO2-eq/kg H_2, and presents a conversion factor of 30 to convert *kg CO2eq/kg H2* to *g CO2eq/kWh H2*.
[12] Wind + electrolyser: 0.5 kg CO2eq/kg H2, and Solar PV + electrolyser: 1.0 kg CO2eq/kg H2 - see: Hydrogen-Council-Report_Decarbonization-Pathways_Part-1-Lifecycle-Assessment.pdf
[13] The precise extent to which the support directly influenced or incentivised these investments remains indeterminate and difficult to ascertain.

Transmission and distribution networks for renewable and low-carbon gases (Hydrogen Network Services)distribution networks for renewable and low-carbon gases (Hydrogen Network Services)	
Detailed methodological approach - quantitative assessment of the *contribution to avoided emissions of investments in* ***Gas Transmission and distribution networks for renewable and low-carbon gases (Hydrogen Network Services, HNS)***	**The methodology used by the DSTA GB framework described below aligns with Gaussine's approach, ensuring consistency.** *Key inputs, units and sources:* • ***Emission factor of the alternative application*** *(kg CO2e/kWh)* emissions generated by consumption of natural gas. For this, we have used an emission factor of 56.4 kg/GJ. This is a conservative assumption. The emission reduction contribution increases when, for example, oil or coal is beingreplaced. *[Source: Gasunie].* • ***Volume of H2 supplied*** *(kWh). Indicates the actual volume of low-carbon hydrogen supplied . It only concerns the domestic demand for renewable and imported hydrogen supplied via HNS (blue hydrogen is not included). [Source: Gasunie].*
	Calculation approach: The contribution to avoided emissions in a specific year ('n'), measured in tonnes of CO2 equivalent, is determined by multiplying the volume of hydrogen supplied in that year n by the the emission factor of the reference application (natural gas): • **Contribution to avoided emissions**, year n (**tonnes CO2eq**) = Volume of H2 supplied (kWh). x Emission factor natural gas (g CO2/kWh) / 1,000,000 (for conversion from grammes to tonnes of CO2).
	Main assumptions and limitations: • The methodology only focuses on domestic demand for renewable hydrogen and considerations for imported hydrogen via HNS. It does not encompass blue hydrogen; • Upstream emissions in the hydrogen production chain are not considered. This omission might overlooks other impacts associated with the production of hydrogen; • The methodology does not account for an attribution factor linking the funds from DSTA green bonds directly to the hydrogen backbone. This is because the subsidy structure for the hydrogen backbone project poses challenges in directly linking the EUR 750 million subsidy received. It's noted that this subsidy operates more as an exploitation-like subsidy, with a maximum amount set and potential clawback if not entirely utilised. This complex subsidy structure creates uncertainties in linking the subsidy to specific emissions reductions. In addition, the subsidy primarily serves as a start-up risk hedge rather than directly financing the capital expenditures (CAPEX) of the hydrogen project itself. This complicates the direct correlation between the subsidy and emissions reductions achieved, as the subsidy's primary purpose is risk mitigation rather than emission reduction support.

A.5.3. District heating / heat networks

Category	Heat networks for the residential sector
Eligible expenditures	Eligibility concerns expenditures in the category of improvement of energy efficiency in the built environment, including infrastructure for district heating or cooling.
Result and impact indicators	Contribution to avoided CO2 emissions due to investments in heat networks for the residential sector (tonnes CO2eq)
Detailed methodological approach - quantitative assessment of the *contribution to avoided emissions of investments in* ***Heat networks for the residential sector***	*Key inputs, units and sources:* • **Emission factor of the alternative application** (kg CO2e/kWh) emissions generated by consumption of natural gas. For this, we an emission factor of natural gas 56.4 kg/GJ is used. [Source: Gausine]. • **Volume of heat supplied** (GJ). Indicates the actual volume of low-carbon heat supplied. • **Efficiency factor heat networks** • **Allocation factor (lower and upper bound)** (X-X%, if available): this factor represents an estimate of the share of emissions reductions that can be attributed to the GB' support.
	Calculation approach: The contribution to avoided emissions in a specific year ('n'), measured in tonnes of CO2 equivalent, is determined by multiplying the volume of low carbon heat supplied in that year n by the the emission factor of the reference application (natural gas): • **Contribution to avoided emissions**, year n **(tonnes CO2eq)** = Volume of heat supplied (GJ). x Emission factor natural gas (kg CO2/GJ) x attribution factor and efficiency factor / 1,000 *(for conversion from kg to tonnes of CO2)*
	Main assumptions and limitations: • A key limitation to the presented methodology is that the transport infrastructure, though essential to allow for the use of the low carbon heat sources, presents beneficial impacts which can also be claimed by the renewable heat producer. There is therefore a significant risk for double-counting, which should be mentioned when reporting the estimated "contribution to avoided CO2 emissions...

A.5.4. Electricity Transmission & Distribution

Category	Electricity Transmission and Distribution (T&D)
Eligible expenditures	Green Bond funds are used to capitalise grid operator TenneT, which improves its balance and thus supports TenneT's operations and their expansion. This concerns investment in Electricity Networks, Connection Services, and Interconnectors - all aligned with the EU Taxonomy.[14] TenneT's also issues Green Bonds itself to invest in new grid infrastructure.[15] For the category "Electricity Network" TenneT only considers expenditures to be eligible "Green Activity" when the grid is transporting more than 50% of renewable electricity within the country of operations.[16] Connection services and interconnectors are assumed to be part of networks which fulfil this requirement. **As per principle, the reported impacts of DSTA's green bonds will not differentiate from those reported by TenneT for their own green bonds.**
Result and impact indicators	• Amount of facilitated transport of electricity from renewable energy (in GWh); • Contribution to avoided CO2 emissions (million tonnes of avoided CO2 emissions per year (tonnes of CO2 emissions per year)
Detailed methodological approach - quantitative assessment of the *contribution to avoided emissions of investments in* ***Transmission and Distribution of electricity***	Key inputs, units and sources: • TenneT's **average Green Bond avoided CO2 emissions impact** for 2022 is**: 0,51 Mtonnes of CO2 per billion Euro of Green Bonds.** Underlying inputs are: o **Emission factor of the reference application** = TenneT's Netherlands reference grid emission factor[17] = 396 kg CO2e/kWh o **Emission factor of the alternative application** = TenneT's emission factor for production of renewable electricity = 0 kg CO2e/kWh o The size of **TenneT's Green Bonds issuances** contributing to avoided emissions in 2022: 19.5 billion EUR o TenneT's estimated **facilitated avoided CO2 emissions in 2022:** 9,9 billion Mtonnes of CO2 • Total annual amount of transported renewable electricity through eligible connections, as reported by TenneT. • The share of Dutch GB proceeds in total finance of TenneT's operations. *Calculation approach:* • **Contribution to avoided CO2 emissions**, year n **(tonnes CO2eq) =** Tonnes of avoided CO2 emissions per billion euro of TenneT green bonds in year n (tCO2eq/billion EUR) x Capitalisation by DSTA in year n (in billion Euros) • **The number of MW of added renewable energy to the network:** *This is data that will need to be provided directly by TenneT.* *Main assumptions and limitations:* • Capitalisation of TenneT by DSTA's green bonds leads to GB eligible expenditures in lign with TenneT's own GB expenditure. We thus assume that the impacts per euro are the same as for TenneT's green bonds; • TenneT's method does not take into account life-cycle GHG emissions of the alternative application of renewable energy. Also, the average represents an average for all of TenneT's operations, instead of only the Dutch operations; • While transporting 50% renewable energy is TenneT's eligibility criterium, the assumption is that all investments increase capacity to facilitate 100% of added capacity to serve new renewable energy production and consumption; • **A limitation of this impact methodology is that electricity grids are only the network, albeit essential, which transports renewable electricity.** There is therefore a risk for double-counting, as one risks to claim the same avoided CO2 impact from support to producers of renewable (RE) electricity and for increasing transport of the same new RE electricity.

[14] TenneT publishes a detailed assessment of its Taxonomy alignment (100% for CAPEX and 98% for its OPEX) in its Integrated Annual Report 2022, source: TenneT IAR 2022 (tennet-drupal.s3.eu-central-1.amazonaws.com)
[15] TenneT's green bonds are subject to pre-issuance and post-issuance second party opinion (SPO).
[16] Given the speed at which renewable power generation is increasing, TenneT might need to increase this threshold in the near future. E.g., in the Netherlands 40 percent of the total electricity consumption was generated from renewable energy sources in 2022. Source: https://www.cbs.nl/nl-nl/longread/rapportages/2023/hernieuwbare-energie-in-nederland-2022/samenvatting
[17] Grid factors should ideally be updated every year.

A.5.5. Clean transportation - Rail infrastructure

Category	Clean transportation - Rail infrastructure
Eligible expenditures	Eligibility for expenditure relates to Taxonomy categories 6.13, 6.14 and 6.15 (Infrastructure for rail; for personal mobility; and for enabling low-carbon public transport). The main requirement is that the infrastructure is meant for zero tailpipe CO2 emissions transport means, which would concern all rail transport using electricity generated from non-CO2 emitting power generation. Furthermore, an exclusion criterium is that the infrastructure should not be used to store or transport fossil fuels. Due to the exclusion of fossil fuels transportation also included in the Taxonomy category 6.2 'freight rail transport' related to the purchase, financing, leasing, rental and operation of freight transport on mainline rail networks it has been removed as a recommended eligible expenditure impact category.
Result and impact indicators	• Number of infrastructure for rail projects considered Taxonomy Aligned; • Total Taxonomy-aligned rail infrastructure kilometers maintained; • Number of passenger kilometers on the railways; • Number of zero-emission road and public transport infrastructure projects; • Contribution to avoided GHG emissions per year (Mtonnes of CO2-eq).
Detailed methodological approach - quantitative assessment of the *contribution to avoided emissions of investments in* ***Rail and other public transport infrastructure***	Key inputs, units and sources: • **A differential emission factor** which consists of the current best available estimate for contributing to avoided CO2 emissions, relative to the reference application**:** o **Differential emission factor** (value for 2018 and 2019) estimated by Significance for the GBR 2022: **141 tonnes of avoided CO2 emissions per million euros of rail expenditure**; • **Amount (value) of green bonds proceeds** used to support maintenance of rail infrastructure (millions of Euros). *Calculation approach:* • **Contribution to avoided CO2 emissions,** year n **(tonnes CO2eq)** = Amount of green bonds proceed for rail (millions of Euros) * Differential emission factor (tonnes of CO2 per million euros of rail expenditure). *Main assumptions and limitations:* • The main real impact of public transport on avoided CO2 emissions is substitution of fossil fuel-based private vehicle road transport. Examples for the calculation of such avoided emissions exist, however, the required data and estimates, for such methodologies are lacking in the case of the Netherlands. In the absence of such methodologies the differential emission factor estimated by Significance based on Rijkswaterstaat's LMS model is the best available estimate. • Significance estimate for 2022 correspondeds approximately to 0,85 Mtonnes of avoided CO2-eq GHG emissions from rail infrastructure in total[18] and to 88 tonnes of avoided CO2-eq GHG emissions per million passenger km.19

[18] Based on a total expenditure on rail infrastructure in 2022 of about 6 billion Euros.
[19] Based on 9,6 billion passenger kilometers in rail transport in the Netherlands in 2022, Source: KiM, 2022. Kerncijfers Mobiliteit 2022.

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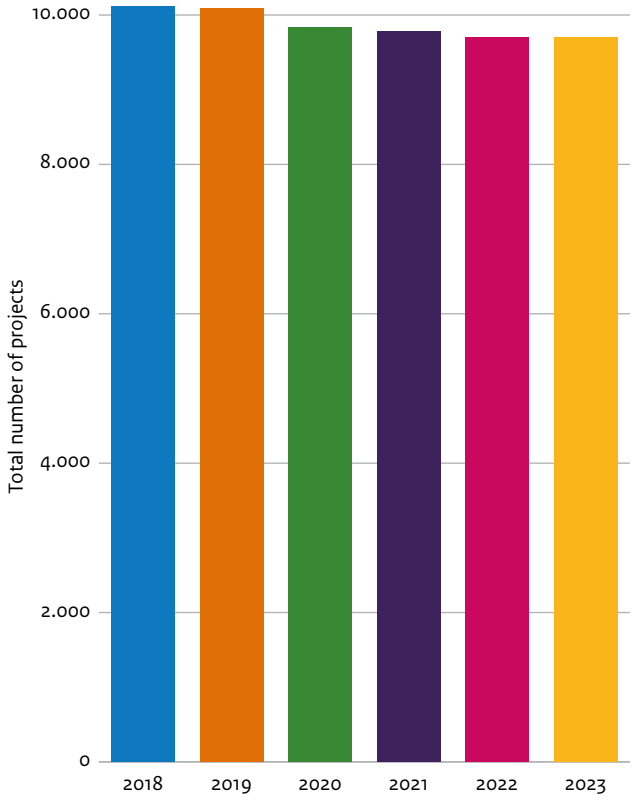
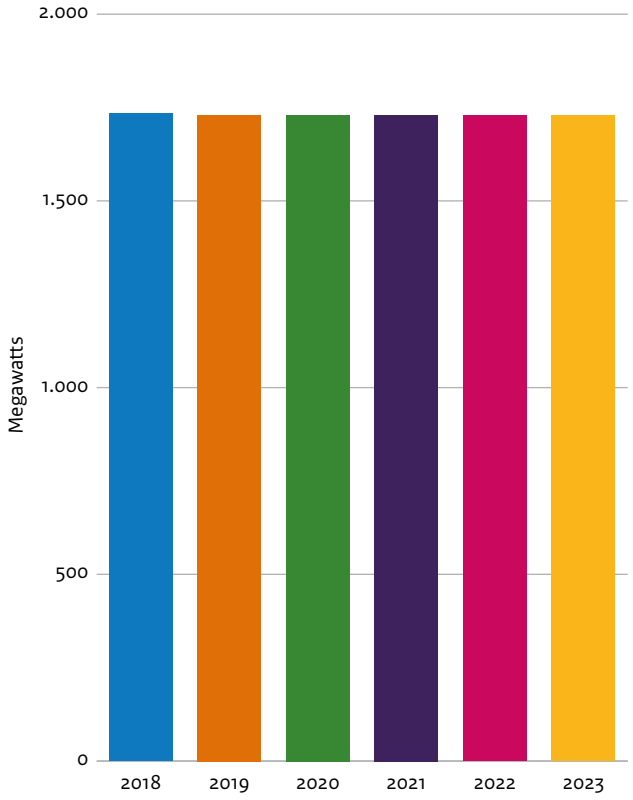
Annex III

Expanded SDE Production Summary Chart

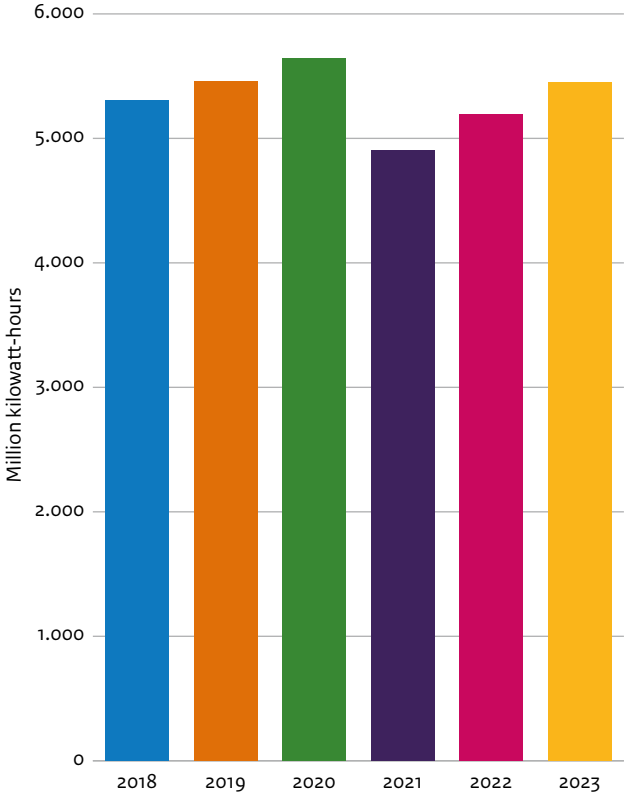
Number of projects



Subsidized installed capacity



Actual annual energy production



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