European Commission

#NextGenerationEU

GREEN BONDS

ALLOCATION AND IMPACT REPORT

Budget

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NGEU Report 2023
Green Bonds - Impact and Allocation report

Foreword

It is with great pleasure that I present the 2023 NextGenerationEU (NGEU) Green Bonds Allocation and Impact Report. This report underlines the central role the NGEU Green Bond programme plays for the European Union's commitment to a greener and more sustainable future. It is thus a key component of the NGEU recovery instrument, which turned the Covid pandemic into an opportunity to invest in the future: in a greener and more digital Europe. Consequently, at least 37% of funds disbursed through each national Recovery and Resilience Plans finance sustainable investments in fields such as green infrastructure and renewable energy.

On the funding side the NGEU Green Bond programme matches this ambition – with great success: Since the inaugural NGEU Green Bond issuance two years ago the European Union managed to become a leader in the global green bond market. By the time this report is published, the NGEU Green Bond programme has brought almost EUR 50 billion of highly rated green bonds to market with the potential to grow into the world's largest green bond programme. Thereby, the European Commission also contributes to deepening and consolidating the EU's leadership in sustainable finance.

The bedrock of this programme is the transparency for investors: We offer information on the use of NGEU Green Bond proceeds via our constantly updated on-line dashboard as well as via our tracking and reporting mechanisms described in this report. In addition, this year's report also provides for the very first time, estimates of the tangible climate impact of investments that are expected to be financed by NGEU green bonds. Full implementation of all measurable climate-relevant actions can permanently reduce greenhouse gas emissions by 44 million tonnes per annum, which is equivalent to 1.2% of aggregate EU greenhouse gas emissions in 2022. Let me underline that these are very conservative estimates.

This NGEU Green Bonds Allocation and Impact Report is a testament to the European Union's unwavering commitment to sustainable finance and the transition towards a greener future. We have established ourselves as a leader in the global green bond market, and this success is a result of the trust placed in us by investors, stakeholders, and citizens alike. We remain dedicated to transparency, open communication, and furthering the green transition.

I invite you to delve into the details of this report, to understand the steady progress that we have made in developing the NGEU Green Bond programme, and to share in our enthusiasm for a greener and more sustainable future.

Johannes Hahn

EU Commissioner for
Administration & Budget

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Abbreviations

CO2e	Carbon dioxide equivalent
DNSH	“Do no significant harm”
ERTMS	European Rail Traffic Management System
GHG	Greenhouse gas
ICMA	International Capital Market Association
NGEU	Next Generation EU
RRF	Recovery and Resiliency Facility
RRP	Recovery and Resilience Plan
SCC	EU Taxonomy Substantial Contribution Criteria
TSC	EU Taxonomy Technical Screening Criteria

Executive summary:

Under the NextGenerationEU (NGEU) instrument at least 37% of spending in Member States' Recovery and Resilience Plans (RRPs) will be used for sustainable investments and reforms in areas such as green infrastructure and renewable energy. Proceeds from NGEU Green Bonds are used to finance these investments.

This report, which builds on the first NGEU Green Bonds Allocation Report, published in December 2022[1], provides investors and stakeholders with updated information on the allocation of proceeds as of the cut-off date of 1 August 2023 and, for the very first time, presents the climate impacts of investments financed by the NGEU Green Bond programme.

As with the first edition, this report has been subject to a limited assurance report by an independent auditor of the information pertaining to allocation of NGEU Green Bond proceeds and realised impact.

The pool of eligible NGEU Green Bond expenditures expands to EUR 190.6 billion:

The report shows that the NGEU Green Bond programme is underpinned by a significant pool of planned eligible expenditure. Based on rigorous screening of Member State expenditure reporting, the volume of national expenditure eligible for financing by NGEU Green Bonds stands at EUR 190.6 billion as of 1 August 2023 (from EUR 184.9 billion as of 19 October 2022).

EUR 4.5 billion of this increase is accounted for by the adoption of new RRPs by Hungary and the Netherlands. The remaining EUR 1.2 billion arises because of the revision of four existing RRPs (Estonia, Finland, France, Slovakia) to include additional measures related to energy security and diversification. Almost 60% of this eligible NGEU Green Bond expenditure relates to 'Clean transport & infrastructure' (EUR 64.7 billion) and 'Energy efficiency' (EUR 49.3 billion). The amount of expenditure eligible for NGEU Green Bond financing may increase further following the ongoing assessment of revisions to other Member State RRPs, to enhance the focus on energy security and diversification under the REPowerEU plan.

NGEU Green Bond issuance and reported expenditures increase steadily:

As of 1 August 2023, the European Commission has issued EUR 44.2 billion of NGEU Green Bonds compared to EUR 28.0 billion as of 19 October 2022 (at the time of the first report) – an increase of almost 58%.

Implementation of planned expenditures that are eligible for NGEU Green Bond financing is now gathering momentum. As of 1 August 2023, 14 Member States (compared to 7 as of 19 October 2022) have reported to the Commission EUR 21 billion worth of expenditure that is eligible for NGEU Green Bond financing. This expenditure is linked to the completion of 153 milestones and targets under the relevant national RRPs. The bulk of the reported expenditures has been allocated to 'Clean transport & infrastructure' and 'Energy efficiency' expenditure categories.

A new wave of payment requests relating to investments and reforms that are eligible for NGEU Green Bond financing is currently being assessed. This is expected to result in a substantial increase in reported expenditures that are eligible for NGEU Green Bond financing and which will form part of next year's allocation and impact report.

[1] https://commission.europa.eu/system/files/2022-12/SWD_2022_442_F1_STAFF_WORKING_PAPER_EN_V4_P1_2417689.PDF

As of 1 August 2023, unallocated proceeds (i.e. the difference between the amount of NGEU Green Bonds issued and reported expenditures) amounted to EUR 23.2 billion. These unallocated proceeds, which are an expected consequence of investments being implemented only after reforms in projects under NGEU, will diminish steadily in the period 2024-2026 as implementation and reporting of NGEU Green Bond expenditures gathers momentum.

NGEU Green Bond pool remains strongly aligned with EU Taxonomy:

Similar to the 2022 report, 57.5% of the total pool of NGEU Green Bond eligible expenditure is assessed as of 1 August 2023 to be fully or substantially aligned with the substantial contribution criteria and additional 'do no significant harm' criteria of the EU Taxonomy. A further 36.5% is partially aligned while the remaining 6.0% is not covered (e.g. for spending categories such as biodiversity or air pollution prevention where specific EU Taxonomy metrics have not yet been developed).

NGEU Green Bond financing has the potential to reduce emissions by 1.2% per annum:

Full implementation of quantifiable milestones and targets up until the end of 2026 funded by NGEU Green Bonds, corresponding to 57% of the NGEU Green Bond eligible expenditure, can reduce GHG emissions by 44 million tonnes of CO2e per annum– equivalent to 1.2% of aggregate 2022 EU GHG emissions. These represent conservative estimates and are derived solely from 353 milestones and targets which can be confidently translated into quantifiable GHG emission impacts. No such impacts are claimed for targets and milestones where translation cannot be established.

The climate impact of already realised expenditure is calculated at 224,143 tonnes of CO2e/year of emissions avoided – or 0.5% of the total estimated reduction of GHG emissions of full programme implementation. The limited realised climate impact reflects the early stage in the implementation of the projects financed by the NGEU Green Bonds and is expected to increase progressively up to 2026, in line with increases in the fulfilled quantifiable milestones and targets. Implemented avoidance of GHG emissions will be maintained well beyond 2026 for the lifetime of the financed investments.

Introduction

1. Introduction

As of 1 August 2023, the Commission has issued EUR 44.2 billion of NGEU Green Bonds. NGEU Green Bond issuances are guided by the NGEU Green Bond Framework (Box 1), which is aligned with the Green Bond Principles of the International Capital Market Association (ICMA).

This report constitutes the first comprehensive NGEU Green Bond report that also discloses climate impacts since the start of the NGEU Green Bond programme in 2021. Given the considerable ramp-up phase of investments and reforms in the Recovery and Resilience Facility, and in line with commitments made in the NGEU Green Bond Framework, the first impact report lags the allocation report by one year. In future, allocation and impact reports will be published annually.

The report presents:

- **(i)** An update, on the amount and break-down of each Member State Recovery and Resilience Facility (RRF) expenditure that is eligible to receive financing from NGEU Green Bonds based on the approved Recovery and Resilience Plans (RRPs);
- **(ii)** The evolution of NGEU Green Bond issuances and how the net proceeds have been allocated;
- **(iii)** A review of the EU Taxonomy alignment of the pool of green bond eligible measures and of the allocated proceeds; and
- **(iv)** A first set of expected and realised climate impacts for the quantifiable parts of the pool of NGEU Green Bond expenditures and related reported expenditures. The report describes the methodology used to derive the climate impacts (GHG emissions avoided presented in tonnes of CO2e/year of emissions avoided) based on the expected and current implementation of quantifiable milestones and targets for measures eligible for NGEU Green Bond financing.

Sections (i), (ii) and (iii) supplement and update information included in the NGEU Green Bonds Allocation Report published in December 2022[2]. Section (iv) presents the methodology for quantifying the climate impacts of the eligible NGEU Green Bond measures and related results.

The information included in this report is based on a cut-off date of 1 August 2023 (compared to a cut off-date of 19 October for the 2022 Allocation Report). In 2023, Member States have been revising their RRPs to reflect, among others, new priorities and additional funding opportunities under the REPowerEU plan - EU's plan to bolster energy resilience, increase renewable energy generation, and promote sustainable energy sources. As Member States sent requests to amend their RRPs throughout summer 2023[3], the 1 August 2023 cut-off date allows for analysis based on a stable dataset[4]. The changes in the national RRPs after the cut-off date will be reflected in the 2024 NGEU Green Bonds Allocation and Impact Report.

This report is supplemented by an independent auditor's limited assurance report in respect of information relating to allocation of NGEU Green Bond proceeds and realised impact.

[2] SWD_2022_442_F1_STAFF_WORKING_PAPER_EN_V4_P1_2417689.PDF (europa.eu)

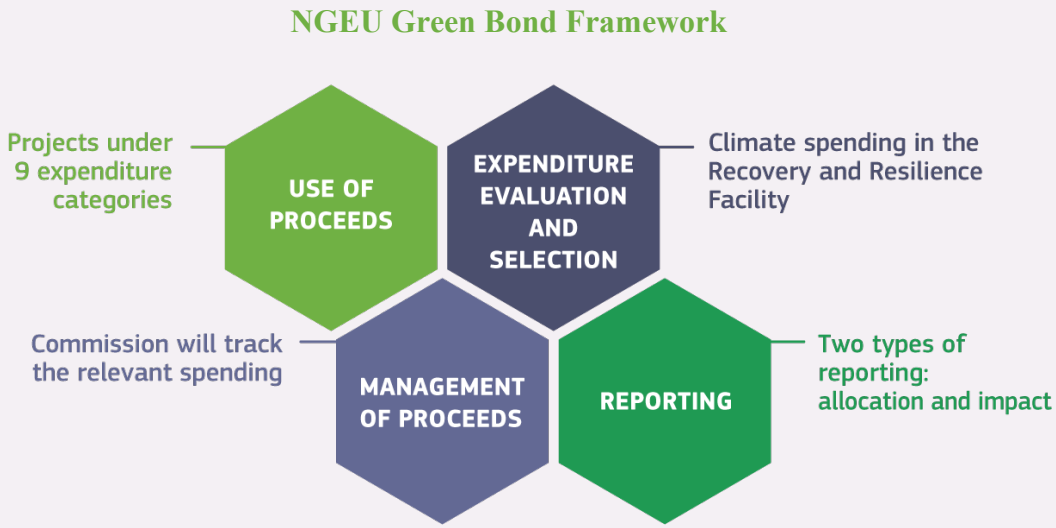
[3] Member State requests can only be considered final after being assessed by the Commission and approved by the Council – expected by the end of 2023.

[4] Despite the earlier cut-off date, revised RRPs from Estonia, Finland, France and Slovakia have been adopted by the Council and have led to a change in the green bond pool. RRP revisions from other Member States received until 1 August 2023 had no impact on the pool.

Box 1: The NGEU Green Bond framework[5] and due diligence procedure

The Commission has put in place a robust multi-level framework of control and assessment procedures to determine whether individual measures will receive financing from the proceeds of NGEU Green Bonds.

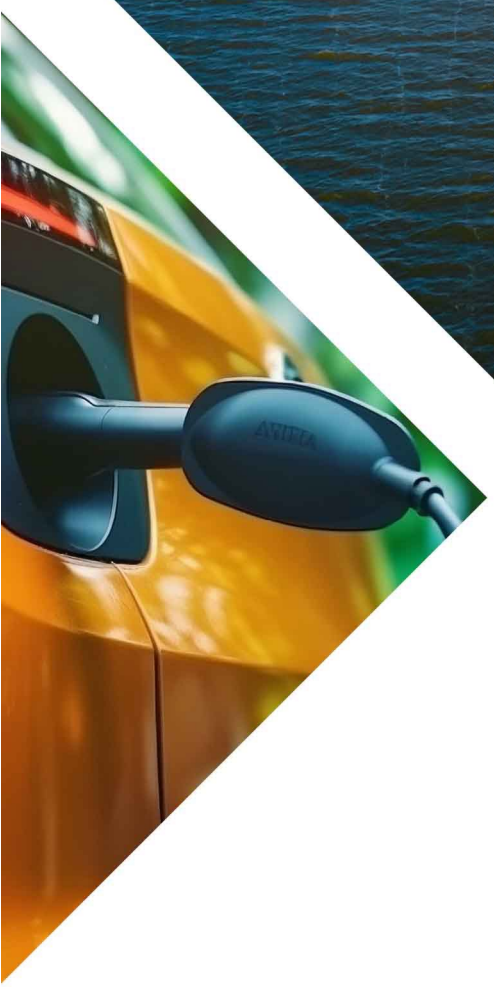
NGEU Green Bond issuances are underpinned by the NGEU Green Bond framework. The framework, adopted in September 2021, aligned with the green bond principles of the International Capital Market Association (ICMA) and reviewed by a second party opinion provider, Vigeo Eiris, part of Moody's ESG Solutions, ensures alignment with market standards on the use, management and reporting of proceed through four main pillars[6]:



- **Use of proceeds.** NGEU Green Bond proceeds are to be used for nine predefined broad expenditure categories, including 'energy efficiency', 'clean energy & network' and 'climate change adaptation' as defined in the NGEU Green Bond framework.
- **Process for expenditure evaluation and selection.** The investments are, in a first instance, identified based on the 37% climate expenditure of the RRPs – the spending roadmaps under the RRF at the heart of the NGEU recovery instrument.
- **Management of proceeds.** The Commission is tracking the net proceeds of the NGEU Green Bonds and the related payments, which are based on data submitted by EU Member States.
- **Reporting.** The Commission is committed to providing investors and the wider public with transparent reporting on allocation of proceeds as well as on the impact of the expenditures financed by NGEU Green Bonds. The Commission released the first allocation report at the end of 2022.

[5] https://commission.europa.eu/system/files/2021-09/nextgenerationeu_green_bond_framework.pdf

[6] The NGEU framework is aligned, to the extent feasible, with the European green bond standard, which defines requirements for compliance of green financing with the EU Taxonomy. However, as the NGEU Green Bond Framework had to be established prior to the EU Taxonomy certain differences exist. These differences were extensively presented in 2022 NGEU Green Bonds Allocation Report.



The pool of NGEU Green Bond eligible expenditure

2. The pool of NGEU Green Bond eligible expenditure

In determining the individual measures that are eligible for financing from NGEU Green Bonds, the Commission applies a multi-level framework of control and assessment procedures. This evaluation and selection process starts with a careful screening of the climate relevant expenditures notified by Member States as part of their national RRPs. This screening is reinforced by a second layer of in-house due diligence of measures aimed at ensuring that only measures that can live up to the strict and conservative standards of the NGEU Green Bond framework are included in the pool of green bond eligible measures (see Annex I). Only measures passing this due diligence are considered eligible for financing under the NGEU Green Bonds. In accordance with this control framework, no measures for energy creation from nuclear or from natural gas are included in the NGEU Green Bond eligibility pool.

As of the cut-off date of 1 August 2023, the pool of measures eligible for receiving financing under NGEU Green Bonds consists of EUR 190.6 billion[7] of eligible assets (made up of 875 measures). This is an increase from EUR 184.9 billion as of 19 October 2022 reported in the 2022 NGEU Green Bonds Allocation Report.

This revised pool reflects the current state of play of RRPs adopted with a Council Implementing Decision[8] and the revision of 4 RRPs (Estonia, Finland, France, Slovakia) that were submitted and assessed by the Commission prior to the cut-off date. All new measures introduced in revisions have been through eligibility due diligence process.

Almost 60% of the maximum eligible NGEU Green Bond expenditure pool relates to financing in expenditure categories: 'Clean transport & infrastructure' (EUR 64.7 billion) and 'Energy efficiency' (EUR 49.3 billion). Additionally, 'Clean energy & network' accounts for EUR 31.2 billion, 'Water supply & waste management' for EUR 12.1 billion, 'Climate change adaptation' EUR 11.8 billion, 'Research and innovation activities supporting the green transition' for EUR 11.0 billion, 'Protection, rehabilitation and biodiversity' for EUR 5.9 billion, 'Digital technologies supporting the green transition' for EUR 0.4 billion and 'Other' for EUR 4.3 billion.

[7] For non-Eurozone Member States, an exchange rate is specified in the Council Implementing Decision for the costing of measures in the RRP. When reporting on expenditures, non-Eurozone Member States report to the Commission in their local currency, a weighted exchange rates of all disbursement dates is used to convert the local currency amount to EUR.
[8] RRPs have now been approved for all 27 Member States (relative to 25 at the time of the 2022 NGEU Green Bonds Allocation Report).

Table 1: NGEU Green Bond pool broken down by expenditure category (in EUR).

Row Labels	NGEU Green Bonds Eligible Amount (as of 1 August 2023)	NGEU Green Bonds Eligible Amount (as of 19 October 2022)
Clean energy & network	31,205,299,035	30,607,675,329
Clean transport & infrastructure	64,693,956,318	63,575,659,898
Climate change adaptation	11,760,281,770	11,785,844,698
Digital technologies supporting the green transition	402,970,079	392,642,079
Energy efficiency	49,262,056,890	46,676,940,123
Nature protection, rehabilitation and biodiversity	5,867,904,567	4,774,204,567
Other	4,256,118,393	4,250,338,393
Research and innovation activities supporting the green transition	11,018,668,481	10,971,968,481
Water supply & waste management	12,138,876,319	11,910,513,844
Grand Total	**190,606,131,852**	**184,945,787,413**

Table 2: NGEU Green Bond pool broken down by Member State (in EUR, as of 1 August 2023)

Row Labels	Sum of NGEU Green Bonds Eligible Amount
Austria	2,230,585,000
Belgium	2,952,051,778
Bulgaria	3,497,684,000
Croatia	2,053,820,674
Cyprus	456,504,000
Czechia	2,197,855,805
Denmark	646,870,171
Estonia	546,280,000
Finland	742,800,000
France	15,211,477,614
Germany	8,074,220,165
Greece	11,003,177,155
Hungary	2,050,429,849
Ireland	406,199,000
Italy	70,286,458,550
Latvia	534,004,500
Lithuania	829,236,000
Luxembourg	60,500,000
Malta	163,760,000
Netherlands	2,451,476,000
Poland	13,944,730,000
Portugal	5,753,554,432
Romania	12,391,528,228
Slovakia	2,664,908,977
Slovenia	1,030,980,682
Spain	27,212,642,999
Sweden	1,212,396,274
Grand Total	**190,606,131,852**

Allocation of NGEU Green Bond proceeds

3. Allocation of NGEU Green Bond proceeds

Under the RRF, Member States' national RRPs set out planned reforms and investments structured around broad expenditure categories (e.g. energy efficiency). Investments and reforms themselves consist of groups or portfolios of individual projects (measures and sub-measures) related to the same economic activities (e.g. renovation of public buildings). Each reform and investment is linked to qualitative milestones and quantitative targets that represent steps towards implementing these reforms and investments.

Member States can receive payments, up to twice per year, after the fulfilment of their respective milestones and targets – in line with the performance-based nature of the programme.

Member States are also required to report to the Commission with each payment request the total cumulative expenditures incurred for the implementation of each reform and investment with a positive climate marker[9]. This requirement is set out in the financing and loan agreements between the Commission and Member States and allows the Commission to match proceeds raised through NGEU Green Bonds with the concrete expenditure for climate relevant measures.

The central role that milestones and targets have in the design and implementation of the RRF enable the Commission to determine the actual expenditure incurred for projects financed through NGEU Green Bonds. The pool of eligible NGEU Green Bond expenditures hence represents the maximum amount to which the NGEU Green Bond proceeds can be allocated.

NGEU GREEN BOND ISSUANCES

As of 1 August 2023, the European Commission had issued EUR 44.2 billion of NGEU Green Bonds across four different lines (as of 19 October 2022: EUR 28.0 billion). This represents an increase of EUR 16.2 billion (or 57.9%). All NGEU Green Bond issuances have been met with strong demand in both syndicated transactions and auctions, indicating a continuous strong investor appetite.

[9] The Commission relies on Member States data availability and quality. The Commission, in its institutional capacity, cannot directly assess the progress of the measures in the Member States. This report is constructed based on available and assessed data as they were presented and submitted to the Commission by the Member States.

Table 3: Summary of NGEU Green Bond issuances

Type	Issue format	Transaction date	Maturity	Volume issued (EUR million)	Yield	ISIN
Tap	Auction	17/04/2023	04/02/2033	1,732	3.087%	EU000A3K4DW8
Tap	Syndication	28/03/2023	04/02/2048	6,000	3.348%	EU000A3K4DM9
Tap	Auction	28/11/2022	04/02/2043	1,000	2.845%	EU000A3K4DG1
New Bond	Syndication	15/11/2022	04/02/2033	6,000	2.820%	EU000A3K4DW8
Tap	Auction	24/10/2022	04/02/2037	1,450	3.378%	EU000A3K4C42
New Bond	Syndication	21/06/2022	04/02/2048	5,000	2.713%	EU000A3K4DM9
Tap	Auction	25/04/2022	04/02/2037	2,499	1.626%	EU000A3K4C42
New Bond	Syndication	05/04/2022	04/02/2043	6,000	1.370%	EU000A3K4DG1
Tap	Auction	24/01/2022	04/02/2037	2,499	0.374%	EU000A3K4C42
New Bond	Syndication	12/10/2021	04/02/2037	12,000	0.450%	EU000A3K4C42

Member States have already received EUR 153.4 billion in RRF grant and loan disbursements, of which EUR 56.8 billion[10] is expected to be spent on climate relevant actions – therefore comfortably exceeding the amounts of NGEU Green Bonds issued.

IMPLEMENTATION OF MILESTONES AND TARGETS

Out of the total 6,273 milestones and targets for the whole RRF financing, the Commission has identified 1,729 milestones and targets that can be directly linked to the EUR 190.6 billion worth of measures which are included in the NGEU Green Bond pool. These 1,729 milestones and targets relate to the 875 individual measures or sub-measures that form the NGEU Green Bond eligible pool.

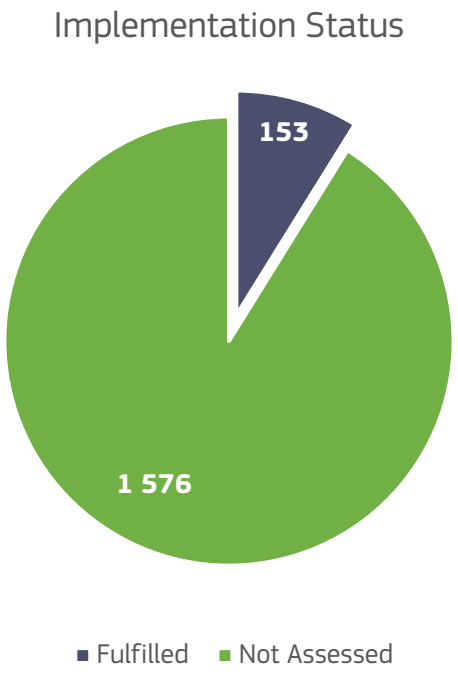
As of the cut-off date of 1 August 2023, out of 1,729 milestones and targets linked to measures in the NGEU Green Bond pool, 153 are considered as 'Fulfilled'. These are associated mostly to measures that are defined by the NGEU Green Bond Framework as contributing towards improved "Energy Efficiency" (e.g. energy Efficient Renovation of private or public buildings) and "Clean transport & infrastructure" (e.g. improved transportation links). A number of these milestones are linked to enabling implementation measures, such as signature of contracts to commence construction.

A further 297 of these milestones and targets have been declared as 'completed' by Member States but are still subject to assessment by the Commission. However, it is noted that the

[10] Based on the payments disbursed to Member States and their respective share of costs eligible for NGEU Green Bond financing in the national RRPs. The financial envelope allocated is based on an ex-ante costing provided by the Member States.

implementation status of milestones and targets is neither directly proportional to the financial envelope of reported expenditure, nor to the outputs implemented by a given Member State[11].

Figure 1: Implementation status of milestones and targets directly linked to the NGEU Green Bond pool (as of 1 August 2023).



Box 2: Milestones and Targets labelling and declaration process[12]:

According to the RRF Regulation, Member States must report twice a year on the progress made in the implementation of their Recovery and Resilience Plan.

The progress status of each milestone and target, can be reported by a Member State, as:

- 'completed' or
- 'not completed'.

Milestones and targets which Member States declare as 'completed' and have already been assessed as satisfactorily fulfilled by the Commission in the context of a payment request, are labelled for the purposes of this report as 'Fulfilled'. Milestones and Targets that are "Not completed" or "Completed but not assessed", are labelled as 'Not Assessed'.

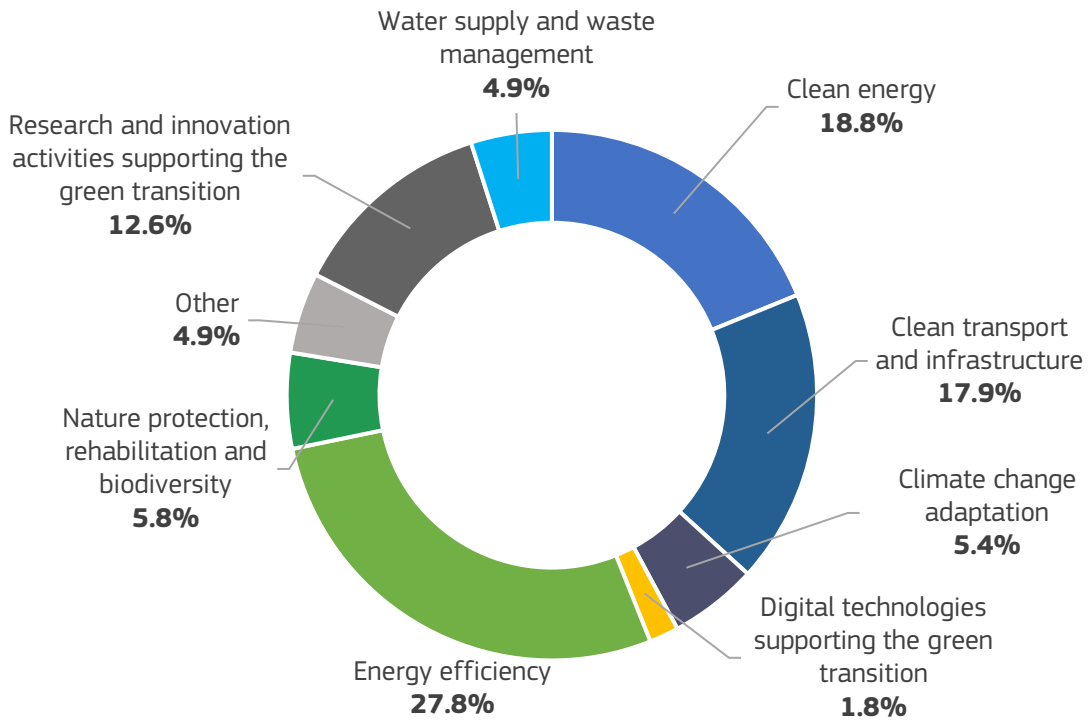
[11] Milestones and targets are reported by Member States within a 12-month window, which is followed by the Commission assessment. In addition, the number of milestones and targets does not necessarily correspond to the financial envelope of related measure (or sub-measure).

[12] Bi-annual Reporting Factsheet – Spring 2023, available at: Microsoft Word - DRAFT spring bi-annual reporting factsheet v2.docx (europa.eu)

Table 4: Fulfilled milestones and targets by Member State

Member State	Number of fulfilled milestones
Austria	11
Bulgaria	1
Croatia	8
Cyprus	3
Czechia	8
Denmark	15
France	10
Greece	16
Italy	34
Lithuania	8
Malta	1
Portugal	15
Romania	10
Slovakia	1
Spain	12
Total	**153**

Figure 2: Fulfilled milestones and targets per expenditure category[13]



[13] Due to structural characteristics of RRF milestones and targets this chart should be interpreted as illustrative only and does not fully align with the numbers in Table 4. In addition, it is noted that the "Other" expenditure category of this graph also includes any milestones and targets which could not be grouped with any specific expenditure category under the Green Bond Framework.

ALLOCATED PROCEEDS

By 1 August 2023, Member States had received EUR 153.4 billion in RRF grant and loan disbursements, of which EUR 56.8 billion is expected to be spent on NGEU Green Bond eligible measures, based on the share of NGEU Green Bond eligible expenditure in the respective RRPs. From the total disbursements, as of 1 August 2023, **14 Member States have reported expenditures** relating to fulfilled milestones and targets eligible for NGEU Green Bond financing for a total amount **of EUR 21.0 billion** (compared to 7 Member States and EUR 13.5 billion as of 19 October 2022).

Most of the reported expenditures are incurred in the expenditure categories 'Energy efficiency' (EUR 9.8 billion), 'Clean transport & infrastructure' (EUR 9.0 billion) and 'Climate change adaptation' (EUR 1.2 billion).

Implementation of the NGEU green funded climate relevant actions and related reporting is expected to gather further pace after the revision of national RRPs, occasioned by the need to integrate a strong energy security focus.

Table 5: Reported expenditure by Member State (in EUR, as of 1 August 2023)

Row Labels	Sum of NGEU Green Bond cumulated expenditure
Austria	206,678,000
Croatia	34,659,272
Cyprus	8,938,000
Czechia	343,767,144
Denmark	35,310,864
France	5,069,652,000
Greece	1,120,888,000
Italy	13,447,364,000
Lithuania	19,000,000
Luxembourg	960,000
Portugal	247,400,000
Slovakia	200,000
Slovenia	89,180,000
Spain	398,176,000
Grand Total	**21,022,173,280**

Table 6: Reported expenditure by expenditure category (in EUR, as of 1 August 2023)

Row Labels	Sum of NGEU Green Bond cumulated expenditure
Clean energy & network	475,185,248
Clean transport & infrastructure	8,986,779,893
Climate change adaptation	1,222,136,053
Digital technologies supporting the green transition	12,000
Energy efficiency	9,797,308,047
Nature protection, rehabilitation and biodiversity	90,729,433
Other	221,461,267
Research and innovation activities supporting the green transition	67,513,689
Water supply & waste management	161,047,650
Grand Total	**21,022,173,280**

Annex III includes granular information on the allocation of proceeds across intervention fields and across Member States.

UNALLOCATED PROCEEDS

Unallocated proceeds is the difference between the funds raised from NGEU Green Bond issuances and Member States' reported eligible green expenditures. As of 1 August 2023, with EUR 44.2 billion of NGEU Green Bonds issued and EUR 21.0 billion of reported expenditure to which proceeds have been allocated, unallocated proceeds, i.e. the remainder, stand at EUR 23.2 billion. These unallocated proceeds are supported by a large pool of NGEU Green Bond eligible measures (of EUR 190.6 billion) which are expected to receive NGEU Green Bonds allocation as implementation of the NGEU programme progresses.

The scale of unallocated proceeds is restricted through robust risk management processes which ensure calibration of NGEU Green Bond issuances to manage the risk of issuing more NGEU Green Bonds than can eventually be allocated to reported green expenditures[14]. Any gap between NGEU Green Bond issuances and reported green expenditure will diminish over time as implementation and reporting of NGEU Green Bond expenditures gathers momentum.

[14] Before being disbursed to Member States or other EU programmes, NGEU Green Bond proceeds, like all NGEU related bond proceeds, are routed through the Commission's cash account at the European Central Bank (ECB). While all green bond proceeds must eventually be allocated to expenditures on green bond eligible measures as reported by Member States, proceeds may also be temporarily used for other EU programmes or by Member States for other measures in their budget. The Commission endeavors to allocate all green bond proceeds within 24 months of issuance and is currently well on track to do so.

Box 3: Refinancing and co-financing

Under the NGEU Green Bond framework, up to 100% of the NGEU Green Bond issuance proceeds can be used to refinance eligible expenditure. In the context of NGEU Green Bonds, a payment from the Commission to Member States is considered to be refinancing when a Member State pays for the measure first and receives the money at a later stage from the Commission. Based on the timing of expenditure reported by Member States, refinancing of reported expenditure amounts to a total of EUR 14.0 billion or 66.7% of reported expenditures.

In addition, under the NGEU Green Bond Framework, it is possible for measures to receive financing from sources other than NGEU Green Bond proceeds. This relates to (i) measures that are tagged with a 40% climate coefficient where the remaining 60% of expenditure is financed from conventional NGEU related bond issuances; and (ii) measures where Member States finance eligible NGEU Green Bond measures partially from their own national budgets. Based on reporting by Member States, the financing from these two additional sources corresponds to EUR 1.2 billion or 5.8%. EUR 0.4 billion of this co-financing is co-financing from Member States with EUR 0.8 billion linked to co-financing by conventional EU Bonds (see Annex IV). The Commission does not receive information from Member States to be able to identify other sources of financing from third parties, such as development banks or agencies.

Further details on the methodology applied for the calculation of refinancing, pre-financing and co-financing can be found in the NGEU Green Bonds Allocation Report published in December 2022.

EU Taxonomy alignment

4. EU Taxonomy alignment

The RRF Regulation, which fixes the parameters for eligible NGEU Green Bond expenditure, predated the delegated acts for the EU Taxonomy. Nevertheless, the draft Taxonomy conditions were reflected in the RRF regulation to the extent feasible. The Commission also committed to reporting on the alignment of the NGEU Green Bond expenditure with the EU Taxonomy. The EU Taxonomy alignment of the pool of NGEU Green Bond eligible measures was originally disclosed in the first NGEU Green Bonds Allocation Report published in December 2022, were the EU Taxonomy alignment of the NGEU Green Bond pool was reported. To further facilitate the investors in their assessment of the EU Taxonomy alignment of their investments, the Commission will initiate reporting on the EU Taxonomy alignment of the allocated proceeds as from this report.

In assessing EU Taxonomy alignment, the Commission relies on information contained in the RRF regulation's annex on climate tracking intervention fields as well as the technical guidance on the application of the DNSH principle in order to compare the alignment of measures supported under the RRF Regulation with the EU Taxonomy Technical Screening Criteria (TSC)[15]. At the time of making the assessment, the Commission could use the Commission regulation covering climate change mitigation, climate change adaptation and the 'do no significant harm' principle[16].

Box 4: Methodology for classification of EU Taxonomy alignment

The EU Taxonomy alignment for the NGEU Green Bonds is based on the assessment at the level of intervention fields[17] of:

1) alignment with the EU Taxonomy's Substantial Contribution Criteria (SCC) to the environmental objectives namely "climate change mitigation and climate change adaptation"; and
2) alignment of the DNSH criteria.

Both SCC and DNSH alignment were assessed independently of one another.

For the SCC, alignment can be classified in one of the following categories: 'Fully aligned'; 'Substantially compliant with the main substantive SCC conditions, but not to the same scale'; 'Partially compliant with only some SCC conditions'; 'Not aligned' and 'Not covered' (see Annex V). In order to be considered 'Fully aligned' or 'Substantially aligned' with the main SCC condition, the inclusion of quantitative criteria must be present in both RRF and the EU Taxonomy, but in case of 'Substantial alignment', the degree of the variable covered by the criteria is not the same.'

[15] The relationship between intervention fields and the EU Taxonomy Technical Screening Criteria (TSC) under the Commission Delegated Regulation (EU) 2021/2139 are set out in the NGEU green bond framework and its annex.
[16] See Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives. Commission has not yet used the Commission Delegated Regulation (EU) 2023/2485 amending Delegated Regulation (EU) 2021/2139, as it was adopted after the cut-off date, on 21.11.2023
[17] The EU Taxonomy alignment assessment at the level of Intervention Fields is driven by the stable nature of these fields (fixed in the RRF regulation), relative to individual measures which are subject to amendments or revisions under Member States RRPs.

To assess consistency with the DNSH requirements, the analysis is based on the standard DNSH criteria stemming from Annexes 1-4 of the Commission guidance notice on DNSH implementation for the RRF[18] along with the additional quantitative conditions present in Annex VI of the RRF Regulation.

The resulting RRF conditions are then compared to the EU Taxonomy DNSH conditions, consisting of both basic standard conditions for all activities and additional quantifiable conditions specific to individual EU Taxonomy activities.

Depending on the evidence, consistency between the conditions is assessed on the following scale: 'Fully aligned', 'Partially aligned' or 'Not covering specific DNSH EU Taxonomy conditions'.

In interpreting this assessment, it is noted that, while both the RRF DNSH criteria and the EU Taxonomy DNSH criteria aim to promote sustainability, they have different scopes, purposes, and areas of focus. The RRF criteria are applied to specific measures and reforms related to economic recovery and resilience, while the EU Taxonomy criteria classify entire economic activities based on their environmental and climate sustainability. These differences do not however retract form the sustainability benefits of the respective measures[19].

In addition, while in many cases, the 1,729 milestones or targets attached to the 875 measures in the NGEU Green Bond pool include conditions to reinforce compliance with DNSH, this could not be considered for the purpose of this analysis, as EU Taxonomy alignment is performed only up to the level on Intervention Fields (not of individual measures). These additional safeguards embedded in the milestones and targets, which are expected to lead to a much closer alignment between the EU Taxonomy Delegated act and the RRF, are hence not reflected in this analysis, rendering the presented estimates on the conservative side.

Based on the methodological considerations set out in Box 4, as of 1 August 2023, **57.5%, of the pool of eligible measures (EUR 190.6 billion) is assessed to be fully or substantially aligned with the EU Taxonomy** of both SCC and additional quantifiable DNSH criteria (compared to 57.9% as of 19 October 2022). **Further 36.5% is partially aligned** and the remaining **6.0% is not covered or aligned** (e.g. spending categories such as "biodiversity" or "air pollution prevention" where specific EU Taxonomy activities were not yet developed at the time of assessment[20]).

[18] Commission Notice C(2021) 1054: Technical guidance on the application of 'do no significant harm' under the Recovery and Resilience Facility Regulation

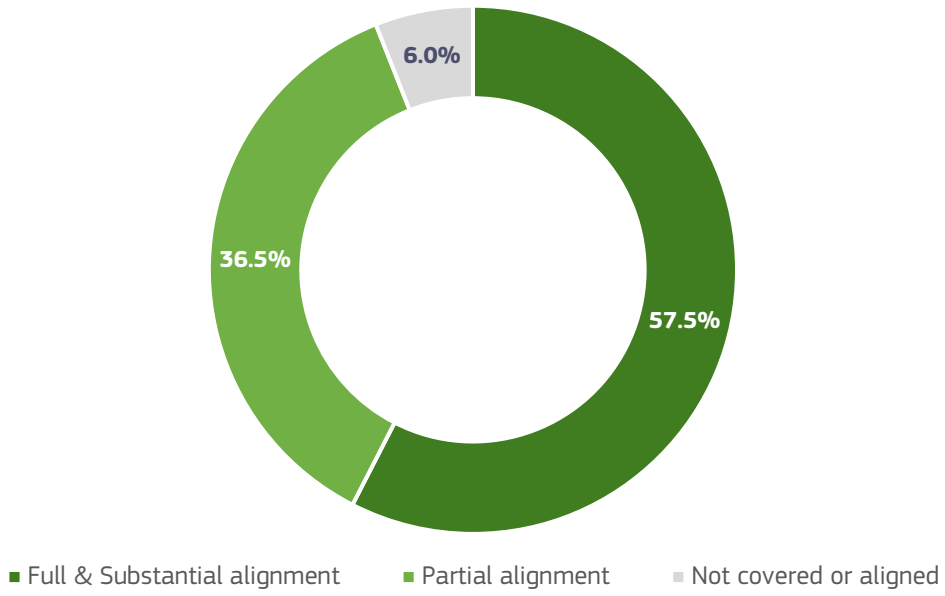
[19] For example, one of the specific considerations of Taxonomy are also Minimum Safeguards of labor and human rights: The Commission does not individually confirm each individual RRF measure to be aligned with Minimum Safeguards, however as all EU financing has to comply with EU labor protection, equality and human rights enshrined in EU fundamental treaties, the Commission operates in confidence that RRF financing, same as all EU financing provides such considerations and protections. In case of violations, EU labor protection agencies, EU and local Ombudsman and national and EU courts intervene. Commission also maintains its right to exclude measures which have unreliable implementation from the NGEU Green bond pool or in case of violations recover funds.

[20] The Commission adopted an Environmental Delegated Act under the Taxonomy Regulation on 27 June 2023 and submitted it to the co-legislators for scrutiny (see the proposal for the Commission Delegated Regulation (EU) 2023/2486supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities). The latest Commission Delegated Regulation (EU) 2023/2486 was adopted on 21.11.2023.

This stable EU Taxonomy alignment is reflective of the relative stable scope of interventions[21] and size of the pool, which however may change as the Commission assesses the alignment of measures arising from RePowerEU revisions.

Table 7: EU Taxonomy-alignment of pool of NGEU Green Bond eligible measure (table in EUR million and chart in %)

	DNSH fully aligned	DNSH partially aligned	DNSH not covering specific EU Taxonomy conditions
Full SCC alignment	21 intervention fields 72,097.5	3 intervention fields 19,429.9	4 intervention fields 38,680.8
Substantial SCC alignment	3 intervention fields 14,594.2	1 intervention field 3,557.5	1 intervention field 3,682.1
Partial SCC alignment	5 intervention fields 1,346.6	1 intervention field 1,199.0	10 intervention fields 24,580.2
Not SCC aligned			8 intervention fields **1,018.2**
Not covered			7 intervention fields **10,420.2**



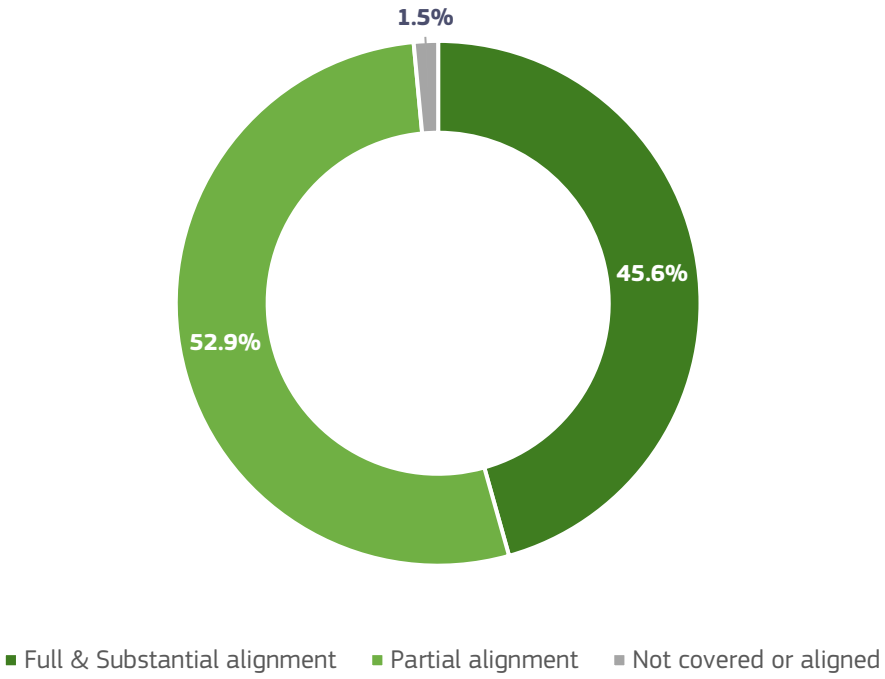
For the EUR 21.0 billion of reported expenditure, the extent of full/substantial alignment is slightly lower at 45.6% while partial alignment is at 52.9% and not covered/aligned with the substantial contribution criteria and DNSH principles of the EU Taxonomy is 1.5%.

[21] This is notwithstanding the revision of the EU Taxonomy alignment methodology for the 2023 report with respect to five intervention fields (064, 065, 067, 068, and 069bis), all pertaining to the railway and TEN-T railway construction and reconstruction, which were upgraded from "substantially aligned" in 2022 to "fully aligned" with the EU Taxonomy SCC for the 2023 assessment. This upgrade follows additional verifications which led the Commission to conclude that for activity 6.14 - Infrastructure for rail transport compliance with the TEN-T directive (EU 2016/797, Annex II.2) sufficiently justifies full alignment of the intervention fields with the Taxonomy activity 6.14 SCC i) and ii) criteria.

The difference between the EU Taxonomy alignment of the total pool relative to that of allocated proceeds is driven by the slower implementation speed of higher EU Taxonomy aligned measures (e.g. new infrastructure).

Table 8: EU Taxonomy-alignment of the allocated proceeds (table in EUR million and chart in %)

	DNSH fully aligned	DNSH partially aligned	DNSH not covering specific EU Taxonomy conditions
Full SCC alignment	21 intervention fields 8,699.2	3 intervention fields 674.9	4 intervention fields 9,285.5
Substantial SCC alignment	3 intervention fields 153.4	1 intervention field 67.9	1 intervention field 0.0
Partial SCC alignment	5 intervention fields 23.9	1 intervention field 0.8	10 intervention fields 1,802.5
Not SCC aligned			8 intervention fields **2.0**
Not covered			7 intervention fields **312.2**



Annex V includes further details on the EU Taxonomy alignment analysis underpinning these results and explaining the differences between different levels of alignment.

Climate Impact of NGEU Green Bond proceeds

5. Climate Impact of NGEU Green Bond proceeds

In the NGEU Green Bond Framework, the Commission has committed to providing investors and the wider public with transparent reporting on allocation of proceeds as well as on the impact of the expenditures financed by NGEU Green Bonds.

This impact report enables for the first time a quantification of these impacts, calculated in million tonnes of CO2e/year of emissions avoided. Given the still early stages of implementation of projects eligible for financing by NGEU Green Bonds, the report serves predominantly as (i) a foundation for future reports, focusing on the impact reporting methodologies; and (ii) as a reference-point for the estimated potential climate impacts that can be achieved through NGEU Green Bond financing, following full implementation of the measures that can currently be quantified.

IMPACT REPORTING METHODOLOGY

In order to approximate the climate impact from investments financed by NGEU Green Bonds, a three-pronged approach has been established building on the milestones and targets included in the national RRPs.

In a first step, all the milestones and targets are analysed in order to find metrics – referred to as output indicators - that can be used in assessing the implementation progress of certain measures. Examples of such output indicators are MWh of solar panel capacity installed, km of railway upgraded or installed, or number of dwellings renovated. While for some measures multiple output indicators could be viable, the final decision on the chosen output indicator is based on its usability in making the translation to climate impact. Milestones and targets and their respective target values are only counted for a single output indicator in order to avoid issues of double counting. Output indicators are assigned to the intervention field for which they apply. Table 9 below provides some examples of output indicators per intervention field.

In a second step, for each output indicator (and corresponding intervention field) a methodology for translating the output indicators into GHG emissions avoided is established[22]. These methodologies have been established with the support of Carbone 4, a specialized consultant in the field, and the establishment of such methodologies rely heavily on available academic literature. Once these two steps are completed, the theoretical basis for translating investments in specific measures to GHG emissions avoided is thus established. A final step, however, is required to calculate actual realised impact based on this approach.

In the final step, the actual completion of milestones and targets is tracked. Milestones and targets are only deemed as fulfilled and therefore taken into account for calculating the realised climate impact after the Commission has confirmed that the target value has indeed been reached. Partially achieved milestones or targets are not used for the purpose of impact calculations. For completed milestones and targets that contain output indicators which are marked as relevant for impact reporting, as per step one, these output indicators are summed up and subsequently

[22] While the Commission recognises that other impact indicators than GHG emissions avoided are available, this first report focuses only on GHG emissions avoided given its usability for investors in estimating the climate impact of their investments. Other climate impact indicators may be added in future reports.

used as input in the developed impact estimation model as per the above step. This concludes the final step in calculating the impact from investments in NGEU Green Bonds.

While certain measures receive funding also from other sources than the RRF, for example national budgets, it is worth noting that the output indicators included in the milestones and targets used as input for calculating climate impact, only relate to funding from the RRF.

All expected impact numbers presented in this report relate to the annual amount of GHG emissions avoided resulting from implementation of investments by fulfilling indicated quantifiable milestones and targets scheduled up until end 2026 only. Nevertheless, emissions that are avoided through NGEU Green Bond proceeds will be maintained for the entire lifetime of the NGEU Green Bond financed investments.

Annex VI provides a more detailed description of the process followed to calculate climate impact per relevant intervention field.

Table 9 – Examples of output indicators and impact indicators

Intervention field	Output indicator	Outcome unit	Impact indicator	Impact unit
025bis - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures compliant with energy efficiency criteria	Square meter or amount of dwellings renovated	m^2	GHG emissions avoided	XYZ ton of CO2e/year emissions avoided
064 - Newly built or upgraded railways - TEN-T core network	KMs of rail track built or upgraded	km	GHG emissions avoided	XYZ ton of CO2e/year emissions avoided
030bis - Renewable energy: biomass with high GHG savings	Additional operation capacity installed for renewable energy	MW	GHG emissions avoided	XYZ ton of CO2e/year emissions avoided
029 - Renewable energy: solar	Additional operation capacity installed for solar energy	MW	GHG emissions avoided	XYZ ton of CO2e/year emissions avoided
075 - Cycling infrastructure	Amount of cycling infrastructure installed	km	GHG emissions avoided	XYZ ton of CO2e/year emissions avoided

ESTIMATED EXPECTED IMPACT

Out of the 1,729 milestones and targets related to the NGEU Green Bond eligible pool, 353 of these (under 20 intervention fields) contained quantifiable data that could be analysed in calculating climate impacts. The analysis captured around 57% of the total amount of costs eligible for NGEU Green Bond financing, while representing 49% of the NGEU Green Bond eligible measures with quantifiable milestones and targets listed under the 20 intervention fields that were part of the analysis. It is estimated that, **following full implementation of quantifiable milestones and targets up until 2026, NGEU Green Bond eligible projects will result in 44 million tonnes of CO2e/year of emissions avoided. This amount represents approximately 1.2% of the annual GHG emissions of the EU for the year 2022**[23].

The expenditure categories resulting in the largest amount of GHG emissions avoided are "clean energy & network", primarily through the investments in wind and solar power, and "energy efficiency", primarily through investments in energy efficiency renovations and energy efficient construction.

The amounts of expected GHG emissions avoided per expenditure category do not necessarily correspond directly to the amount of costs eligible for NGEU Green Bond financing in the respective category and cannot be used as a basis to assess the effectiveness of spending in this regard. While some expenditure categories may result in higher amounts of emissions avoided per cost, differences are primarily due to the complexity of the investments under individual categories. In order to achieve climate neutrality by 2050, investments under all expenditure categories are necessary however, regardless of their individual ratios of funds spent per ton of emissions avoided.

Table 10: Estimated impact per expenditure category

Expenditure Category	GHG Emissions avoided (in tCO2e/year) - Total expected by 2026
Research and innovation activities supporting the green transition	3,499,281
Energy efficiency	7,407,791
Clean energy & network	18,648,956
Water supply & waste management	992,881
Clean transport & infrastructure	13,656,781
Grand Total	**44,205,690**

[23] Source: EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/ENV_AC_AIGG_Q__custom_2691128/bookmark/table?lang=en&bookmarkId=4bb9ab20-296b-4119-88e9-580ea7741c0a)
The reference year of 2022 was chosen to represent an amount of GHG emissions that is not artificially lowered by the effects of the COVID-19 pandemic.

REALISED IMPACT

The nature of the RRF means that for measures financed by NGEU Green Bonds the associated milestones and targets can be achieved up until end 2026 by Member States. Hence, unlike other sovereign issuers, NGEU Green Bonds issued by the EU do not refinance spending from previous budget years, but are rather forward looking, financing measures that are being implemented or are planned to be implemented in the upcoming years.

As a result, much of the potential impact is likely to only be realised towards the end of the RRF programme, with the impact at the current initial phase being limited. The expected backloaded nature of impacts under the RRF programme is reflected in the structure of milestones and targets included in the calculations, for which the share of quantitative targets that can be used in the quantification of impacts increases towards the end of the programme in 2026.

This backloaded nature of milestones and targets and the fact that the RRF programme contains numerous investments with long lead times, means that in this early stage of implementation realised impacts are limited.

Considering the implementation of milestones and targets up until the cut-off date of 1 August 2023, the realised impact of the allocated NGEU Green Bond proceeds is calculated to be 224,143 tonnes of CO2e/year of emissions avoided. As of yet, this realised impact has been achieved solely through energy efficiency renovations. This amounts to 0.5% of the total estimated reduction of GHG emissions from the expected climate impact of full implementation of quantifiable milestones and targets up until end 2026. The limited realised climate impact reflects the early stage in the implementation of the investment part of projects financed by the NGEU Green Bonds and is expected to increase progressively leading up to 2026, in line with the increase in the relevant quantifiable milestones and targets.

A detailed list of intervention fields incorporated in the analysis as well as the output indicator and impact indicator results can be found below. Description of methodologies used to calculate the impact indicator results of CO2e/year of emissions avoided for each intervention field and output indicator can be found in the methodological annex (Annex VI).

Table 11: Realised impact per expenditure category

Expenditure Category	GHG Emissions avoided (in tCO2e/year) – realised impact
Research and innovation activities supporting the green transition	-
Energy efficiency	224,143
Clean energy & network	-
Water supply & waste management	-
Clean transport & infrastructure	-
Grand Total	**224,143**

Table 12: Climate impact per Intervention Field (expected and realised)

INTERVENTION FIELD	OUTPUT				IMPACT GHG Emissions avoided (in tCO2e/year)	
	Indicator	Current result	Total 2026	Unit	Current result	Total 2026
022 - Research and innovation processes, technology transfer and cooperation between enterprises focusing on the low carbon economy, resilience and adaptation to climate change	Electrolyser capacity - Hydrogen production	0	1,810	MW	0	3,397,629
	Number of zero emission vehicles	0	100,000	Number	0	101,653
025bis - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures compliant with energy efficiency criteria	Square Meters renovated (residential and non-residential)	39,360,880	581,085,576	m2	224,143	5,938,669
025ter - Construction of new energy efficient buildings	Square Meters renovated (residential and non-residential)	0	2,921,881	m2	0	39,690
	Square Meters constructed (residential and non-residential)	0	11,652,034	m2	0	39,284
026 - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures	Square Meters renovated (residential and non-residential)	0	2,048,150	m2	0	21,606
	Square Meters constructed (residential and non-residential)	0	890,143	m2	0	4,472
026bis - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures compliant with energy efficiency criteria	Square Meters renovated (residential and non-residential)	0	23,194,378	m2	0	442,964
	Square Meters constructed (residential and non-residential)	0	30,060,218	m2	0	157,670
	Additional MWh saved per year	0	319,841	MWh	0	124,924
028 - Renewable energy: wind	Installed Capacity of Wind Farms	0	3,451	MW	0	3,452,050

INTERVENTION FIELD	OUTPUT				IMPACT GHG Emissions avoided (in tCO2e/year)	
	Indicator	Current result	Total 2026	Unit	Current result	Total 2026
	Installed Capacity of Offshore Wind Farms	0	8,000	MW	0	4,267,844
	Installed Capacity of Wave Energy	0	200	MW	0	214,332
029 - Renewable energy: solar	Installed Capacity of Solar Panels	0	9,923	MW	0	4,233,265
030bis - Renewable energy: biomass with high GHG savings	Production of bioethanol equivalent	0	3,068,636	tons	0	2,043,390
	Production of hydrogen	0	560,000	m3	0	476,596
	Additional CO2e/year	-	-		0	15,000
031 - Renewable energy: marine	Installed Capacity of Offshore Wind Farms	0	1,500	MW	0	3,946,479
033 - Smart Energy Systems (including smart grids and ICT systems) and related storage.	Number of smart electricity meters	0	730,680	Number	0	60,088
	Electrolyser capacity - Hydrogen production	0	150	MW	0	187,714
	Installed Capacity of Solar Panels	0	1,500	MW	0	390,711
042 - Household waste management: prevention, minimisation, sorting, reuse, recycling measures	Number of sorting facilities - Plastic waste	0	3	Number	0	992,881
	Number of sorting facilities - Municipal waste	0	38	Number		
064 - Newly built or upgraded railways - TEN-T core network	Length of railway	0	5,981	km	0	280,937
065 - Newly built or upgraded railways - TEN-T comprehensive network	Length of railway	0	4,175	km	0	230,757

INTERVENTION FIELD	OUTPUT				IMPACT GHG Emissions avoided (in tCO2e/year)	
	Indicator	Current result	Total 2026	Unit	Current result	Total 2026
068 - Reconstructed or modernised railways - TEN-T comprehensive network	Length of railway	0	5,048	km	0	922,132
072bis - Mobile zero emission/electric powered rail assets	Number of trains/locomotives	0	701	Number	0	1,449
073 - Clean urban transport infrastructure	Length of constructed tram or metroway	0	642	km	0	1,550,857
	Charging points constructed	0	6,602	Number	0	7,450
074 - Clean urban transport rolling stock	Zero-emission buses	0	37,344	Number	0	2,038,359
	Charging points constructed	0	13,200	Number	0	17,658
075 - Cycling infrastructure	Cycle path constructed	0	7,845	km	0	477,460
	Bicycle parking spaces constructed	0	10,000	Number		
077 - Alternative fuels infrastructure	Zero-emission car charging points (public and private)	0	557,102	Number	0	6,988,904
	Zero-emission bus charging points	0	417	Number	0	3,642
	Electric vehicles	0	3,525	Number	0	4,424
	Biogas refuelling stations (compressed)	0	59	Number	0	323,674
	Biogas refuelling stations (liquefied)	0	14	Number	0	28,211
ADHOC - Ad hoc intervention field	Zero-emission vehicles	0	585,952	Number	0	780,867
TOTAL						**44,205,690**

METHODOLOGICAL CONSTRAINTS

While the Commission strives to provide a large overview of NGEU Green Bond's achievements in terms of climate impact, the analysis presented in this report is subject to a number of methodological constraints.

To start, the impact reporting methodology is based on establishing reasonable output indicators per intervention field as the first step and assessing the climate impact of the respective intervention field as the next step. For the current report, this climate impact is defined primarily in terms of climate change mitigation through the use of the impact indicator of GHG emissions avoided. While all measures financed by NGEU Green Bonds contribute to furthering the EU's climate ambitions, only these measures where the translation into the desired impact indicator (GHG emissions avoided) was possible have been included in the impact reporting. Primarily, this concerns measures where an effect of GHG emissions avoided could reasonably be expected (such as clean energy or renovation actions). Intervention fields where such a specific impact metric was less readily evident tended to not be included in this year's analysis of impact (e.g., Adaptation to climate change measures and prevention and management of climate related risks or Water management and water resource conservation), though their contribution to the green transition remains undisputed.

In addition, this type of analysis necessitates translation of measures' quantitative targets into output indicators. By nature, only such targets that actually provided reasonable quantitative information can be taken into account. As not all measures have quantifiable milestones or targets that can be incorporated in the calculation of the output indicators, not all measures can be factored into the calculation of the output metrics per intervention field. Where only qualitative information was available, the available data was not suitable for aggregation or there was no methodology available to translate the output indicator into an impact indicator, milestones or targets were not taken into account. For example, while most measures under intervention field *"Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures compliant with energy efficiency criteria* dealing with renovations" will have provided targets indicating the square meters or number of dwellings/buildings to be renovated, some measures only provided the number of actions. Since this did not allow for a reasonable conversion towards m2 or number of dwellings, these measures could not be included in the analysis.

It should be noted that most measures contain more qualitative milestones than quantitative targets, as milestones often refer to the necessary prerequisites to start implementation. For example, while milestones may refer to necessary legislation being passed, the quantitative target may then refer to the actual implementation at a later stage.

Furthermore, while the Commission has sought to cover as much eligible expenditure and allocated proceeds as possible in the first impact reporting cycle, methodological constraints meant that the analysis is based on the largest intervention fields in terms of their importance to the NGEU Green Bond pool and for which calculations of outputs and impacts were deemed feasible.

Due to the above mentioned limitations, while the NGEU Green Bond pool comprises 1,729 milestones and targets, only 353 of these provide quantitative data that could be incorporated in the analysis of outputs and impacts presented in this report. Despite this limited absolute number, these quantifiable milestones and targets represent around 57% of the total NGEU Green Bond eligible expenditures. The remaining measures, while relevant in terms of climate impact, could not be quantified at the time of this report.

The Commission will continue to provide updates of the realised climate impacts from projects financed by NGEU Green Bonds until full allocation of NGEU Green Bond proceeds has been completed.

Case studies of investments financed by NGEU Green Bonds

6. Case studies of investments financed by NGEU Green Bonds

Case studies help exemplify the transformative power of investments financed by NGEU Green Bonds. The case studies presented below showcase how funds raised through NGEU Green Bond are contributing to a greener and more resilient Europe across different sectors and Member States, from innovative green infrastructure projects to advancements in energy efficiency.

Further examples of concrete reforms and investments financed by the RRF including in the area of green transition can be found in the annexes of the Commission report on the implementation of the RRF[24].

AUSTRIA

Measure Title: Exchange of oil and gas heating systems

Measure/Project Description:

The project aims to increase the share of renewable energy-based heating systems in residential buildings, reducing energy consumption, GHG emissions and air pollution. It provides financial support to households replacing fossil-fuelled heating systems with renewable heating technologies, such as biomass-based heaters, heat pumps or connectors to district heating.

The Ministry of Climate Action and Energy is responsible for the implementation of the investment. The only beneficiaries are private individuals.

It sets the objective of replacing at least 31,800 heating systems.

Photo: @Reflexpixel, Adobe Stock, 2023

[24] COM (2023) 545 final: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023DC0545

Measure achievements

The replacement of 6,360 heating systems was positively assessed in the context of the first payment request. According to Austrian Authorities, the final target of 31,800 heating systems has been already fulfilled. This will be assessed in the context of the second payment request.

By replacing fossil-fueled heating systems with new systems relying on renewable energy, the project has been contributing to reduce heating-related energy consumption, GHG emissions and air pollution.

BULGARIA

Measure Title: Sofia metro line 3 – new section

Measure/Project Description

Bulgaria's RRP introduced investments to support green and efficient public transport services. The RRF provides EUR 110.5 million for the construction of the Hadzhi Dimitar – Levski section on line 3 of the Sofia metro, which will provide a clean, rapid and efficient public transport service to passengers with intermodal connections. EUR 95 million of this is eligible for financing from NGEU Green Bonds. The total length of the section is 3 km and covers three stations. Works are expected to be completed by 31 December 2025. The project is implemented by Metropoliten EAD, a company owned by the Sofia Municipality which operates the metro lines in Sofia.

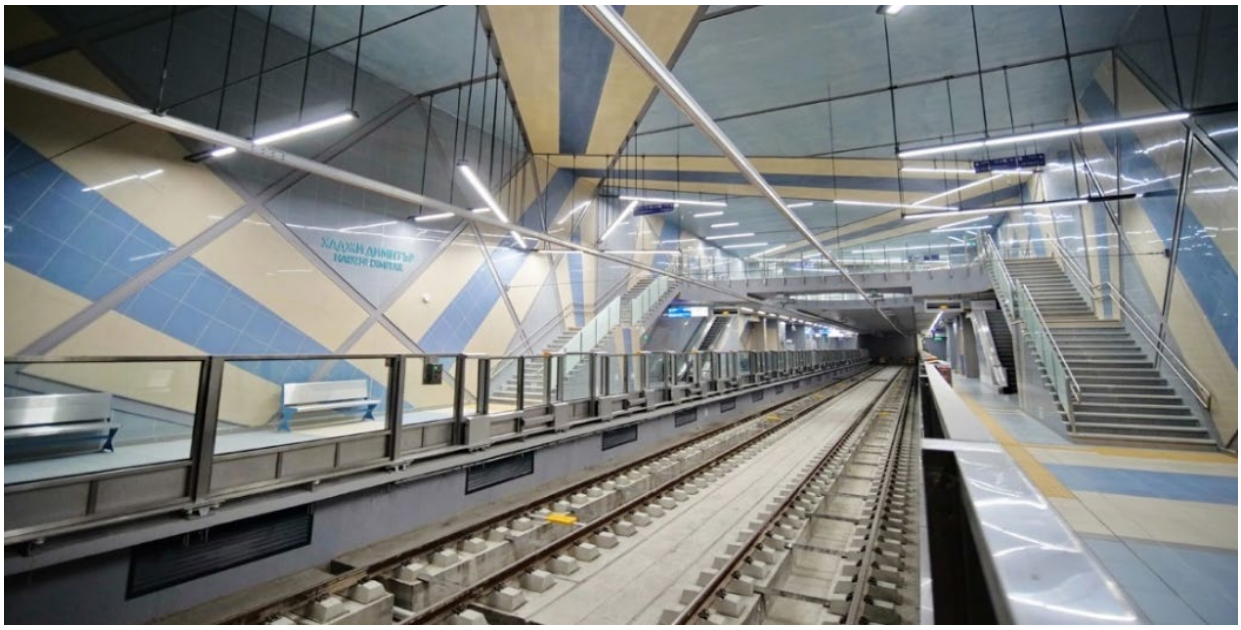


Photo: courtesy of Metropolitan, Sofia Municipality website

Measure achievements:

The contracts for the construction works have been signed and the implementation is ongoing. The investment is expected to allow the transport of 7.6 million passengers per year on average as of 2026 and to lead to a reduction in GHG and air pollution, as well as in the number of cars in circulation in the city.

DENMARK

Measure Title: Subsidies to replace oil burners and gas furnaces with green heating solutions

Measure Description:

The measure aims at phasing oil and natural gas out of the national heating system by supporting the replacement of oil burners and gas furnaces with electric heat pumps and district heating from renewable sources. The measure consists in the provision of subsidies to the amount of EUR 65 million to reduce the cost borne by consumers for the conversion to green heating solutions. The support scheme financed under the national RRP is articulated in three sub-schemes: (1) Sub-scheme for district heating ("*Fjernvarmepuljen*") providing a subsidy to expand district heating grids into new areas; (2) Sub-scheme for decoupling ("A*fkoblingsordningen*") exempting households from the payment of the decoupling fee charged by the Danish state-owned gas distribution company; and (3) Sub-scheme for scrapping ("*Skrotningsordningen*") providing a subsidy for companies that offer heat pumps on subscription for private year-round housing. This subsidy is particularly relevant for citizens who wish to convert to a heat pump but have limited financing opportunities.

The three subsidy schemes (*Fjernvarmepuljen, Afkoblingsordningen and Skrotningsordningen*) are all under the responsibility of the Danish Energy Agency. The Danish Energy Agency is a part of the Ministry of Climate, Energy and Utilities. The measure will result in at least 10,100 oil burners and gas furnaces being replaced with electric heat pumps and district heating from renewable sources by 31 August 2026.

Photo: Installation of a heat pump, ©European Union, 2023

Measure achievements:

The selection phase of applications received under the schemes will be completed by 31 March 2025. The final output target of 10,100 oil burners and gas furnaces being replaced with electric heat pumps and district heating from renewable sources will be reached at the latest by 31 August 2026.

LITHUANIA

Measure title: Support to increase local production of RES fuels

Measure description:

The aim of the sub-measure is to create a supply of renewable fuels and to promote their use in the transport sector. The first part of the investment covers the roll out of an IT system to support the production and consumption of biofuels and biogas in the transport sector in order to replace fossil fuels. The system will record the quantities of biomethane gas and other renewable fuels supplied to the transport sector as well as of the certificates given to producers to fulfil their RES fuels supply obligations, therefore ensuring the increase in consumption of biomethane and other alternative fuels produced over time. The System will also provide functionalities for data cross checking with the databases of Lithuania's State Tax Inspectorate. Investments on biomethane, second generation biofuels and green hydrogen production will follow up. Total cost of the measure is EUR 50,9 million.

Photo: @Fokussiert, Adobe Stock, 2023

Measure achievements

The IT System together with the registration module was launched in December 2021. With the entry into operation of the IT system, producers of alternative fuels have now a tool to assess the demand for alternative fuels, which will allow them to increase their level of production. Investments related to the production of alternative fuels will be implemented gradually with the objective that by the end of the RRF timeframe the share of fossil fuels in the transport sector in Lithuania will have significantly be reduced.

Limited Assurance Report

7. Limited Assurance Report

Independent Auditor's Assurance Report on selected information of the European Union (EU)

To the Directorate General for Budget of the European Commission (DG Budget)

In accordance with our agreed terms of engagement dated 25 July 2022 and 27 July 2023, we have completed our limited assurance engagement to report on the preparation of the selected information for the NextGenerationEU (NGEU) green bonds (ISIN: EU000A3K4C42, EU000A3K4DG1, EU000A3K4DM9 and EU000A3K4DW8) of the EU prepared by the DG Budget (Selected Information) and contained in Annex III: "Allocation of NGEU Green Bond proceeds by Member State, category and intervention field" and Table 11: "Realised impact per expenditure category" under section 5 "Climate Impact of NGEU Green Bond proceeds" in the EU's NGEU Green Bonds Allocation and Impact Report. The applicable criteria on the basis of which the DG Budget has prepared the Selected Information are described in the Annex I: "Evaluation and selection of eligible NGEU Green Bond measures" and Annex VI: "Impact methodologies per Intervention Fields" in the NGEU Green Bonds Allocation and Impact Report (Basis of Preparation).

Responsibility of the DG Budget for the Selected Information

The DG Budget is responsible for the preparation of the Selected Information on the basis of the applicable criteria described in the Basis of Preparation.

Our independence and quality management

We have complied with the independence and other ethical requirements of the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants (IESBA) and as adopted for Luxembourg by the *Commission de Surveillance du Secteur Financier* (CSSF), which is founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behavior.

Our firm applies International Standard on Quality Management 1, as adopted for Luxembourg by the CSSF, which requires the firm to design, implement and operate a system of quality management including policies or procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Inherent limitations

The absence of a significant body of established practice on which to draw to evaluate and measure non-financial information allows for different, but acceptable, measures and measurement techniques and can affect comparability between entities.

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Cabinet de révision agréé. Expert-comptable (autorisation gouvernementale n°10028256)
R.C.S. Luxembourg B 65 477 - TVA LU25482518

Responsibilities of the Réviseur d'entreprises agréé

Our responsibility is to express a limited assurance conclusion on the Selected Information based on the procedures we have performed and the evidence we have obtained. We conducted our limited assurance engagement in accordance with International Standard on Assurance Engagements 3000 (Revised) 'Assurance Engagements other than Audits or Reviews of Historical Financial Information', as issued by the International Auditing and Assurance Standards Board (IAASB) and as adopted for Luxembourg by the *Institut des Réviseurs d'Entreprises* (IRE) and in accordance with the Luxembourg legislation and with the professional standards issued by the IRE.

This standard requires that we plan to perform our work to obtain limited assurance as to whether the Selected Information were prepared by the DG Budget, in all material respects, in accordance with the Basis of Preparation.

The procedures performed in a limited assurance engagement vary in nature and timing from, and are less in extent than for, a reasonable assurance engagement. Consequently, the level of assurance obtained in a limited assurance engagement is substantially lower than the assurance that would have been obtained had a reasonable assurance engagement been performed.

The selection of such procedures depends on our professional judgment, including the assessment of the risks of management's assertion being materially misstated. The scope of our work comprised, among others, of the following procedures:

- assessing and testing the design and functioning of the systems and processes used for data-gathering, collection, consolidation and validation, including the methods used for calculating and estimating the information and data presented in the Selected Information;

- conducting interviews with responsible officers; and

- inspecting internal and external documentation.

We have evaluated the Selected Information against the Basis of Preparation. The accuracy and completeness of the Selected Information are subject to limitations given their nature and the methods for determining, calculating, or estimating such information.

We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our conclusion.

Limited assurance conclusion

Based on the procedures we have performed and the evidence we have obtained, nothing has come to our attention that causes us to believe that the Selected Information has not been prepared, in all material respects, in accordance with the Basis of Preparation.

Restriction of use and distribution of the report

This report, including the opinion, has been prepared for and only for the DG Budget in accordance with the terms of our engagement letters and is not suitable for any other purpose. We do not accept any responsibility to any other party to whom it may be distributed.

PricewaterhouseCoopers, Société coopérative — Luxembourg, 28 November 2023

Represented by

Electronically signed by:
Malik Lekehal

Malik Lekehal

EUROPEAN
COMMISSION

Brussels, 1.12.2023
SWD(2023) 405 final

PART 2/2

COMMISSION STAFF WORKING DOCUMENT

NGEU Report 2023
Green Bonds - Impact and Allocation report

Annexes

8. Annexes

Annex I: Evaluation and selection of eligible NGEU Green Bond measures

The Commission has put in place a robust multi-level framework of control and assessment procedures to determine whether individual measures will receive financing from NGEU Green Bonds. These processes and associated results for 2023 are described here.

RECOVERY AND RESILIENCE PLAN ASSESSMENT

All Member States submit RRPs to the Commission, listing planned investments under the RRF and their expected cost. Of these investments, at least 37% of the value of the RRP must be invested into measures combating climate change or adapting to it, with many Member States striving to do even more.

All the national RRPs are assessed for compliance with the eligibility and assessment criteria under the RRF Regulation. The criteria of particular relevance from a NGEU Green Bond perspective are: a) whether the measure is correctly assigned to the notified intervention field, which in turn determines the corresponding climate coefficient of 40% and 100%; b) whether the measures comply with the 'DNSH' principle as defined in Article 17 of the EU Taxonomy Regulation[25] and specific RRF-related guidance[26]; and c) whether the measures are consistent with National Energy and Climate Plans. The assessment also ensures that appropriate milestones and targets are agreed, allowing the Commission to track the implementation of the measures in a meaningful and rigorous way.

Following a positive assessment by the Commission, the RRPs are adopted by the Council through a Council Implementing Decision, which sets out the reforms and investments to be implemented, the milestones and targets to be reached, and the amount of funding to be released if specific sets of milestones/targets are met.

SECOND 'DUE DILIGENCE' SCREENING OF NGEU ELIGIBLE EXPENDITURES

Following the adoption of the RRPs by the Council, all climate-relevant measures in the RRPs are subject to an additional due diligence exercise by Commission services prior to being admitted to the NGEU Green Bond eligibility pool of measures that will receive financing from NGEU Green Bonds. The due diligence exercise aims to ensure that individual projects financed by NGEU Green Bonds are in line with the strict standards and the prudent approach that investors expect with respect to their climate relevance and impact. It is important to stress that the criteria for inclusion in the NGEU Green Bond eligibility pool come on top of the criteria applied to determine whether measures contribute to climate objectives. This means that inclusion of a measure in the NGEU Green Bond eligibility pool has no impact on the attribution of climate intervention fields in the context of the RRF Regulation.

[25] EU taxonomy for sustainable activities (europa.eu)

[26] Commission Notice Technical guidance on the application of 'do no significant harm' under the Recovery and Resilience Facility Regulation 2021/C 58/01.

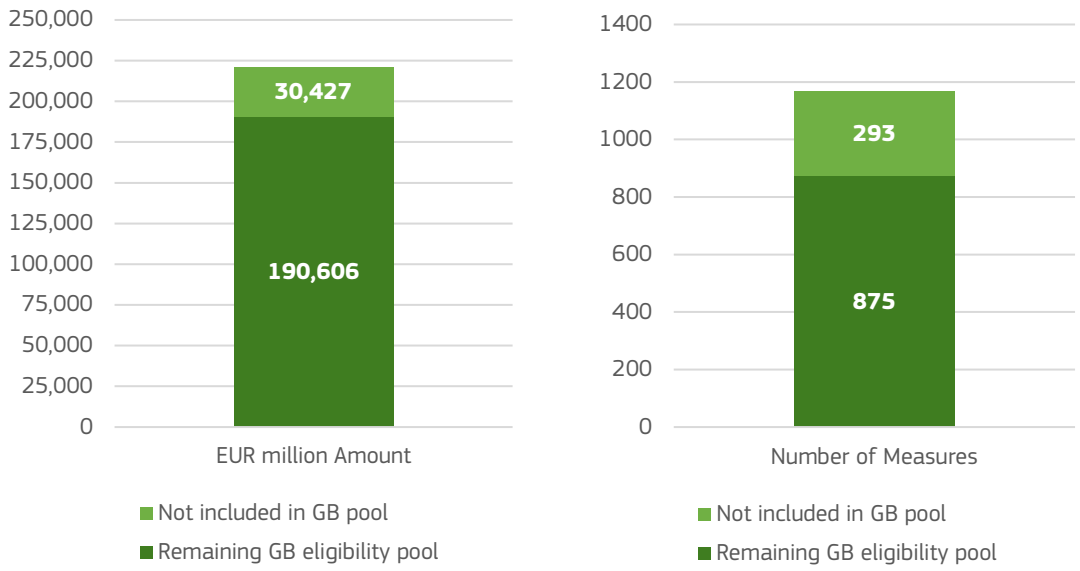
Figure 1: The due diligence process

For measures to be admitted to the final NGEU Green Bond pool of eligible expenditures, a multi-step due diligence process has been developed. In the first step, based on the structured information in national RRPs, every single measure as well as every intervention field is given a risk score on the basis of pre-defined risk factors. This scoring is based on nine risk factors at the level of the assigned intervention fields and ten risk factors at the level of individual measures. For example, if there is a chance that a measure might have a link with natural gas (which is excluded from financing from NGEU Green Bonds), the measure receives a high risk score. Based on this scoring, measures are divided in three groups:

1) measures that are well defined in terms of the precise investment they entail and where the probability is very high that the original assessment for the purpose of approving the RRP can be relied on also for NGEU Green Bond eligibility; those measures are considered eligible,
2) measures that require additional in-depth review (because the risk score for either the intervention field or the individual measure was too high or both) and
3) measures for which the initial risk was considered too high and who were directly considered ineligible.

In the second step, a thorough in-depth analysis is conducted on all the measured that require an additional check. From an initial pool of 1,168 measures, 875 measures corresponding to almost EUR 190.6 billion have been included in the final pool of measures eligible for financing from NGEU Green Bonds, resulting in a NGEU Green Bond pool that allows for a high level of investor confidence.

Figure 2: Summary of the results of the due diligence process



Annex II: The pool of eligible expenditures per intervention field

Table 1: NGEU Green Bonds Eligible Amount

Row Labels	Max of NGEU green bond Eligibility Coefficient	Number of NGEU green bonds Eligible Measures	Sum of NGEU green bonds Eligible Amount, in EUR
Clean energy & network	**100%**	**124**	**31,205,299,035**
SDG 7, SDG 13			
Climate change mitigation			
028 - Renewable energy: wind	100%	12	2,013,948,000
029 - Renewable energy: solar	100%	33	9,379,687,678
030bis - Renewable energy: biomass with high GHG savings	100%	6	2,034,743,333
031 - Renewable energy: marine	100%	2	3,687,000,000
032 - Other renewable energy (including geothermal energy)	100%	27	3,730,246,994
033 - Smart Energy Systems (including smart grids and ICT systems) and related storage.	100%	38	9,961,204,504
034bis0 - High efficiency co-generation, efficient district heating and cooling with low lifecycle emissions	100%	6	398,468,526
Clean transport & infrastructure	**100%**	**239**	**64,693,956,318**
SDG 9, SDG 11			
Climate change mitigation			
063bis - Digitalisation of transport when dedicated in part to GHG emissions reduction: road	40%	2	71,960,000
064 - Newly built or upgraded railways - TEN-T core network	100%	16	18,086,851,177
065 - Newly built or upgraded railways - TEN-T comprehensive network	100%	6	4,649,330,000
066 - Other newly or upgraded built railways	40%	3	111,664,000
066bis - Other newly or upgraded built railways – electric/zero emission	100%	3	929,757,757
067 - Reconstructed or modernised railways - TEN-T core network	100%	6	908,023,979
068 - Reconstructed or modernised railways - TEN-T comprehensive network	100%	11	8,219,165,155

Row Labels	Max of NGEU green bond Eligibility Coefficient	Number of NGEU green bonds Eligible Measures	Sum of NGEU green bonds Eligible Amount, in EUR
069 - Other reconstructed or modernised railways	40%	11	1,166,137,652
069bis - Other reconstructed or modernised railways – electric/zero emission	100%	9	2,586,198,148
070 - Digitalisation of transport: rail	40%	17	752,909,377
071 - European Rail Traffic Management System (ERTMS)	40%	8	1,338,464,000
072bis - Mobile zero emission/electric powered rail assets	100%	12	3,557,472,280
073 - Clean urban transport infrastructure	100%	22	7,381,178,611
074 - Clean urban transport rolling stock	100%	30	5,277,145,581
075 - Cycling infrastructure	100%	18	1,717,306,148
076bis - Digitalisation of transport when dedicated in part to GHG emissions reduction: urban transport	40%	2	3,860,000
077 - Alternative fuels infrastructure	100%	44	3,575,484,704
078 - Multimodal transport (TEN-T)	40%	2	95,832,000
079 - Multimodal transport (not urban)	40%	3	78,497,600
082bis - Inland waterways and ports (TEN-T) excluding facilities dedicated to transport of fossil fuels	40%	1	8,160,000
084bis - Digitising transport when dedicated in part to GHG emissions reduction: other transport modes	40%	1	14,480,000
ADHOC - Ad hoc intervention field	100%	12	4,164,078,150
Climate change adaptation	**100%**	**57**	**11,760,281,770**
SDG 13			
Climate change adaptation			
035 - Adaptation to climate change measures and prevention and management of climate related risks: floods (including awareness raising, civil protection and disaster management systems, infrastructures and ecosystem-based approaches)	100%	21	8,037,912,586

Row Labels	Max of NGEU green bond Eligibility Coefficient	Number of NGEU green bonds Eligible Measures	Sum of NGEU green bonds Eligible Amount, in EUR
036 - Adaptation to climate change measures and prevention and management of climate related risks: fires (including awareness raising, civil protection and disaster management systems, infrastructures and ecosystem-based approaches)	100%	15	1,381,107,049
037 - Adaptation to climate change measures and prevention and management of climate related risks: others, e.g., storms and drought (including awareness raising, civil protection and disaster management systems, infrastructures and ecosystem-based approaches)	100%	21	2,341,262,135
Digital technologies supporting the green transition	**100%**	**10**	**402,970,079**
SDG 8, SDG 9			
Climate change mitigation			
010ter - Digitising SMEs or large enterprises (including e-Commerce, e-Business and networked business processes, digital innovation hubs, living labs, web entrepreneurs and ICT start-ups, B2B) compliant with GHG emission reduction or energy efficiency criteria	100%	1	330,000
011bis - Government ICT solutions, e-services, applications compliant with GHG emission reduction or energy efficiency criteria	40%	6	187,009,279
055bis - ICT: Other types of ICT infrastructure (including large-scale computer resources/equipment, data centres, sensors, and other wireless equipment) compliant with the carbon emission reduction and energy efficiency criteria.	40%	3	215,630,800
Energy efficiency	**100%**	**226**	**49,262,056,890**
SDG 9, SDG 11			
Climate change mitigation			
024 - Energy efficiency and demonstration projects in SMEs and supporting measures	40%	9	198,326,852
024bis - Energy efficiency and demonstration projects in large enterprises and supporting measures	40%	2	13,478,694

Row Labels	Max of NGEU green bond Eligibility Coefficient	Number of NGEU green bonds Eligible Measures	Sum of NGEU green bonds Eligible Amount, in EUR
024ter - Energy efficiency and demonstration projects in SMEs or large enterprises and supporting measures compliant with energy efficiency criteria	100%	18	3,682,071,655
025 - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures	40%	16	676,949,234
025bis - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures compliant with energy efficiency criteria	100%	33	28,958,826,062
025ter - Construction of new energy efficient buildings	40%	57	3,956,993,998
026 - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures	40%	34	1,969,982,534
026bis - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures compliant with energy efficiency criteria [6]	100%	57	9,805,427,862
Nature protection, rehabilitation and biodiversity	**100%**	**48**	**5,867,904,567**
SDG 6, SDG 14, SDG 15			
The protection and restoration of biodiversity and ecosystems			
049 - Protection, restoration, and sustainable use of Natura 2000 sites.	100%	7	1,145,780,000
050 - Nature and biodiversity protection, natural heritage and resources, green and blue infrastructure	100%	41	4,722,124,567
Other	**100%**	**44**	**4,256,118,393**
N/A			
N/A			
01 - Contributing to green skills and jobs and the green economy	100%	23	663,217,854
027 - Support to enterprises that provide services contributing to the low carbon economy and to resilience to climate change including awareness-raising measures	100%	15	2,253,980,000

Row Labels	Max of NGEU green bond Eligibility Coefficient	Number of NGEU green bonds Eligible Measures	Sum of NGEU green bonds Eligible Amount, in EUR
047 - Support to environmentally friendly production processes and resource efficiency in SMEs	40%	1	620,000
048 - Air quality and noise reduction measures	100%	5	1,338,300,539
Research and innovation activities supporting the green transition	**100%**	**61**	**11,018,668,481**
SDG 8, SDG 11, SDG 12			
All objectives			
022 - Research and innovation processes, technology transfer and cooperation between enterprises focusing on the low carbon economy, resilience and adaptation to climate change	100%	50	9,640,558,519
023 - Research and innovation processes, technology transfer and cooperation between enterprises focusing on circular economy	100%	11	1,378,109,962
Water supply & waste management	**100%**	**66**	**12,138,876,319**
SDG 6, SDG 11, SDG 12			
Sustainable use and protection of water and marine resources, Transition to a circular economy, waste prevention and recycling			
039bis - Provision of water for human consumption (extraction, treatment, storage and distribution infrastructure, efficiency measures, drinking water supply) compliant with efficiency criteria	100%	6	1,573,325,057
040 - Water management and water resource conservation (including river basin management, specific climate change adaptation measures, reuse, leakage reduction)	100%	23	3,485,585,111
041bis - Waste water collection and treatment compliant with energy efficiency criteria	100%	6	1,199,000,000
042 - Household waste management: prevention, minimisation, sorting, reuse, recycling measures	100%	17	4,427,270,089
044 - Commercial, industrial waste management: prevention, minimisation, sorting, reuse, recycling measures	100%	6	786,123,040
045bis - Use of recycled materials as raw materials compliant with the efficiency criteria	100%	4	370,789,148
046bis - Rehabilitation of industrial sites and contaminated land compliant with efficiency criteria	100%	4	296,783,874
Grand Total	**100%**	**875**	**190,606,131,852**

Annex III: Allocation of NGEU Green Bond proceeds by Member State, category and intervention field

Table 1: NGEU Green Bond eligible reported expenditure (in EUR million)

	AT	HR	CY	CZ	DK	FR	EL	IT	LT	LU	PT	SK	SI	ES	Grand Total *(EUR million)*
Clean energy & network	32	0	0	143	0	0	281	0	19	0	0	0	0	0	475
029 - Renewable energy: solar	0	0	0	0	0	0	62	0	0	0	0	0	0	0	62
030bis - Renewable energy: biomass with high GHG savings	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
032 - Other renewable energy (including geothermal energy)	20	0	0	143	0	0	0	0	0	0	0	0	0	0	164
033 - Smart Energy Systems (including smart grids and ICT systems) and related storage.	0	0	0	0	0	0	219	0	19	0	0	0	0	0	238
034bis0 - High efficiency co-generation, efficient district heating and cooling with low lifecycle emissions	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10
Clean transport & infrastructure	175	0	0	23	23	3,811	0	4,500	0	0	123	0	89	243	8,987
064 - Newly built or upgraded railways - TEN-T core network	173	0	0	0	0	0	0	3,154	0	0	0	0	0	96	3,423
065 - Newly built or upgraded railways - TEN-T comprehensive network	0	0	0	0	0	0	0	22	0	0	0	0	89	48	159
066bis - Other newly or upgraded built railways – electric/zero emission	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2

	AT	HR	CY	CZ	DK	FR	EL	IT	LT	LU	PT	SK	SI	ES	Grand Total *(EUR million)*
068 - Reconstructed or modernised railways - TEN-T comprehensive network	0	0	0	0	0	3,550	0	888	0	0	0	0	0	0	4,438
069 - Other reconstructed or modernised railways	0	0	0	15	0	116	0	2	0	0	0	0	0	0	134
069bis - Other reconstructed or modernised railways – electric/zero emission	0	0	0	0	0	0	0	0	0	0	0	0	0	65	65
070 - Digitalisation of transport: rail	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
071 - European Rail Traffic Management System (ERTMS)	0	0	0	0	0	0	0	24	0	0	0	0	0	0	24
072bis - Mobile zero emission/electric powered rail assets	0	0	0	0	0	0	0	68	0	0	0	0	0	0	68
073 - Clean urban transport infrastructure	0	0	0	0	0	91	0	126	0	0	123	0	0	0	340
074 - Clean urban transport rolling stock	0	0	0	0	0	0	0	150	0	0	0	0	0	0	150
075 - Cycling infrastructure	0	0	0	7	22	0	0	66	0	0	0	0	0	0	95
077 - Alternative fuels infrastructure	0	0	0	1	0	53	0	0	0	0	0	0	0	31	86
078 - Multimodal transport (TEN-T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Climate change adaptation	0	14	2	89	0	39	18	1,008	0	0	23	0	0	30	1,222

	AT	HR	CY	CZ	DK	FR	EL	IT	LT	LU	PT	SK	SI	ES	Grand Total *(EUR million)*
035 - Adaptation to climate change measures and prevention and management of climate related risks: floods (including awareness raising, civil protection and disaster management systems, infrastructures and ecosystem-based approaches)	0	14	2	0	0	0	0	1,008	0	0	0	0	0	6	1,030
036 - Adaptation to climate change measures and prevention and management of climate related risks: fires (including awareness raising, civil protection and disaster management systems, infrastructures and ecosystem-based approaches)	0	0	0	0	0	0	0	0	0	0	23	0	0	2	25
037 - Adaptation to climate change measures and prevention and management of climate related risks: others, e.g., storms and drought (including awareness raising, civil protection and disaster management systems, infrastructures and ecosystem-based approaches)	0	0	0	89	0	39	18	0	0	0	0	0	0	22	167
Digital technologies supporting the green transition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	AT	HR	CY	CZ	DK	FR	EL	IT	LT	LU	PT	SK	SI	ES	Grand Total *(EUR million)*
011bis - Government ICT solutions, e-services, applications compliant with GHG emission reduction or energy efficiency criteria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
055bis - ICT: Other types of ICT infrastructure (including large-scale computer resources/equipment, data centres, sensors, and other wireless equipment) compliant with the carbon emission reduction and energy efficiency criteria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy efficiency	0	1	7	0	12	1,178	601	7,900	0	0	98	0	0	1	9,797
024 - Energy efficiency and demonstration projects in SMEs and supporting measures	0	0	0	0	0	3	0	0	0	0	0	0	0	1	4
024bis - Energy efficiency and demonstration projects in large enterprises and supporting measures	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
025 - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures	0	0	0	0	0	0	0	5	0	0	0	0	0	0	5
025bis - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures compliant with energy efficiency criteria	0	0	4	0	12	860	596	7,533	0	0	77	0	0	0	9,082

	AT	HR	CY	CZ	DK	FR	EL	IT	LT	LU	PT	SK	SI	ES	Grand Total *(EUR million)*
025ter - Construction of new energy efficient buildings	0	0	1	0	0	0	0	33	0	0	4	0	0	0	39
026 - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures	0	0	0	0	0	0	4	329	0	0	0	0	0	0	334
026bis - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures compliant with energy efficiency criteria	0	1	2	0	0	315	0	0	0	0	17	0	0	0	334
Nature protection, rehabilitation, and biodiversity	0	0	0	26	0	15	0	3	0	1	2	0	0	44	91
049 - Protection, restoration, and sustainable use of Natura 2000 sites.	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
050 - Nature and biodiversity protection, natural heritage and resources, green and blue infrastructure	0	0	0	26	0	15	0	3	0	1	2	0	0	43	89
Other	0	2	0	0	0	0	194	0	0	0	0	0	0	26	221
01 - Contributing to green skills and jobs and the green economy	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2

	AT	HR	CY	CZ	DK	FR	EL	IT	LT	LU	PT	SK	SI	ES	Grand Total *(EUR million)*
027 - Support to enterprises that provide services contributing to the low carbon economy and to resilience to climate change including awareness-raising measures	0	0	0	0	0	0	194	0	0	0	0	0	0	0	194
048 - Air quality and noise reduction measures	0	0	0	0	0	0	0	0	0	0	0	0	0	26	26
Research and innovation activities supporting the green transition	0	0	0	0	1	0	0	13	0	0	0	0	0	54	68
022 - Research and innovation processes, technology transfer and cooperation between enterprises focusing on the low carbon economy, resilience, and adaptation to climate change	0	0	0	0	1	0	0	8	0	0	0	0	0	10	19
023 - Research and innovation processes, technology transfer and cooperation between enterprises focusing on circular economy	0	0	0	0	0	0	0	4	0	0	0	0	0	44	48
Water supply & waste management	0	18	0	62	0	28	28	24	0	0	1	0	0	1	161
039bis - Provision of water for human consumption (extraction, treatment, storage and distribution infrastructure, efficiency measures, drinking water supply) compliant with	0	18	0	0	0	0	0	0	0	0	0	0	0	0	18

	AT	HR	CY	CZ	DK	FR	EL	IT	LT	LU	PT	SK	SI	ES	Grand Total *(EUR million)*
efficiency criteria															
040 - Water management and water resource conservation (including river basin management, specific climate change adaptation measures, reuse, leakage reduction)	0	0	0	62	0	0	0	24	0	0	1	0	0	0	87
041bis - Waste water collection and treatment compliant with energy efficiency criteria	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
042 - Household waste management: prevention, minimisation, sorting, reuse, recycling measures	0	0	0	0	0	28	0	0	0	0	0	0	0	0	28
044 - Commercial, industrial waste management: prevention, minimisation, sorting, reuse, recycling measures	0	0	0	0	0	0	27	0	0	0	0	0	0	0	27
046bis - Rehabilitation of industrial sites and contaminated land compliant with efficiency criteria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	**207**	**35**	**9**	**344**	**35**	**5,070**	**1,121**	**13,447**	**19**	**1**	**247**	**0**	**89**	**398**	**21,022**

Annex IV: co-financing

The tables below show the intervention fields per Member State for which investments financed by NGEU Green Bonds have also received financing from either the Member States' national budget or from conventional (non-green) EU bonds.

Table 1: Co-financing by Member State

Row Labels	Sum of co-financed by Member States *(in EUR)*
Croatia	**46,728**
01 - Contributing to green skills and jobs and the green economy	46,728
Czechia	**50,712,307**
050 - Nature and biodiversity protection, natural heritage and resources, green and blue infrastructure	50,712,307
France	**285,150,000**
025bis - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures compliant with energy efficiency criteria	260,150,000
042 - Household waste management: prevention, minimisation, sorting, reuse, recycling measures	25,000,000
Slovenia	**69,620,000**
065 - Newly built or upgraded railways - TEN-T comprehensive network	69,620,000
Grand Total	**405,529,035**

Table 2: Co-financed by conventional EU bonds

Row Labels	Sum of co-financed by non-green NGEU bonds *(in EUR)*
Austria	**12,000**
055bis - ICT: Other types of ICT infrastructure (including large-scale computer resources/equipment, data centres, sensors and other wireless equipment) compliant with the carbon emission reduction and energy efficiency criteria.	12,000
Croatia	**354,000**
011bis - Government ICT solutions, e-services, applications compliant with GHG emission reduction or energy efficiency criteria	6,000
024bis - Energy efficiency and demonstration projects in large enterprises and supporting measures	348,000
Cyprus	**1,212,000**
025ter - Construction of new energy efficient buildings	1,212,000
Czechia	**23,098,500**
069 - Other reconstructed or modernised railways	23,098,500
France	**179,208,000**
024 - Energy efficiency and demonstration projects in SMEs and supporting measures	4,500,000
069 - Other reconstructed or modernised railways	174,708,000
Greece	**6,762,000**
025ter - Construction of new energy efficient buildings	120,000
026 - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures	6,642,000
Italy	**589,956,000**
025 - Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures	6,762,000
025ter - Construction of new energy efficient buildings	49,860,000
026 - Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures	494,010,000
069 - Other reconstructed or modernised railways	3,546,000
071 - European Rail Traffic Management System (ERTMS)	35,778,000
Portugal	**6,600,000**
025ter - Construction of new energy efficient buildings	6,600,000
Spain	**4,644,000**
024 - Energy efficiency and demonstration projects in SMEs and supporting measures	1,674,000
070 - Digitalisation of transport: rail	2,334,000
078 - Multimodal transport (TEN-T)	636,000
Grand Total	**811,846,500**

Annex V: Alignment with the EU Taxonomy Substantial Contribution Criteria

Examples of EU Taxonomy Substantial Contribution Criteria (SCC) alignment with the RRF intervention fields:

Category	**Full alignment**
Description	The intervention field corresponds to the EU Taxonomy in full substance and criteria.
Example	Intervention field 029 - Renewable energy: solar fully encapsulates and translates to the two activities in EU Taxonomy 4.1 and 4.2 Electricity generation using solar photovoltaic technology. Electricity generation using concentrated solar power (CSP) technology. Even though an intervention field is translated to two activities there is no loss of scope or misalignment of criteria.
Category	**Compliant with the main SCC EU Taxonomy condition**
Description	The intervention field corresponds closely with the EU Taxonomy activity, however there are minor insubstantial deviations.
Example	Intervention field 024ter - Energy efficiency and demonstration projects in SMEs or large enterprises and supporting measures compliant with energy efficiency criteria (3) corresponds closely to EU Taxonomy activity 7.2. Renovation of existing buildings. Though not so immediately obvious but nonetheless a significant divergence is in the additional quantifiable criteria, where the EU Taxonomy demand 30% reduction in Primary Energy Demand, while the RRF demands the 30% reduction of direct and indirect GHG emissions. Conditions are divergent, but thematically interlinked.
Category	**Compliant with some SCC EU Taxonomy conditions**
Description	The Intervention field might only in part reference EU Taxonomy activities (or vice versa), while missing key criteria or areas of substance.
Example	Intervention field 041bis – Waste water collection and treatment compliant with energy efficiency criteria corresponds in principle to EU Taxonomy activities 5.3. - Construction, extension and operation of waste water collection and treatment and 5.4. - Renewal of waste water collection and treatment. The conditions under the RRF were based on the draft version of the EU Taxonomy available at the time of drafting and adoption of the RRF Regulation. Hence, for instance for activity 5.4, the main SCC criteria of an energy reduction target in the RRF is 10% overall while the EU Taxonomy mandates 20% for specific components. This is a key factor of misalignment.. It is important to stress that there are cases, where RRF has both stricter and less strict criteria than the EU Taxonomy given that the EU Taxonomy went through several more iterations after the RRF regulation was agreed.

Category	**Not aligned**
Description	The intervention field is not aligned with an activity in the EU Taxonomy, which means that the EU Taxonomy does mention these climate prevention actions, directly or just as a minor reference/footnote, but this vague or indistinctive mention could not reasonably be labelled under any other level of alignment. These intervention fields are rare, as the RRF's climate tracking methodology was designed while taking the EU Taxonomy into account where relevant and possible.
Example	Intervention field 063bis – Digitalisation of transport when dedicated in part to GHG emissions reduction: road is related, in principle, to the EU Taxonomy activities 6.3. Urban and suburban transport, road passenger transport and 6.6. Freight transport services by road. These two activities both have some elements of improving road infrastructure, but neither of them indicate any exclusive reference to digitalisation with the intention of GHG reduction but instead focus on infrastructure construction standards. We conclude that measures included under NGEU are covered by the EU Taxonomy as digitalisation of road is part of freight road construction sector, but this link is very insignificant and not specific.
Category	**Not covered**
Description	Intervention fields include measures with no corresponding activities in the EU Taxonomy, which supports the argument that in some cases NGEU considers larger scope of climate action.
Example	Intervention field *01 – Contributing to green skills and jobs and the green economy* is not related to any activity. Even though there is a chapter in the EU Taxonomy on education, it relates more to the upgrade and adaptation of education and academic infrastructure. There is no activity in the EU Taxonomy to cover specialized trainings on green economy. Also, to mention that we considered *Not covered intervention* fields to be in regard to biodiversity protection and air quality, which is part of standard DNSH criteria, but otherwise lacking any sort of reference within SCC of activities, at the time of assessment, making them *Not Covered* and not *Not Aligned*.

Annex VI: Impact methodologies per Intervention Fields

FROM GREEN BOND INVESTMENT TO CLIMATE IMPACT – IN DETAIL

The approach for determining impact focuses on the level of the intervention field, since this provides the most granular result while allowing for aggregation across key areas. The analysis establishes the total potential output and related impact per intervention field for the entire programme's length, i.e. in a scenario of full implementation, essentially establishing target values. Realised impacts are then derived on the basis of achievements of milestones and targets until the cut-off date of the report.

DEFINING OUTPUT INDICATORS

To develop output indicators, the approach aggregates outputs from all RRF measures under a single intervention field to provide a full-overview reporting.

As several RRF measures and sub-measures are encompassed by a single intervention field (IF), to create a singular output indicator, it is necessary to collect data from all milestones and targets associated with the measures in each intervention field. Hence the methodology to determine impact is based on a detailed bottom-up analysis of milestones and targets related to the measures classified under each intervention field. This exercise concerns converting as many of the measures as possible into a quantifiable output indicator. As part of this process measures are screened and classified as "unusable" (e.g. because they do not provide output information) or "usable" for use in the aggregation of the output indicator.

For example, in the case of railway related measures, this approach entails defining output indicators for all the railway related measures present across 10 different intervention fields (e.g. kilometres of railways either build, upgraded or digitised as well as corresponding infrastructure, such as stations and/or crossings). Once measures that can be included in this quantification are defined, aggregation of outputs to a single output number per intervention field is possible, thereby identifying the expected quantifiable output under that intervention field, based on full completion of milestones and targets. This number serves as the output indicator's target, excluding however non-quantifiable measures.

The chosen output indicators are based on advice from experts in the field (Carbone 4) who have also validated the methodology used. Nonetheless, the estimation of single output indicators across different investment areas entails methodological challenges, restrictions and underlying assumptions which need to be accounted for when interpreting the final results.

TRANSLATING OUTPUT INDICATOR TO IMPACT INDICATORS

For the intervention fields where output indicators have been established, the "output to impact translation methodology" is developed by Carbone 4, based on their experience, market practice, and the most recent studies and academic literature. The methodologies are developed at the level of the intervention field and the focus is on presenting, wherever possible, the GHG avoided through the use of the above output metrics. Many of the intervention fields covered by national RRPs are in standard areas of green investments that are well known and understood (e.g. "energy efficiency", "clean energy & network", "clean transport & infrastructure"). However, some intervention fields are very broad and general (e.g. "support for services to the low carbon economy"). In these areas more innovative methods for translating outputs to impacts are required.

DETERMINING THE REALISED IMPACT

Realised impact is determined on the basis of fulfilled milestones and targets of measures included in the green bonds eligible pool and that make a quantifiable contribution to the chosen output indicator. The achievement of these milestones and targets is linked to the payment requests, with their satisfactory fulfilment assessed by the Commission.

Intermediary targets / milestones may also be taken into account depending on the type of measure. For example, partial implementation of a housing renovation scheme is likely to have an impact at the level of individual units, while a railroad may need to be built entirely for impact. Milestones and targets are associated to a quarterly planning cycle, allowing predictions for the expected timeline of realised impact. This also allows for adjustments to the results and targets in case of delays and non-fulfilment.

Methodology per Intervention Field

The methodology for estimating the climate impacts from investments eligible for green bond expenditure is presented on an intervention field and output-indicator basis. For output indicators that occur in multiple intervention fields, the methodology is presented in the primary applicable intervention field.

Wherever necessary and feasible, the methodologies used for determining the GHG emissions avoided take into account measures' lifecycle emissions as well as emissions caused by their respective implementation.

Unless otherwise stated, the underlying data used for the calculations and the calculations themselves have been implemented on EU Member State level wherever applicable.

The methodologies, which are summarized below, were formulated in collaboration with the external consultant, Carbone 4.

While intervention fields' titles generally indicate which actions are included under the respective intervention field, the nature of the RRF's construction also results in additional measures being covered in this impact report under an intervention field that may not appear fitting. Where this is the case, calculations always rely on methodologies developed for the more appropriate intervention field.

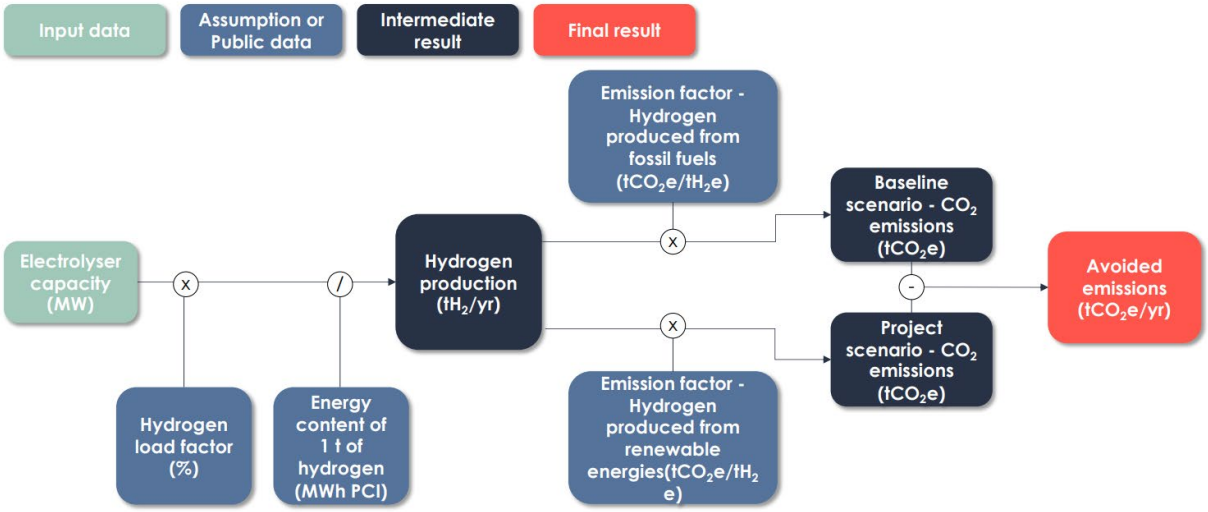
Intervention Field 022

Research and innovation processes, technology transfer and cooperation between enterprises focusing on the low carbon economy, resilience and adaptation to climate change

The impact assessments under this intervention field focused on groups of measures around the production of green hydrogen and measures focusing on zero-emission vehicles.

However due to methodological constraints, measures focusing on financing (basic) research were not part of the analysis of GHG emissions avoided.

Methodology for calculating avoided emissions of new hydrogen production capacity installed:



Assumptions:

- Conversion : It is considered that 1 kg of hydrogen contains 33.6 kWh PCI.
- Load factor: The load factor of an electrolyser is the ratio of the energy actually produced over a given period to the energy it would have produced if it had been operating at its rated power during the same period. We used an average load factor of 60% of the IEA scenarios.
- Emissions factor: Since it is mainly of fossil origin, hydrogen has a very high carbon footprint, with a world average of 15 kgCO2e / kgH2 for dedicated hydrogen production. Hydrogen is considered low-carbon if and only if its carbon footprint is less than or equal to 3 kgCO2e / kgH2, according to the EU Taxonomy. For the calculation of avoided emissions financed by green bonds, the baseline situation consists in fossil hydrogen production and the scenario consists in low-carbon hydrogen production.

Methodology for calculating avoided emissions of zero-emission vehicles:

- Please refer to the methodology for zero-emission vehicles under intervention field ADHOC.
- The relevant measures under this intervention field denote zero-emission vehicle production capacity. For the purpose of impact reporting, the assumption is that these vehicles are actually produced.

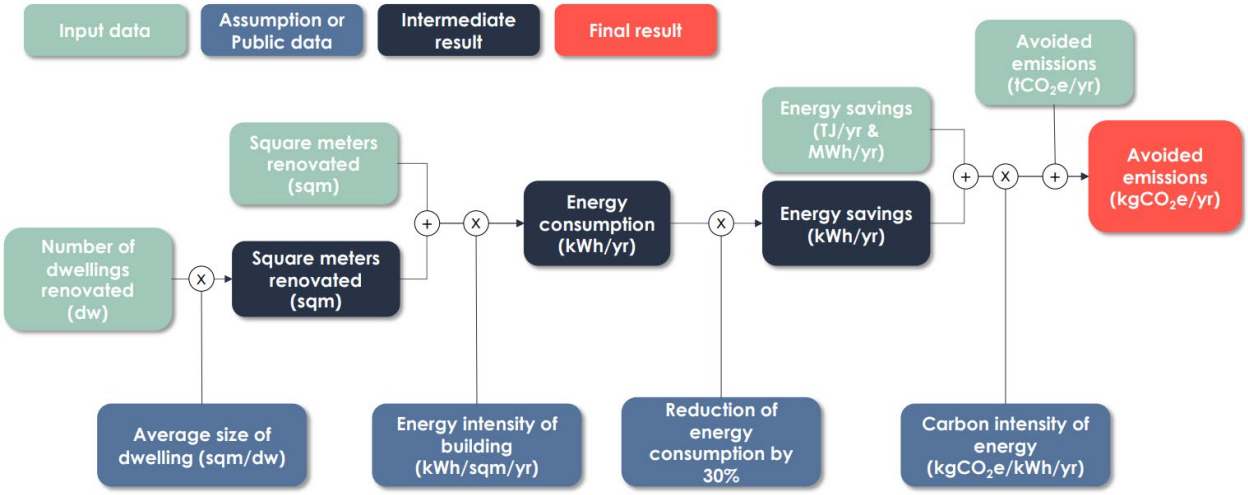
- Avoided emissions are calculated based on the production of electric vehicles for a given year, based on the data provided. The reference value is 100,000 electric vehicles.

Intervention Field 025bis

Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures compliant with energy efficiency criteria

The intervention field focuses exclusively on renovation activities.

Methodology for calculating avoided emissions of building renovation:



Assumptions:

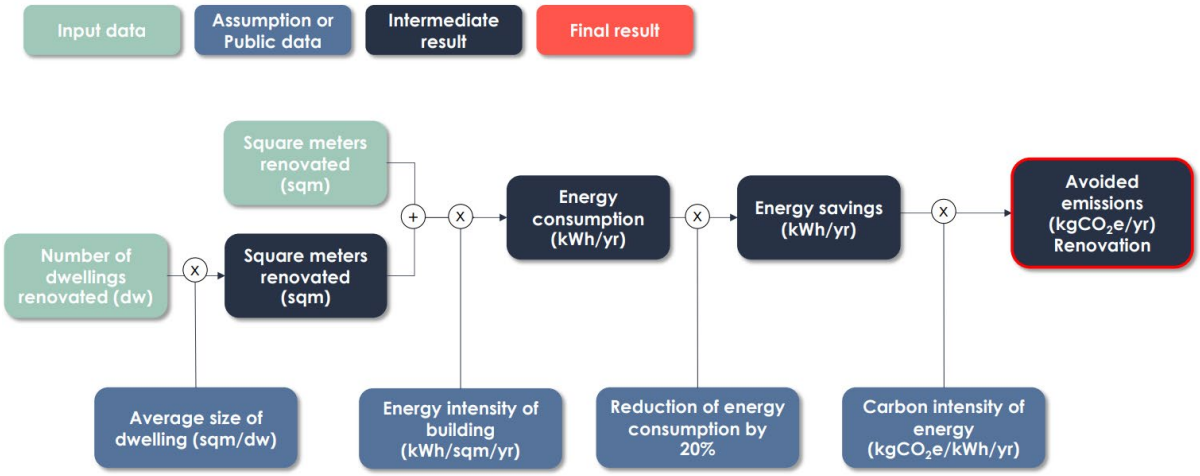
- The calculation differentiates between residential and non-residential buildings.
- Energy intensity of building (kWh/sqm/yr): Based on the CRREM data base, last updated in January 2023, uses an average measure of energy intensity per EU Member State per square meter for both residential buildings (multi-family) and non-residential buildings (office).
- Reduction of energy consumption by 30%: Based the European regulation establishing the RRF, requiring that the measures will achieve, on average, at least a 30% reduction of direct and indirect GHG emissions compared to the ex-ante emissions. Measures are therefore assumed to achieve a 30% reduction as a minimum.
- Carbon intensity of energy (kgCO2/kWh/yr): Based on the CRREM database, last updated in January 2023, uses an average measure of the carbon intensity of energy per EU Member State for both residential buildings (multi-family) and non-residential buildings (office).
- The calculation takes into account the Member State of the project, as well as the type of building that is renovated.

Intervention Field 025ter

Construction of new energy efficient buildings

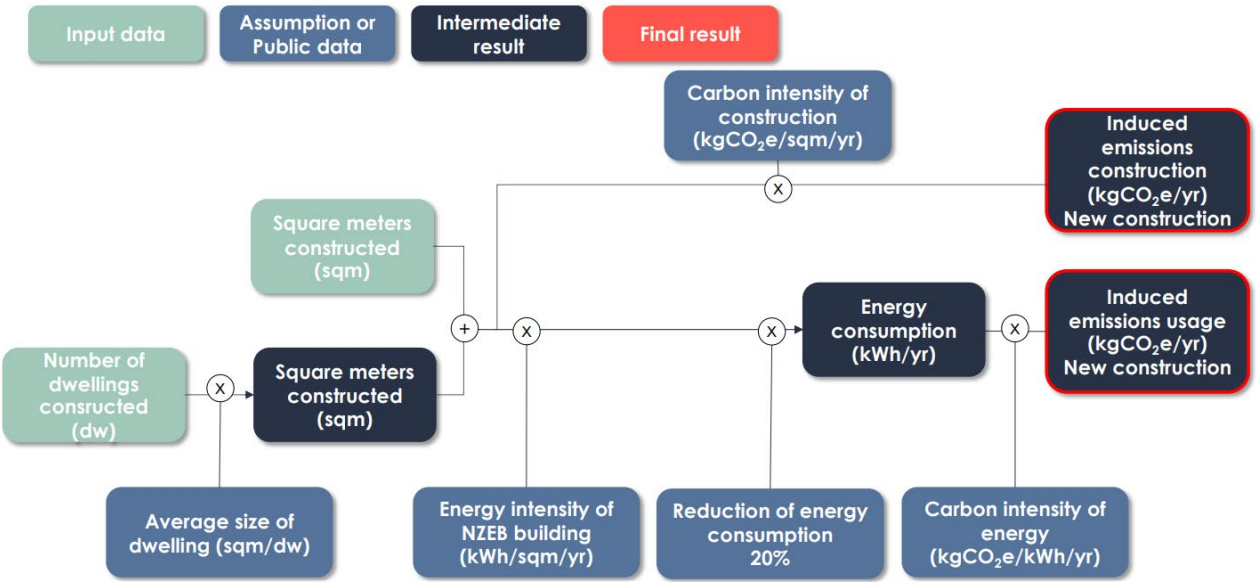
Intervention field 025ter targets the construction of new energy efficient buildings. Milestones and targets associated to the measures that apply this intervention field among others, can in some cases also cover energy efficiency renovation of buildings (categorised under relevant intervention fields).

Methodology for calculating avoided emissions of renovation activities:

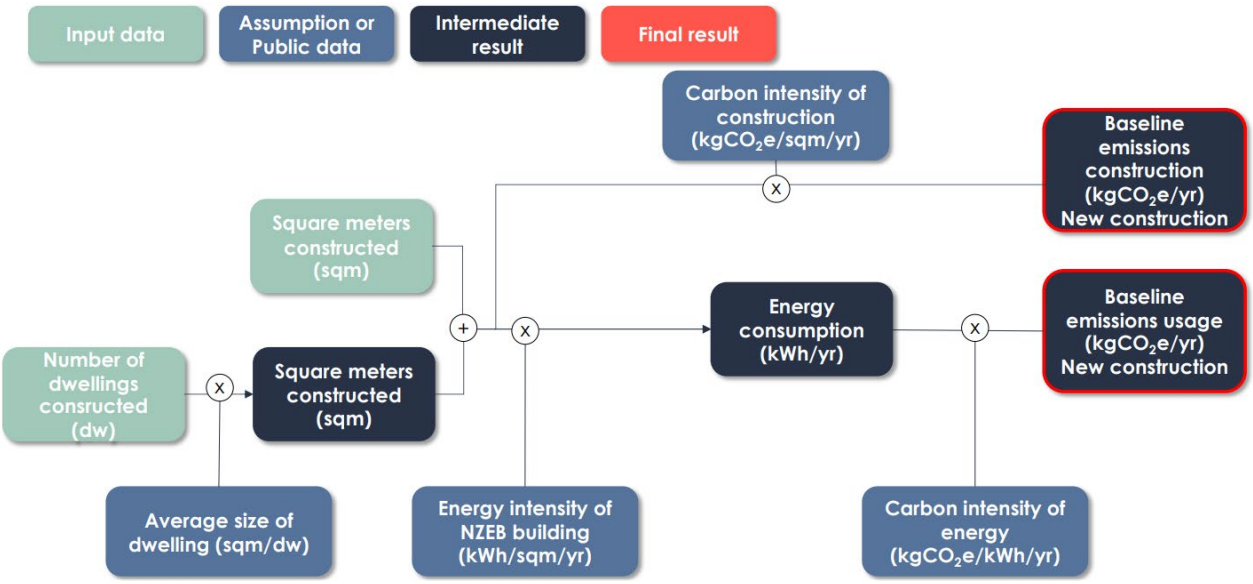


Methodology for calculating avoided emissions of new construction activities:

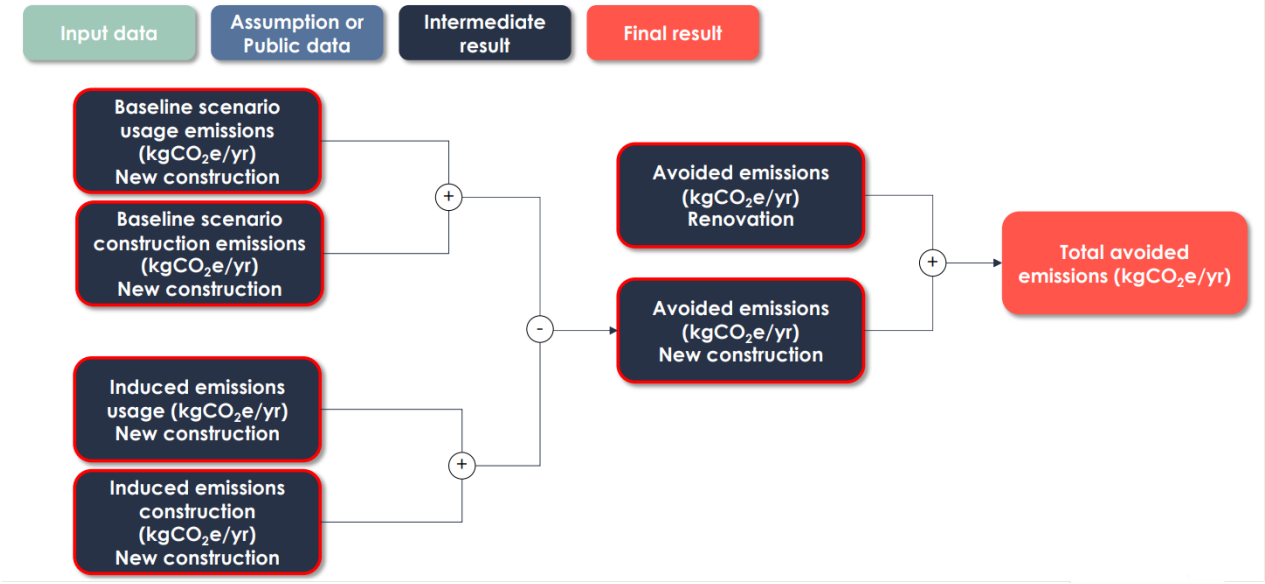
- **Induced emissions: from input to intermediate results**



- **Baseline scenario: from input to intermediate results**



- **Residential and non-Residential: from intermediate results to final results for the entire intervention field**



Assumptions:

- The calculation differentiates between residential and non-residential buildings.
- Emissions avoided result from a 20% energy performance improvement of the operation of the building compared to the NZEB standard.

- Energy intensity of building (kWh/sqm/yr): Based on the CRREM data base, last updated in January 2023, uses an average measure of energy intensity per EU Member State per square meter for both residential buildings (multi-family) and non-residential buildings (office).
- Reduction of energy consumption by 20% (New construction): Based on the European regulation establishing the RRF that the new buildings constructed have a Primary Energy Demand (PED) that is at least 20 % lower than the NZEB requirement (nearly zero-energy building).
- Reduction of energy consumption for renovation by 20%: Assumption in line with the intervention field's requirement of a 20% reduction in Primary Energy Demand (PED) for new buildings.
- Carbon intensity of energy (CO2/kWh/yr): Based on the CRREM database, last updated in January 2023, uses an average measure of the carbon intensity of energy per European country for both residential buildings (multi-family) and non-residential buildings (office). The carbon intensity of buildings was considered constant over the project's lifetime and identical between NZEB buildings and the Member States' building stock.
- Construction carbon intensity (kgCO2e/sqm/yr): Data used for the carbon intensity of construction is based on the carbon intensity of construction in OECD countries when using concrete as the main material.
- Baseline scenario (New construction): The baseline scenario considers that the construction of the buildings would have happened and that the buildings would have achieved a NZEB performance.
- Average size of dwelling (sqm/dw): Based on a 2019 Eurostat dataset named « Average size of dwelling by household type and degree of urbanisation », we used an average size per dwelling per European country for all types of households, all types of urbanization.
- The calculation takes into account the country of the project, as well as the type of building.

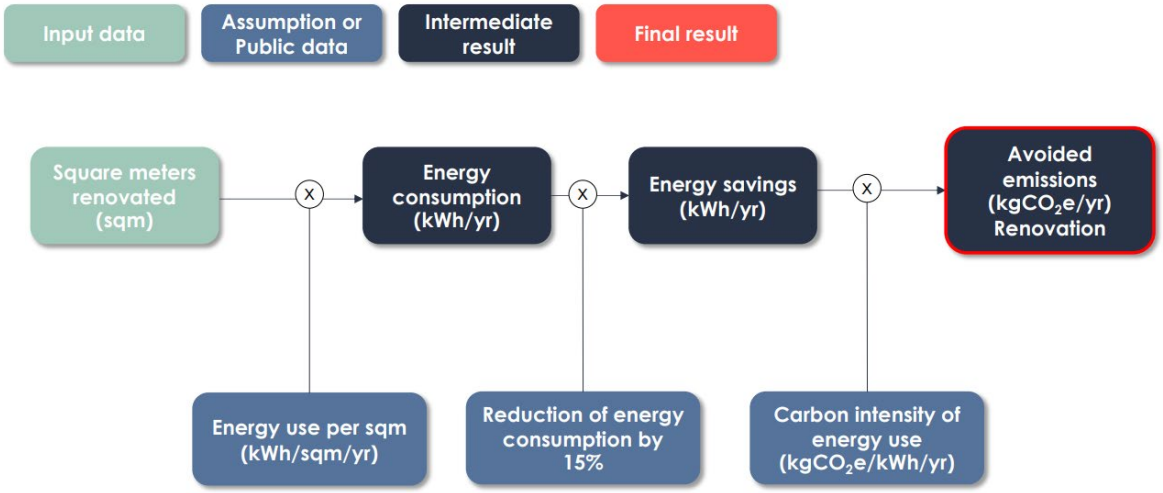
Intervention Field 026

Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures

The intervention field includes projects related to renovation. Milestones and targets associated to the measures that apply this intervention field among others, can in some cases also cover the construction of energy efficient buildings.

Methodology for calculating avoided emissions:

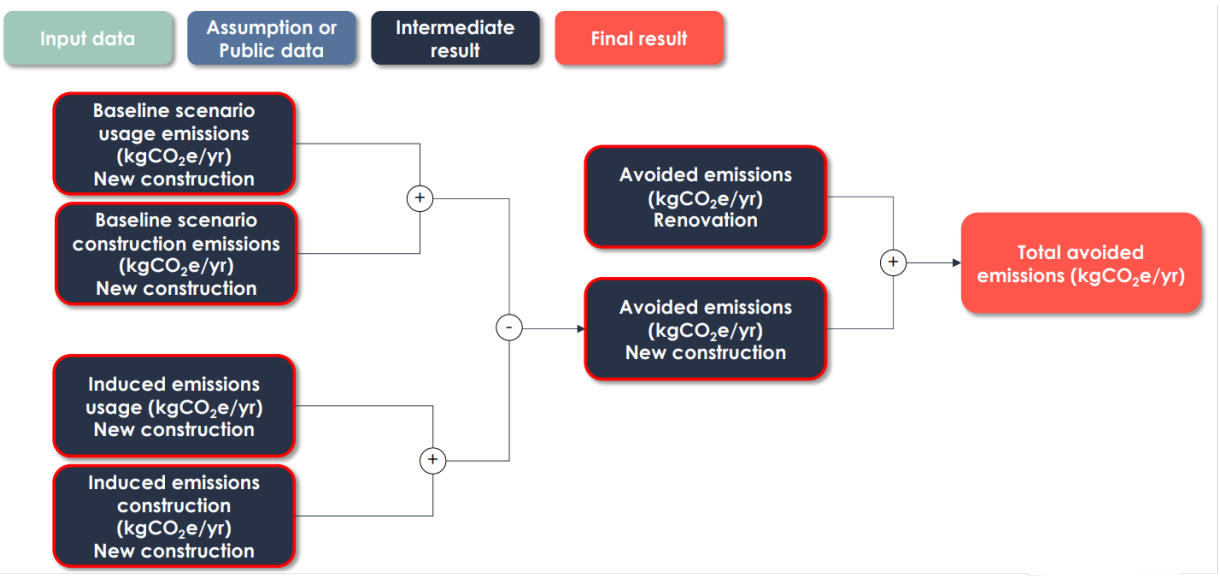
- **Renovation: from input to intermediate results**



- **New construction: from input to intermediate results**

Please refer to the methodology under intervention field 025ter.

- **Renovation and new construction: from intermediary to final results**



Assumptions (Renovation):

- The calculation differentiates between residential and non-residential buildings.
- Energy intensity of building (kWh/sqm/yr): Uses an average measure of energy intensity per EU Member State per square meter for both residential buildings (multi-family) and non-residential buildings (office).
- Reduction of energy consumption by 15% (Renovation): The IF has no objective of energy reduction linked with the projects. It is assumed that projects still produce, on average, an energy reduction of 15% compared to the ex-ante energy use due to falling below the 30% threshold required for other intervention fields but still being required to provide meaningful energy savings.
- Carbon intensity of energy (kgCO2/kWh/yr): Uses an average measure of the carbon intensity of energy per EU Member State for both residential buildings (multi-family) and non-residential buildings (office).
- The calculation takes into account the Member State of the project, as well as the type of building.

Assumptions (new construction):

- Please refer to the methodology under intervention field 025ter.

Intervention Field 026bis

Energy efficiency renovation or energy efficiency measures regarding public infrastructure, demonstration projects and supporting measures compliant with energy efficiency criteria

The intervention field includes renovation. Milestones and targets associated to the measures that apply this intervention field among others, can in some cases also cover the construction of energy efficient buildings.

Methodology for calculating avoided of building construction and renovation:

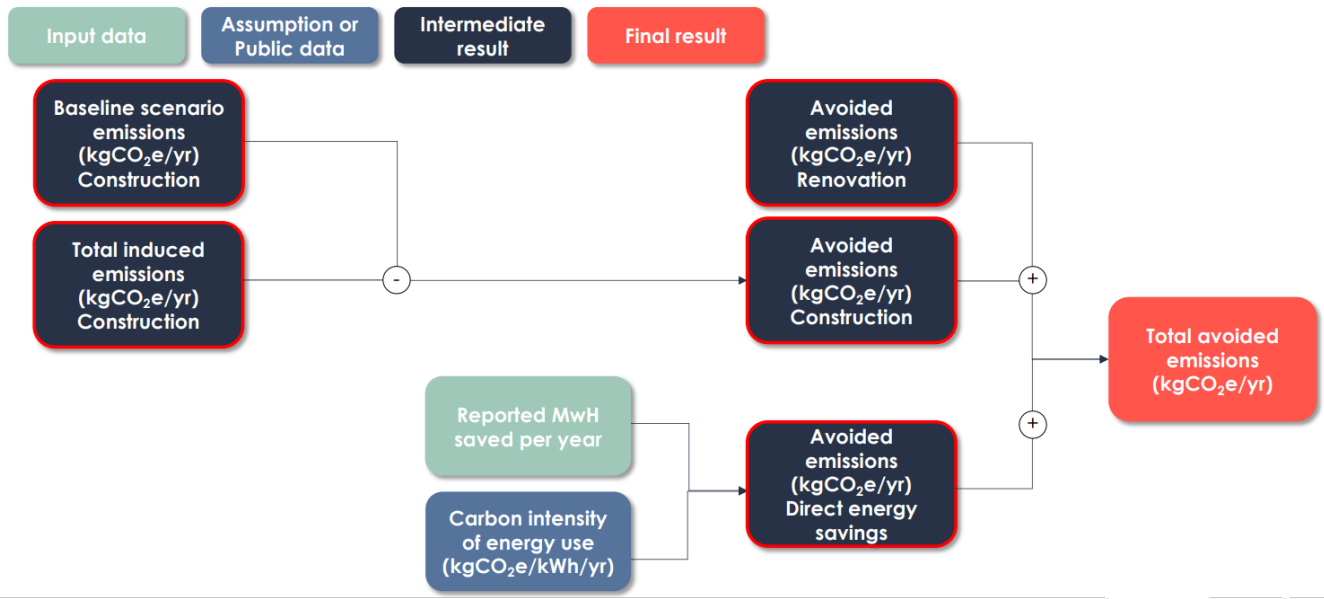
- **renovation activities: from input to intermediate results**

Please refer to the methodology listed under intervention field 025bis.

- **new construction activities: from input to intermediate results**

Please refer to the methodology under intervention field 025ter.

- **renovation and new construction: from intermediate to final results**

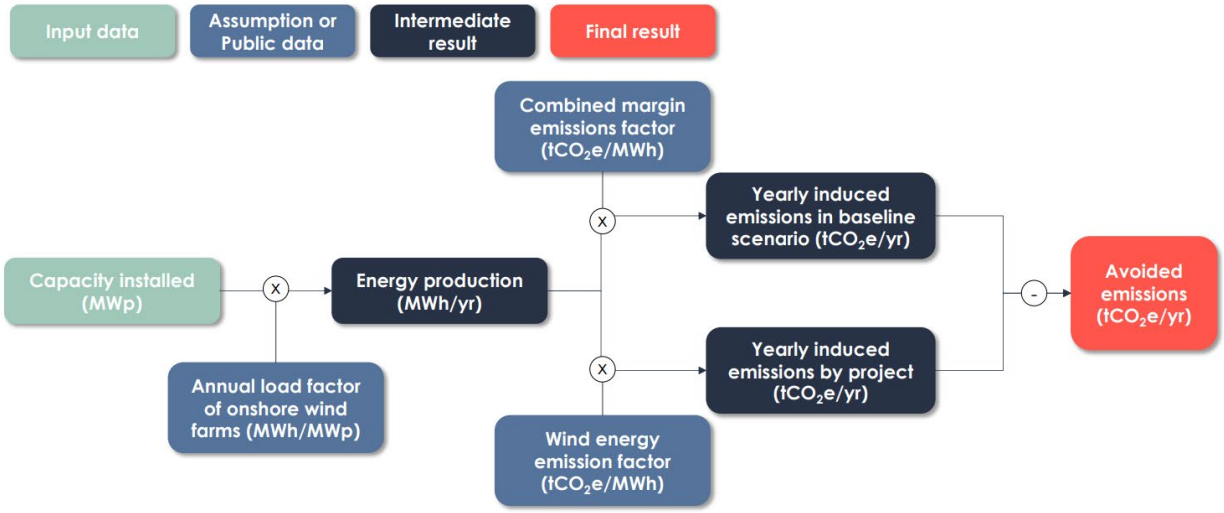


Intervention Field 028

Renewable energy: wind

The intervention field includes onshore and offshore wind energy and wave energy

Methodology for calculating avoided emissions of onshore windfarms:

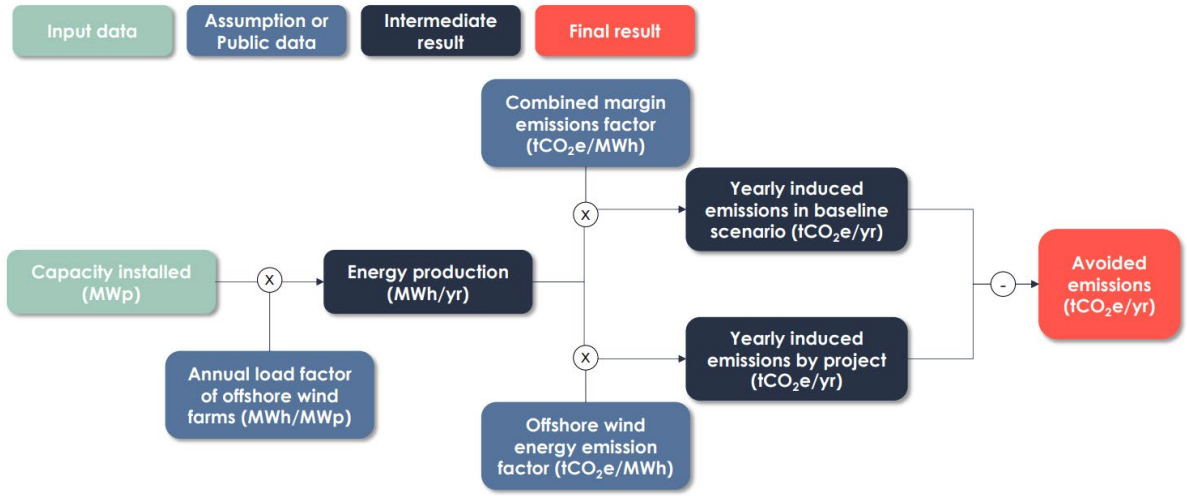


Assumptions:

- The calculation takes into account the Member State of the project for load factor and emissions factor of electricity in baseline scenario.
- Load factor: The country load factors are from IRENA.
- Baseline emissions factor: The baseline emissions factor is calculated using OMBM methodology. The emissions factor is the Combined Margin (CM) which takes into account the Operating Margin EF and the Build Margin EF.
  - The Operating margin (OM) EF is the emission factor related to existing power plants and current electricity generation.
  - The Build margin (BM) EF is the emission factor related to the power plants under construction.

  OMBM emissions factors are from the International Financial Institutions technical working group on GHG accounting. They have been reviewed by Carbone 4 to integrate the upstream emissions factor.

Methodology for calculating avoided emissions of offshore windfarms:

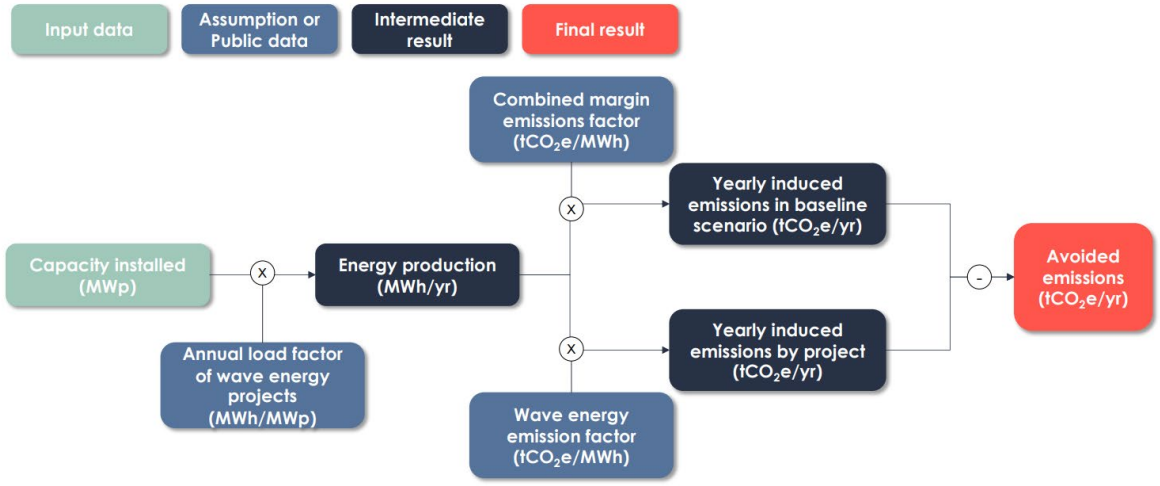


Assumptions:

- The calculation takes into account the Member State of the project for load factor and emissions factor of electricity in baseline scenario.
- Load factor: The country load factors are from IRENA.
- Baseline emissions factor: The baseline emissions factor is calculated using OMBM methodology. The emissions factor is the Combined Margin (CM) which takes into account the Operating Margin EF and the Build Margin EF.
  - The Operating margin (OM) EF is the emission factor related to existing power plants and current electricity generation.
  - The Build margin (BM) EF is the emission factor related to the power plants under construction.

  OMBM emissions factors are from the International Financial Institutions technical working group on GHG accounting. They have been reviewed by Carbone 4 to integrate the upstream emissions factor.

Methodology for calculating avoided emissions of wave energy projects:



Assumptions:

- The calculation takes into account the Member State of the project for load factor and emissions factor of electricity in baseline scenario.
- Load factor: The country load factors are from IRENA.
- Baseline emissions factor: The baseline emissions factor is calculated using OMBM methodology. The emissions factor is the Combined Margin (CM) which takes into account the Operating Margin EF and the Build Margin EF.
  - The Operating margin (OM) EF is the emission factor related to existing power plants and current electricity generation.
  - The Build margin (BM) EF is the emission factor related to the power plants under construction.

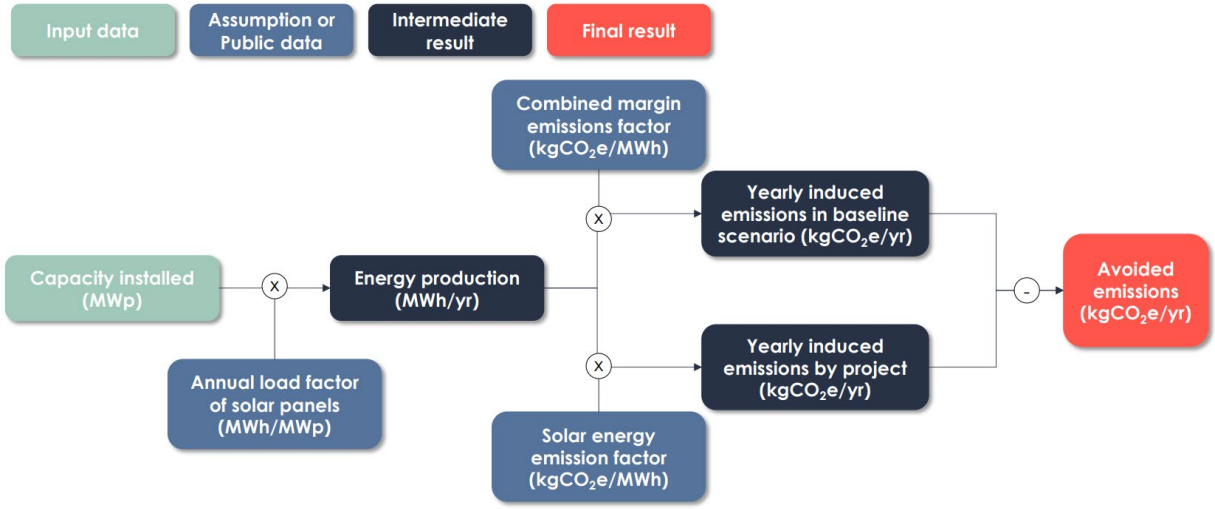
  OMBM emissions factors are from the International Financial Institutions technical working group on GHG accounting. They have been reviewed by Carbone 4 to integrate the upstream emissions factor.

Intervention Field 029

Renewable energy: solar

The intervention field includes new solar energy installations

Methodology for calculating avoided emissions of new solar energy installations



Assumptions:

- Load factor: The country load factors are from IRENA.
- Baseline emissions factor: The baseline emissions factor is calculated using OMBM methodology. The emissions factor is the Combined Margin (CM) which takes into account the Operating Margin EF and the Build Margin EF.
  - The Operating margin (OM) EF is the emission factor related to existing power plants and current electricity generation of the respective Member State.
  - The Build margin (BM) EF is the emission factor related to the power plants under construction or planned in the near future in the Member State. It enables to take into account the future evolution of the electrical system.

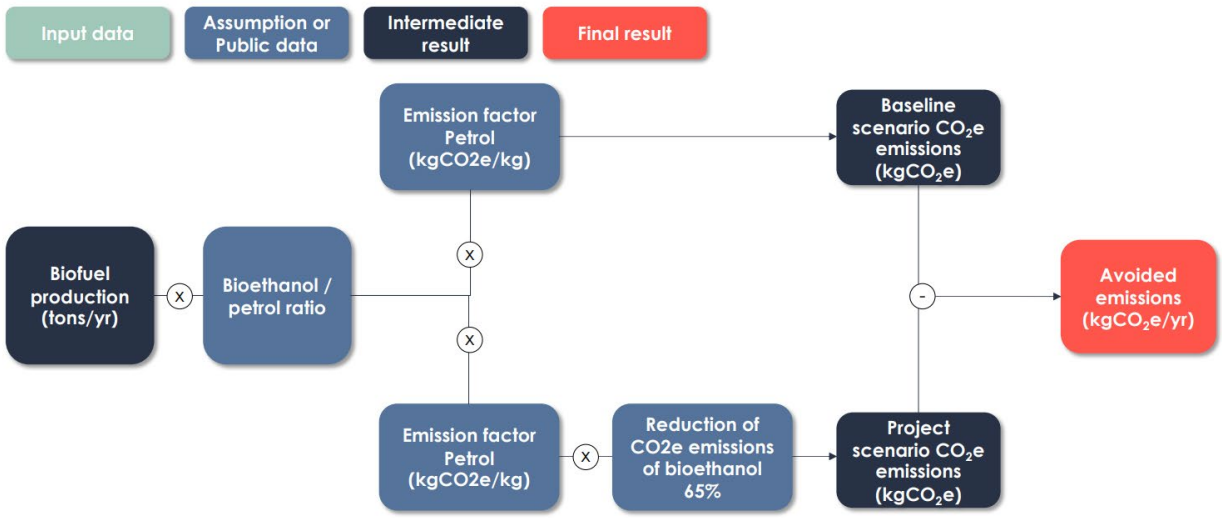
  OMBM emissions factors are from the International Financial Institutions technical working group on GHG accounting. They have been reviewed by Carbone 4 to integrate the upstream emissions factor.
- Project emissions factor: The emissions from solar energy come from the panel manufacturing. The emissions factor of solar panels installed in France is used to calculate each Member State emissions factor, taking into account the specific load factor of the respective Member State.
- The calculation takes into account the Member State of the project for load factor and emissions factor of electricity in baseline scenario.

Intervention Field 030bis

Renewable energy: biomass with high GHG savings

Intervention field 030bis covers both electricity or heat generation and transport activities. In the context of NGEU green bond financing milestones and targets associated to the measures under this intervention field relate to bioethanol and hydrogen production.

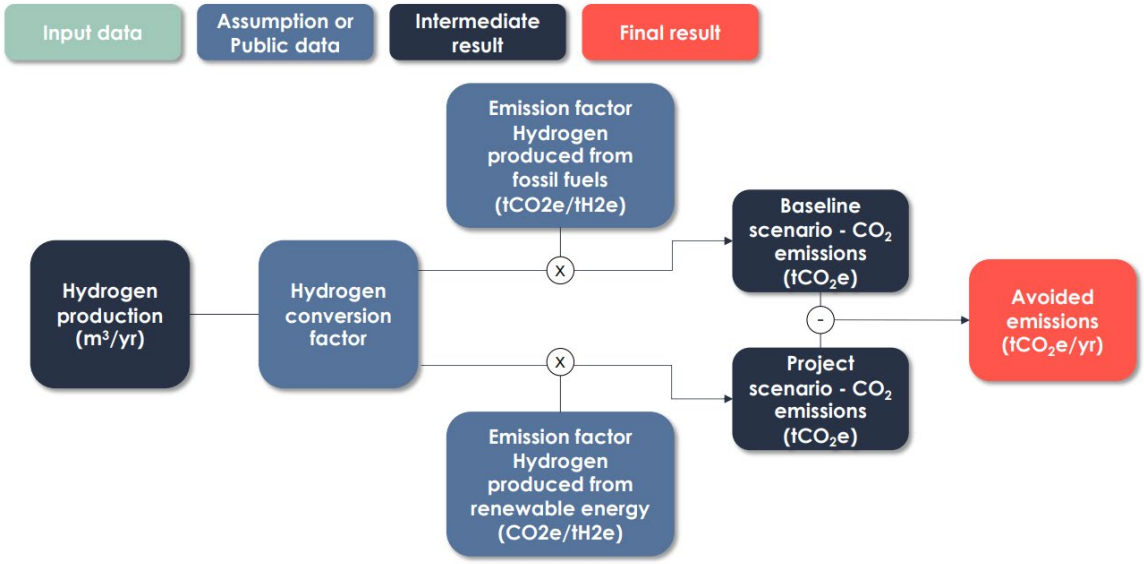
Methodology for calculating avoided emissions of bioethanol production capacity:



Assumptions:

- The usage of bioethanol replaces the usage of pure petrol, therefore using the emission factor of petrol in the baseline scenario. A conversion factor is used to estimate how many kilograms of bioethanol would be used instead of one kilogram of petrol, based on the energy production of each one.
- Avoided emissions are based on the revised renewable energy directive (2018/2001/EU) mandating that bioethanol should induce 65% less emissions compared to petrol.
- The methodology uses tons of bioethanol as the unit of choice.

Methodology for calculating avoided emissions of new hydrogen production capacity:



Assumptions:

- In order to develop this methodology, m3 of hydrogen was chosen as the unit of choice and existing data then converted into tons of hydrogen.
- Emissions factor: Since it is mainly of fossil origin, hydrogen has a very high carbon footprint, with a world average of 15 kgCO2e / kgH2 for dedicated hydrogen production. Hydrogen is considered low carbon if and only if its carbon footprint is less than or equal to 3 kgCO2e / kgH2, according to the EU Taxonomy. For the calculation of avoided emissions financed by green bonds, the baseline situation consists in fossil hydrogen production and the scenario consists in low-carbon hydrogen production.

Intervention Field 031

Renewable energy: marine

The milestones and targets associated to the measures under this intervention field concern offshore windfarms.

Methodology for calculating avoided emissions of offshore windfarms:

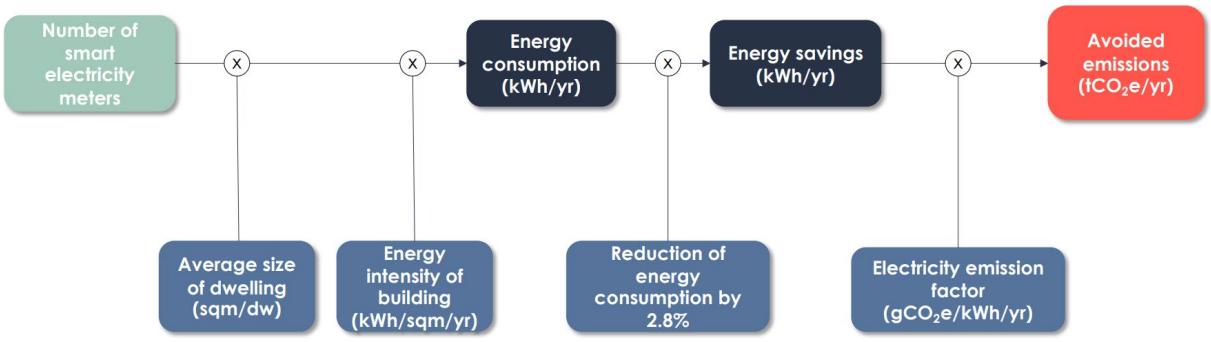
Please refer to the methodology under intervention field 028.

Intervention Field 033

Smart Energy Systems (including smart grids and ICT systems) and related storage.

The intervention field primarily focuses on smart meters but includes also some measures related to hydrogen and solar panels.

Methodology for calculating avoided emissions of smart electricity meters:



Assumptions:

- The calculation takes into account the emission pathway of electricity in each Member State.
- It is assumed that smart/advanced meters, together with provision of data, will reduce electricity consumption by 2.8%.
- As the information is lacking, the projects are tagged as 'Residential' as the energy consumption is lower for most countries. For dwelling size, the data is not differentiated between residential and non-residential.
- It is assumed that there is one smart electricity meter per dwelling.
- The reference emission factor of the electricity is calculated using the carbon intensity pathway of electricity in each Member State over the entire life cycle of the smart meters.
- The lifespan of smart electricity meters is assumed to be 15 years.

Methodology for calculating avoided emissions of new hydrogen production capacity:

- Please refer to the methodology under intervention field 022 with the following change of assumption:
  - Load factor: The load factor of an electrolyser is the ratio of the energy actually produced over a given period to the energy it would have produced if it had been operating at its rated power during the same period. An average load factor of 40% of the IEA scenarios was used.

Methodology for calculating avoided emissions of solar panels:

- Please refer to the methodology under intervention field 029 with the following assumption:
  - If no precise information about the type of projects between solar and wind projects was present, all projects were assumed to be solar panel projects to be more conservative. The associated emission factor is higher, and the load factor is lower.

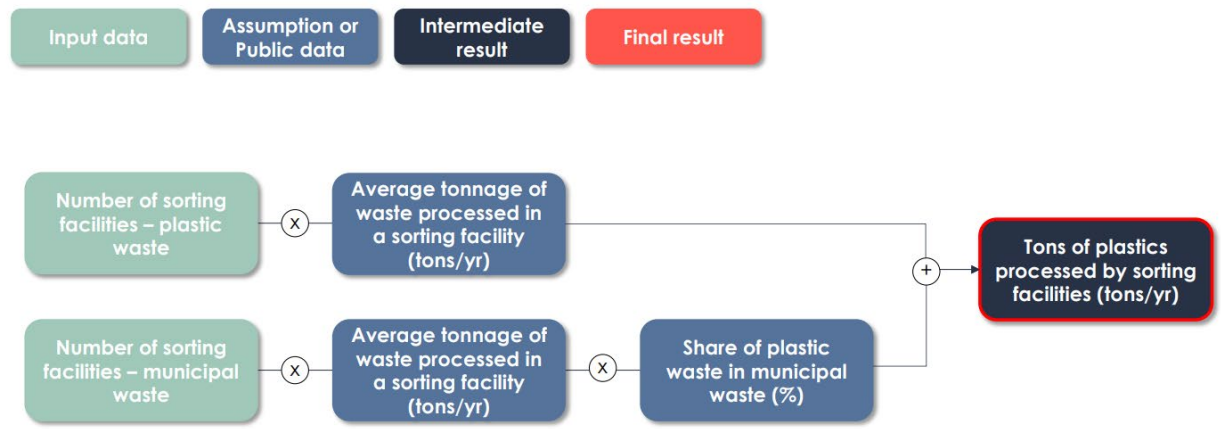
Intervention Field 042

Household waste management: prevention, minimisation, sorting, reuse, recycling measures

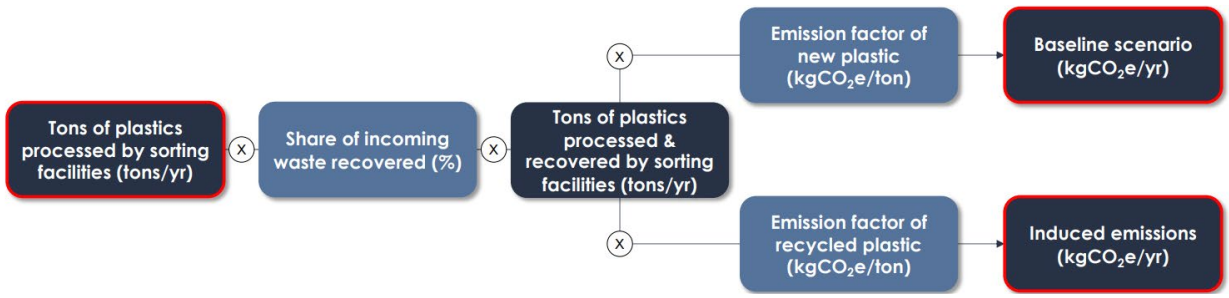
The intervention field groups a large number of waste prevention and processing activities. For the purpose of impact reporting however, only the ones pertaining to plastic and municipal waste sorting/processing were included due to the lack of data for other activities.

Methodology for calculating avoided emissions of sorting facilities:

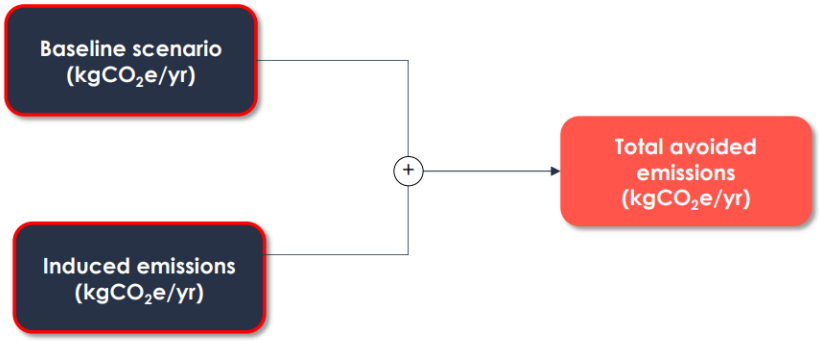
- **from input to intermediate results**



- **from intermediate to final results (1)**



- **from intermediate to final results (2)**



Assumptions:

- Recycling facilities are not covered in this IF as there is not enough data available. Moreover, this would lead to double counting of emissions, as recycling facilities and sorting facilities are on the same value chain. All emissions are allocated to the sorting plant.
- The assumption for the number of kilograms of plastic waste treated by the plant is based on data from existing plants in Europe.
- For sorting facilities that treat municipal waste, the assumption for the kilograms of plastic waste treated was based on the average ratio of plastic waste in municipal waste in Europe.
- In order to calculate avoided emissions, it is assumed that 90% plastic waste treated will lead to the use of recycled plastic and thus avoid the use of new plastic.

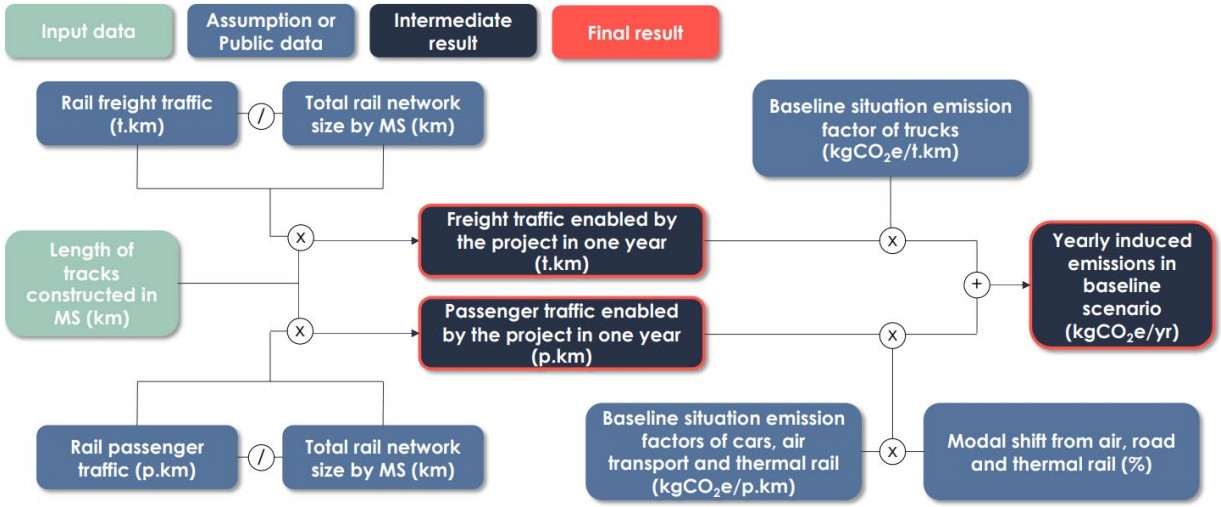
Intervention Field 064

Newly built or upgraded railways - TEN-T core network

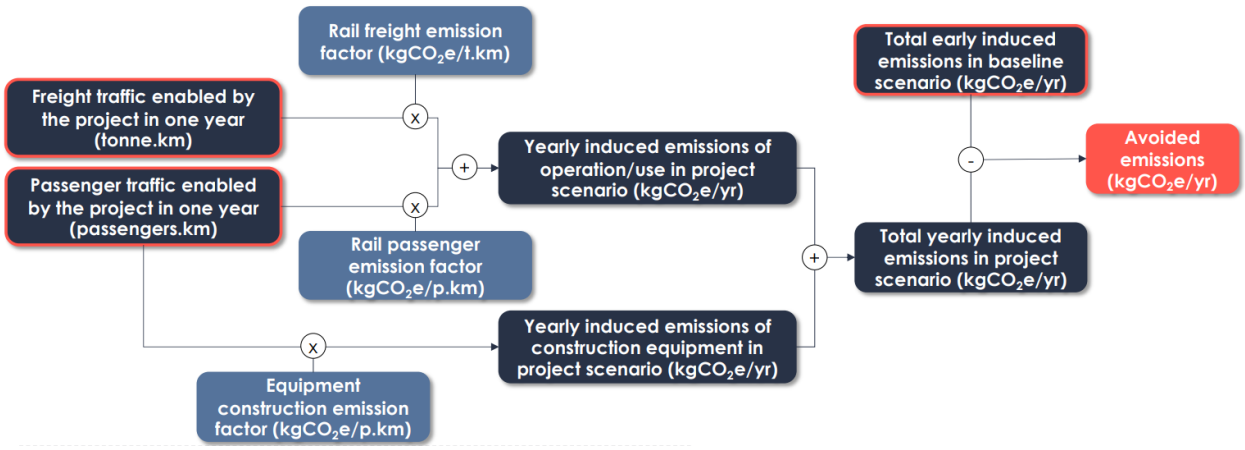
The intervention field includes passenger and freight rail

Methodology for calculating avoided emissions of newly built or upgraded railways:

- **from input to intermediate results**



- **from intermediate to final results**



Assumptions:

- The calculation takes into account the emission pathway of electricity in each Member State.
- Traffic enabled by the project in one year: The traffic enabled by the project is calculated using total passenger. kilometre and total ton. kilometre of the year 2019 using Eurostat divided by the total train network length in kilometres per Member State. This is multiplied by the new kilometres built to estimate the traffic enabled by the investments.
  - The year 2019 was chosen to avoid the effects of COVID-19 on the data.

- Induced emissions: Based on IEA's scenarios, we take into account the evolution of the emission factors of electricity in each of the Member States to calculate emissions associated with electric train usage.
- Modal shift:
  - Passenger transport: Estimates the added passenger traffic by the project as well as the modal shift from cars, thermal trains, and aviation to electric trains.
  - Freight: It is considered that all freight induced by the project is additional freight. In the absence of the project, the freight would have occurred by road.
- Baseline scenario:
  - Emission from car usage: Based on data from the International Energy Agency, takes into account the increase in electric fleet in the next years. The emissions factor from car usage is a weighted average between emissions from a medium thermal car and a medium electric car.
  - The emissions from thermal trucks and thermal trains are considered to be identical in all Member States.
  - Emissions from air transport: The emissions factor that was chosen is for travel between 0 and 1000km, a distance range that is the most likely to be replaced by rail travel after the project completion.
  - Due to lack of data, Belgium and Netherlands are not covered.

Intervention Field 065

Newly built or upgraded railways - TEN-T comprehensive network

The intervention field includes passenger and freight rail

Methodology for calculating avoided emissions of newly built or upgraded railways:

- Please refer to the methodology under intervention field 064.

Intervention Field 068

Reconstructed or modernised railways - TEN-T comprehensive network

The intervention field includes passenger and freight rail.

Methodology for calculating avoided emissions of reconstructed or modernised railways

- Please refer to the methodology under intervention field 064.

Assumptions:

- For the purpose of the analysis, the rail reconstructed or modernized is assumed to be similar to newly constructed. This will lead to an underestimation of GHG emissions avoided due to higher construction emissions being assumed.

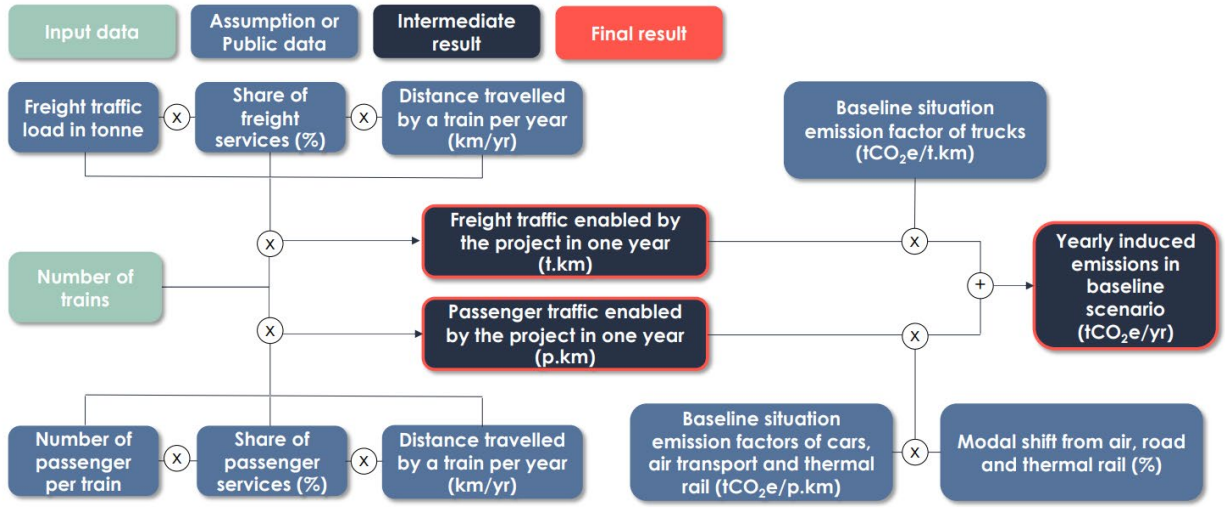
Intervention Field 072bis

Mobile zero emission/electric powered rail assets

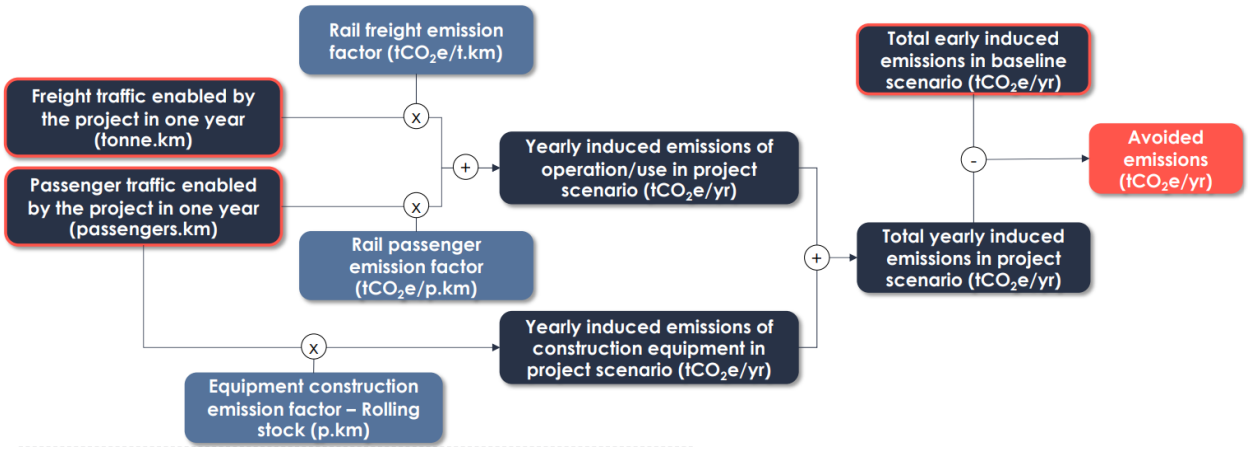
The intervention field includes trains and locomotives.

Methodology for calculating avoided emissions of mobile zero emission/electric powered rail assets (trains):

- **from input to intermediate results**



- **from intermediate to final results**

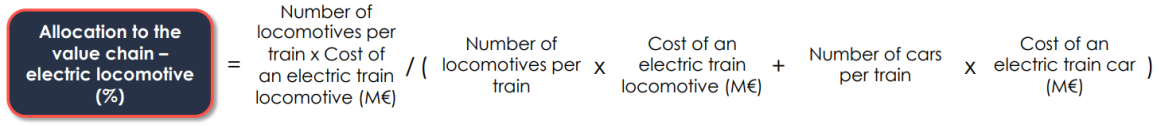


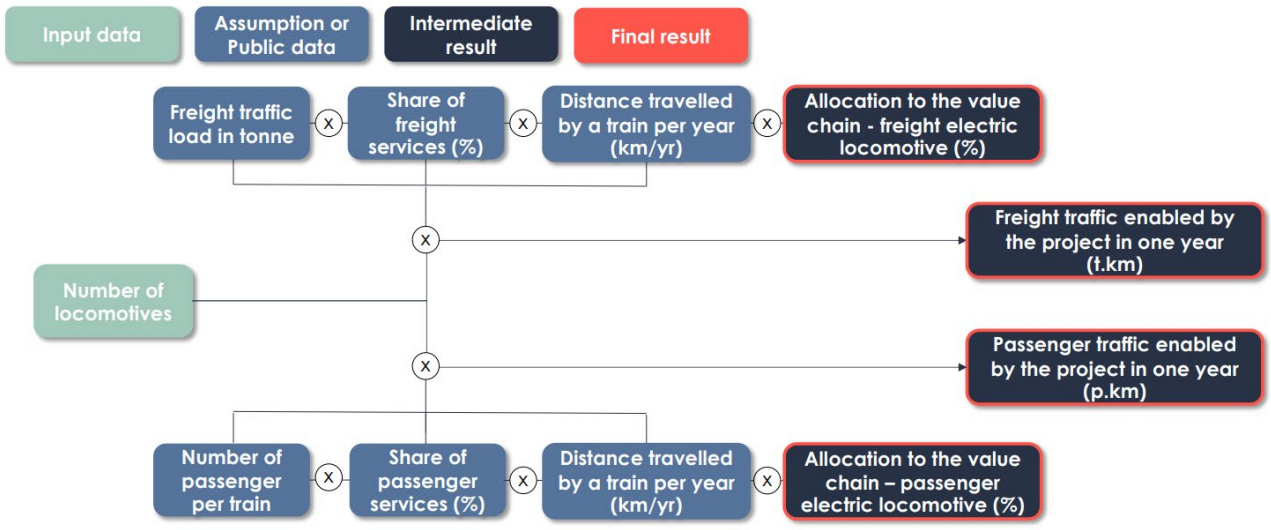
Assumptions:

- Emission pathways of electricity: Estimating the evolution of the emission factors associated with the train and the electric car and the evolution of the share of electric vehicles in Europe.
- Modal shift:
  - Passenger transport: estimates the added passenger traffic by the project as well as the modal shift from cars, thermal trains, and aviation to electric trains.
  - Freight: It is considered that all freight induced by the project is additional freight. In the absence of the project, the freight would have occurred by road.
- Traffic enabled by the project in one year: Passenger and freight activity data are estimated from national averages from the IRG-rail. The distance travelled by a train is estimated from a French national average.
- The calculation takes into account the emission pathway of electricity in each Member State.

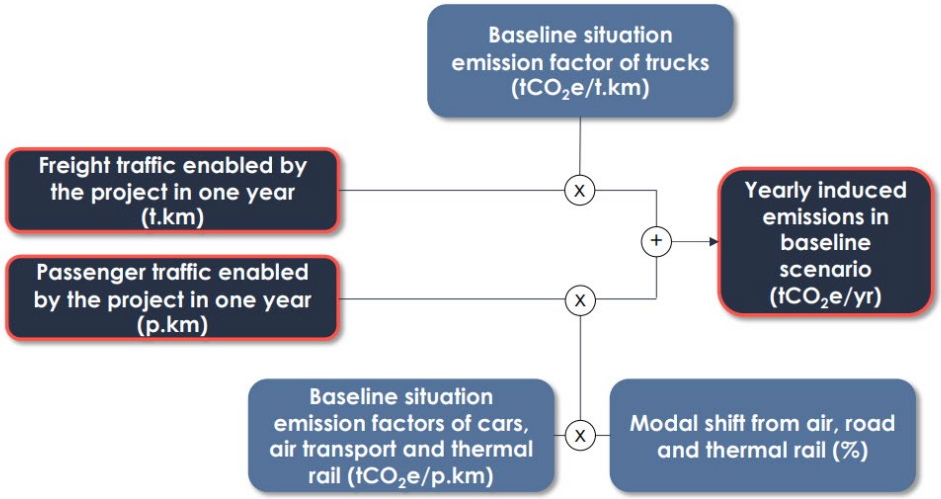
Methodology for calculating avoided emissions of mobile zero emission/electric powered rail assets (locomotives):

- **from input to intermediate results**

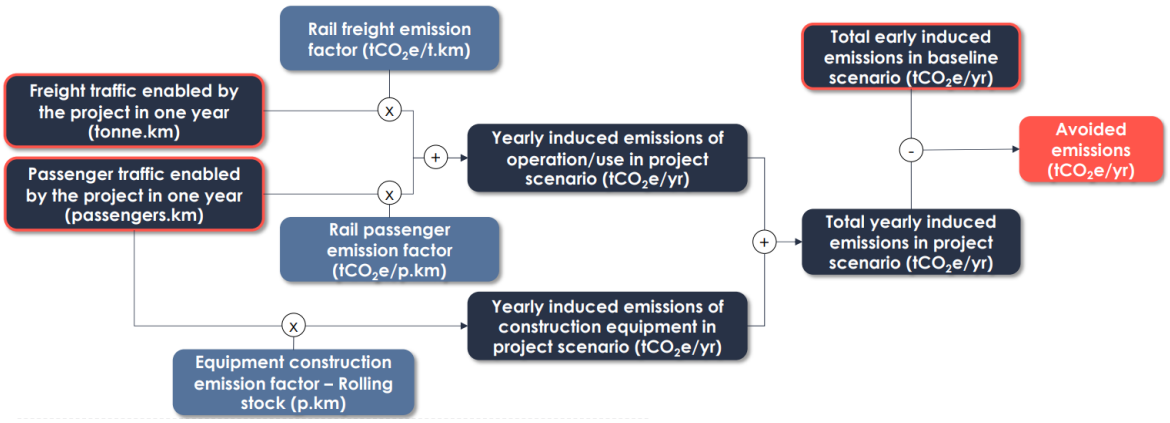




- **from intermediate to final results (1)**



- **from intermediate to final results (2)**



Assumptions:

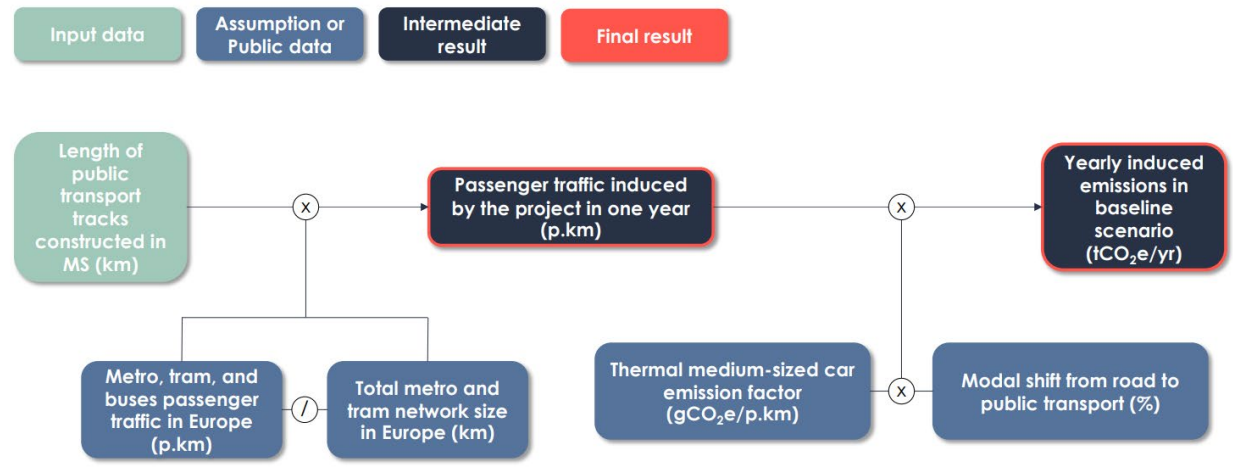
- Emission pathways of electricity: estimating the evolution of the emission factors associated with the train and the electric car and the evolution of the share of electric vehicles in Europe.
- Modal shift:
  - Passenger transport: estimates the added passenger traffic by the project as well as the modal shift from cars, thermal trains, and aviation to electric trains.
  - Freight: It is considered that all freight induced by the project is additional freight. In the absence of the project, the freight would have occurred by road.
- Traffic enabled by the project in one year: Passenger and freight activity data are estimated from national averages from the IRG-rail. The distance travelled by a train is estimated from a French national average.
- The allocation of avoided emissions to locomotives is estimated from the allocation to the value chain, based on the distribution of rolling stock costs between cars and locomotives. It is assumed that there are 1 locomotive and 8 cars per passenger train, 1 locomotive and 35 cars per freight train.
- The calculation takes into account the emission pathway of electricity in each Member State.

Intervention Field 073

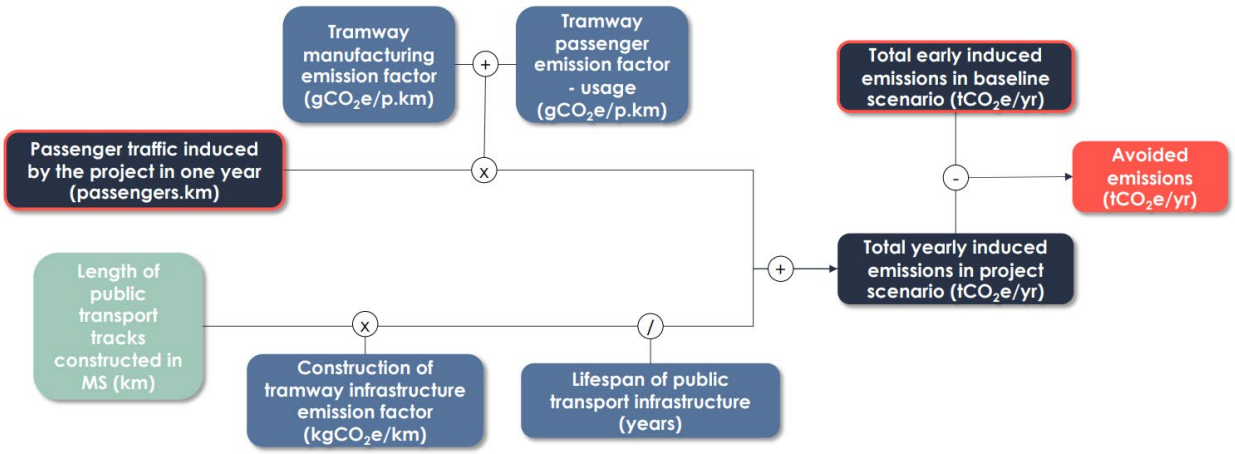
Clean urban transport infrastructure

Methodology for calculating avoided emissions of newly built or upgraded clean urban transport:

- **from input to intermediate results**



- **from intermediate to final results**



Assumptions:

- All projects are considered to be tramway line projects. This may introduce inaccuracies for projects that are bus lines and metro lines.
- The emission factor of electricity is calculated using the carbon intensity pathway of electricity in each Member State over the entire life cycle of the tramway. It is assumed that the lifespan of a tramway is 35 years.

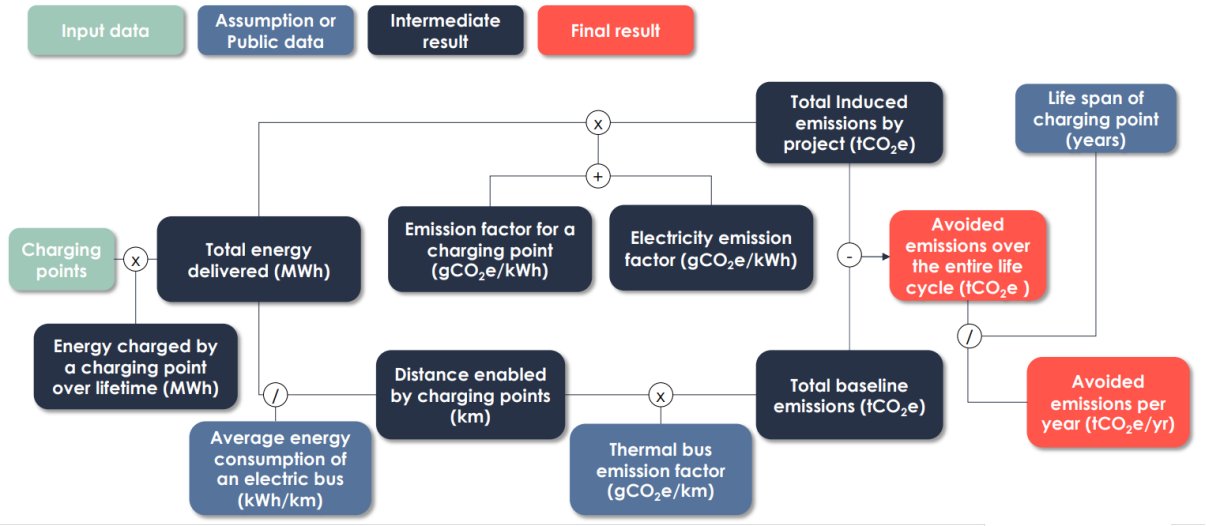
- Baseline emissions factor: The reference factor of the thermal car is estimated using the emission factor of a medium-sized gasoline car, which is considered to be constant over time.
- Modal shift: Passenger transport: Based on a report by UK Tram, estimates the modal shift from road to public transport.
- Traffic enabled by the project in one year: Based on European commission databases to calculate the traffic induced by the project. Uses the total tram, metro, and bus passenger/kilometres of the year 2019 divided by the total tram and metro network in kilometres. Results are multiplied by new kilometres built to estimate the traffic enabled by the project.
- The emission factor for the construction of public transport infrastructure: Estimated from the emission factors for the construction of a tramway track, multiplied by the km built in each Member State, divided by the lifetime of the infrastructure. It is assumed that the lifetime of a public transport infrastructure is 35 years.
- The calculation takes into account the emission pathway of electricity in each country.

Methodology for calculating avoided emissions of bus charging points:

- **intermediary calculation**

Annal energy production of a publicly available charging point (MWh)	=	$\frac{\text{Bus electricity demand (TWh) x share of public chargers in installed capacity (\%)}}{\text{Total installed capacity (units)}}$
Carbon intensity of charging point manufacturing ($kgCO_2e$/unit)	=	Charger weight (kg) x manufacturing emissions ($kgCO_2e$/kg)
Energy charged by a charging point over lifetime (MWh)	=	Annual energy production of a charging point (MWh) x charging point lifetime (years)
Emission factor for a charging point (gCO_2e/kWh)	=	$\frac{\text{Carbon intensity of charging point manufacturing ($kgCO_2e$/unit)}}{\text{Energy charged by a charging point over lifetime (MWh)}}$ + Electrical losses x Electricity emission factor over the charging point lifetime (gCO_2e/kWh)
Emission factor of electricity for electric bus (gCO_2e/kWh)	=	(Electricity emission factor over the charging point lifetime (gCO_2e/kWh)

- **from intermediate to final results**



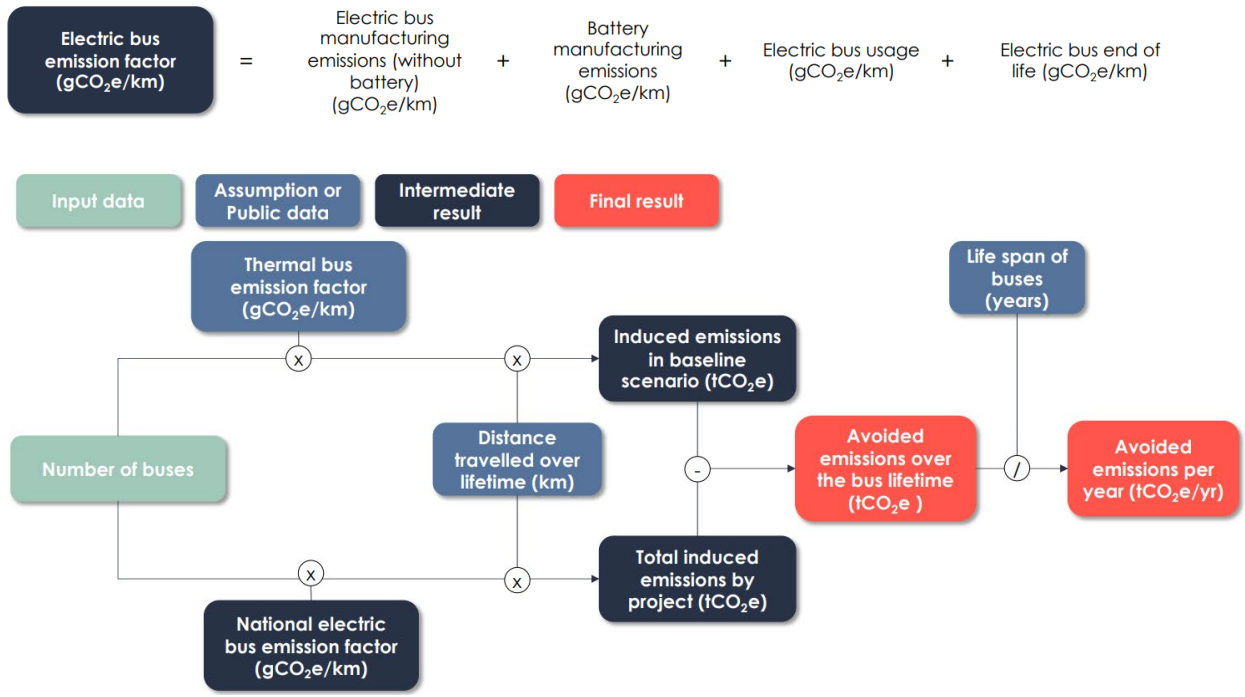
Assumptions:

- The annual production of a charging station is calculated using the total electricity consumption of electric buses in Europe and the total installed capacity. For this purpose, it is estimated that 25% of the recharging is done in public stations.
- The emissions of the charged electricity are compared to the fuel needed for average combustion cars. Emissions may be avoided in two contexts:
  - When an electric bus replaces an existing bus
  - When an electric bus prevents the purchase of another new bus
- The emission factor of a charging station is calculated by the ratio of the carbon intensity of the production phase of the charging station and the energy charged during its lifetime. Electricity losses are also considered.
  - It is assumed that the electrical losses are 5%.
  - It is assumed that charging points have a lifetime of eight years.
  - The reference charging point for manufacturing emissions calculations weighs 6.2kg
- The emission factor of electricity is calculated using the carbon intensity pathway of electricity in each Member State over the entire life cycle of the charging point.
- The emissions factor of the thermal bus is estimated using the emission factor of a diesel bus purchased in 2020 in Europe. It is considered to be constant over time.
- It is assumed that the number of electric buses purchased with support under the RRF (for which the emission reduction is accounted for under intervention field ADHOC) is a small proportion of the electric bus fleet in the EU, and as such the electric charging stations are predominantly used by electric buses not supported under the RRF which makes double counting negligible.

Intervention Field 074

Clean urban transport rolling stock

Methodology for calculating avoided emissions of electric buses:



Assumptions:

- It is assumed that both thermal and electric buses have a lifespan of 12 years.
- It is assumed that both thermal and electric buses travel 480,000 km over their entire life cycle.
- It is assumed that the purchase of electric buses replaces 100% of thermal buses.
- Baseline emissions factor: The reference factor of the thermal bus is estimated using the emission factor of a diesel bus purchased in 2020 in Europe, which is considered to be constant over time.
- Project emissions factor: The emissions induced by the use of an electric bus (gCO2e/km) are equal to its electricity consumption (kWh/km) multiplied by the electricity emissions factor (gCO2e/kWh). In this methodology, the input data is the emissions induced by electric buses purchased in 2020 for a European electricity mix. It is assumed that electric buses financed by a Member State will be used in this Member State. Each Member State's electric bus usage emissions factor is obtained as the product of the European electric bus emissions factor and the share of the Member State's electricity emission factor of the European electricity mix emission factor.
- The emission factor of the electric bus is calculated using the carbon intensity pathway of electricity in each Member State over the entire life cycle of the bus.

- The buses emissions factors considered the entire life cycle (manufacturing battery manufacturing (for electric buses), usage, and end of life).

Methodology for calculating avoided emissions of bus charging points:

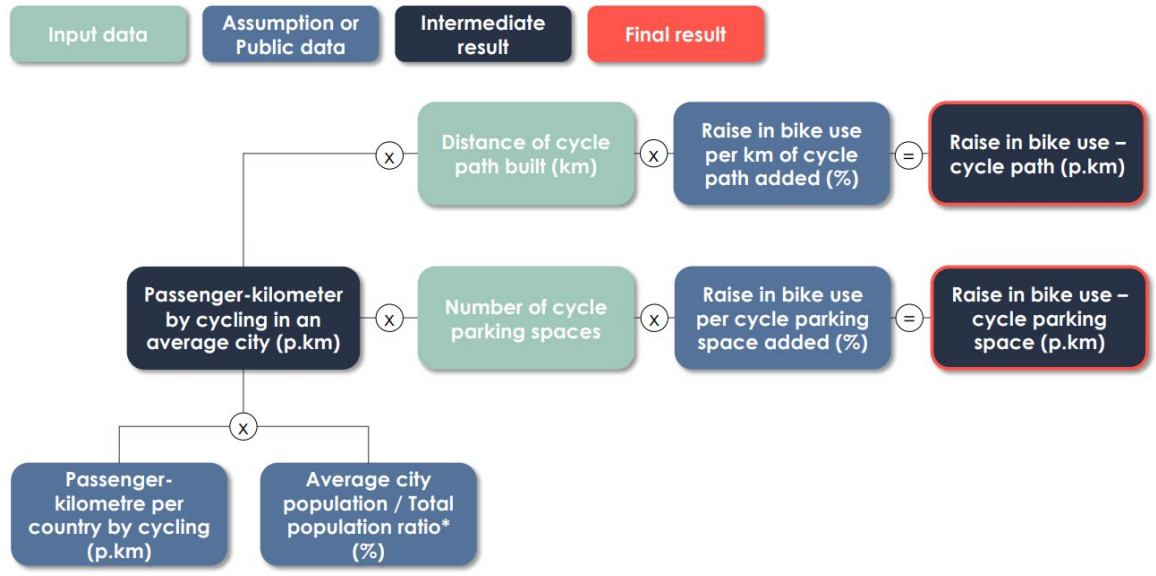
- Please refer to the methodology under intervention field 073.

Intervention Field 075

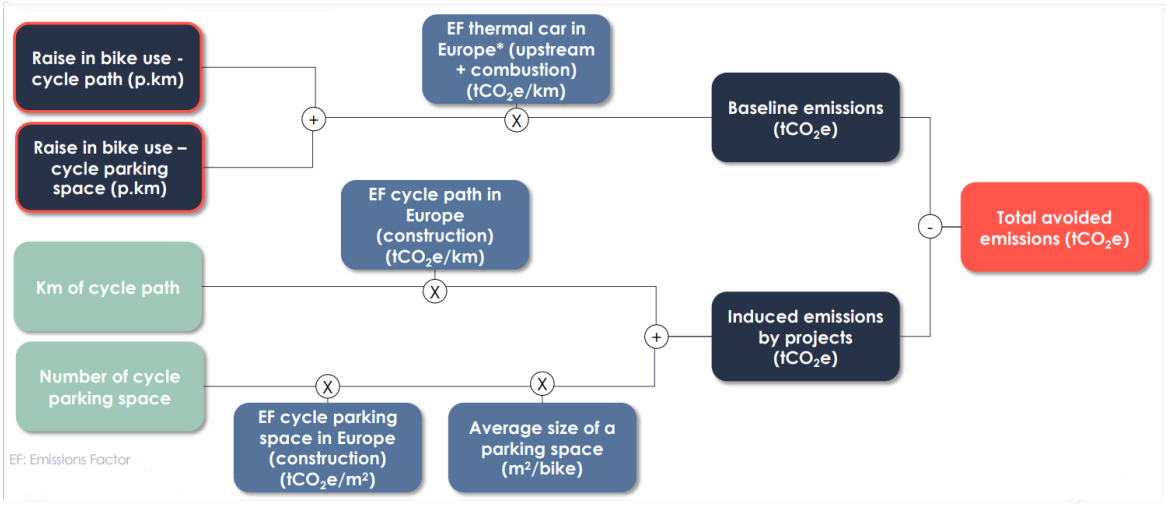
Cycling infrastructure

Methodology for calculating avoided emissions of new cycle paths and cycle biking places:

- **from input to intermediate results**



- **from intermediate to final results**



Assumptions:

- Calculation basis:
  - The calculation base is reduced to one medium-sized city per Member State. This base is calculated based on the Member State's total population, the rate of urbanisation and the number of towns in the city, in order to deduce the size of an average city.
  - The calculations focus on urban mobility as bike is mostly used for short-distance mobility and urban mobility.
- Induced emissions:
  - Induced emissions for cycle path is calculated as if all cycle paths are newly built.
  - Induced emissions for cycle parking space are based on the emission factor of a parking space of 1m2.
- Avoided emissions:
  - The analysis of the environmental impacts of new cycle paths and cycle parking spaces was based on the evolution of modal shift and the reduction in car use in favour of cycling. Car is the predominant mode of transport in Europe for all trips, including short-distance trips and urban mobility.
  - Considering the existing car fleet, it is assumed that all cars whose usage is replaced by cycling are thermal cars. Electric cars represent only a negligible proportion of the car fleet today (<2%). The average emission factor for a thermal car in each country is calculated by taking a weighted average based on the number of diesel and petrol vehicles.
  - The ratios used to calculate the raise in bike use per km of cycle path added and per number of cycle parking place added are based on empirical observations in some European cities.
  - Only the usage of mechanical bikes is taken into account and, for the usage phase alone, their carbon emissions are none.

Intervention Field 077

Alternative fuels infrastructure

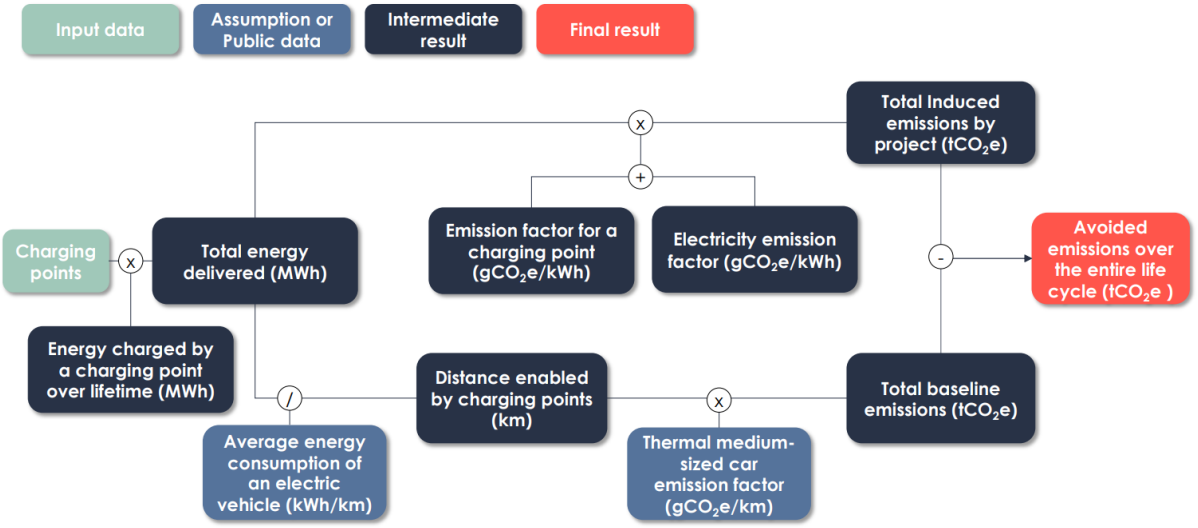
The intervention field contains a number of different actions, which were addressed separately.

Methodology for calculating avoided emissions of public and private charging point (electric cars):

- **intermediary calculation**

Annual energy production of a publicly available charging point (MWh)	=	$\frac{\text{EV electricity demand (TWh) x share of public chargers in installed capacity (\%)}}{\text{Total installed capacity (units)}}$
Carbon intensity of charging point manufacturing ($kgCO_2e$/unit)	=	Charger weight (kg) x manufacturing emissions ($kgCO_2e$/kg)
Energy charged by a charging point over lifetime (MWh)	=	Annual energy production of a charging point (MWh) x charging point lifetime (years)
Emission factor for a charging point (gCO_2e/kWh)	=	$\frac{\text{Carbon intensity of charging point manufacturing ($kgCO_2e$/unit)}}{\text{Energy charged by a charging point over lifetime (MWh)}}$ + Electrical losses x Electricity emission factor over the charging point lifetime (gCO_2e/kWh)
Emission factor of electricity for electric vehicle (gCO_2e/kWh)	=	(Electricity emission factor over the charging point lifetime (gCO_2e/kWh) + Emission factor for a charging point (gCO_2e/kWh))

- **from intermediate to final results**



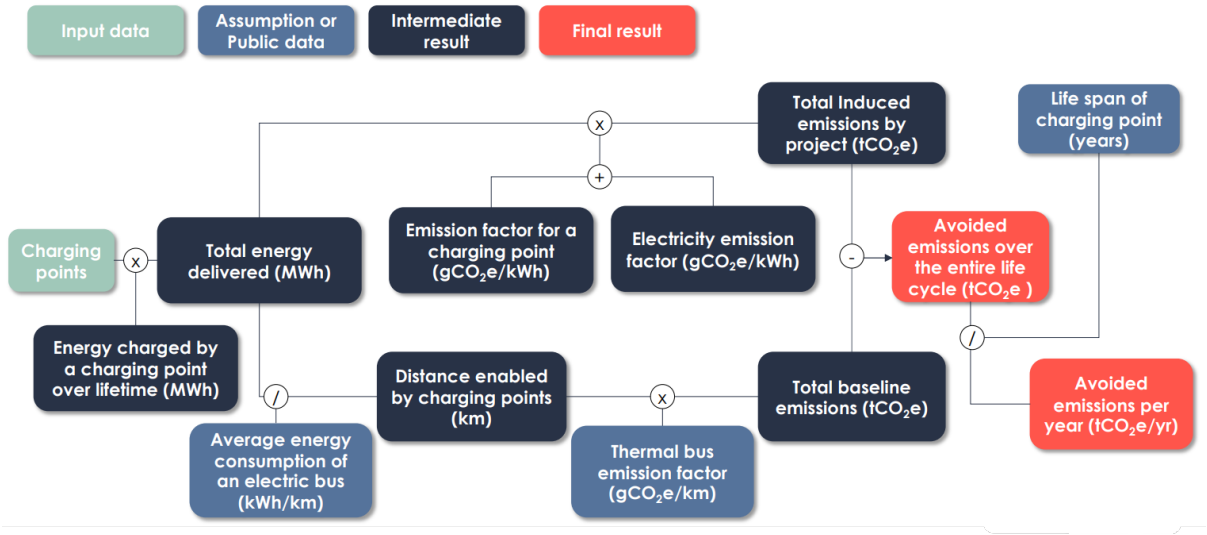
Assumptions:

- The annual production of a charging station is calculated using the total electricity consumption of electric vehicles in Europe and the total installed capacity. For this purpose, it is estimated that 25% of the recharging is done in public stations, 60% at home, 15% at work.
- The emissions of the charged electricity are compared to the fuel needed for average combustion cars. Emissions may be avoided in two contexts:
  - When an electric vehicle replaces an existing vehicle
  - When an electric vehicle prevents the purchase of another new vehicle
- The emission factor of a charging station is calculated by the ratio of the carbon intensity of the production phase of the charging station and the energy charged during its lifetime. Electricity losses are also considered.
  - It is assumed that the electrical losses are 5%.
  - It is assumed that charging points have a lifetime of eight years.
  - The reference charging point for manufacturing emissions calculations weighs 6.2kg
- The emission factor of electricity is calculated using the carbon intensity pathway of electricity in each Member State over the entire life cycle of the charging point.
- The emissions factor of the thermal car is estimated using the emission factor of a medium-sized gasoline car purchased in 2020 in Europe. It is considered to be constant over time.
- Only electric charging stations projects have been included. In the absence of detailed information, it cannot be ensured hydrogen vehicles would avoid emissions. Hydrogen vehicles avoid emissions only if the hydrogen is produced from a renewable mix. If an emission factor is applied based on the average production of hydrogen by electrolysis in Europe, the CO2 emissions would be higher than those of diesel vehicles. As the energy mix used to produce hydrogen is not known in all cases, we choose not to calculate avoided emissions.
- It is assumed that the number of electric cars purchased with support under the RRF (for which the emission reduction is accounted for under intervention field ADHOC) is a small proportion of the electric car fleet in the EU, and as such the electric charging stations are predominantly used by electric cars not supported under the RRF which makes double counting negligible.
- The methodology takes the life span of charging points into account to arrive at annual emissions avoided.

Methodology for calculating avoided emissions of charging points (electric buses):

- **from intermediate to final results**
- Please refer to the above intermediary calculation.

- **from intermediate to final results**



Assumptions:

- The annual production of a charging station is calculated using the total electricity consumption of electric buses in Europe and the total installed capacity. For this purpose, it is estimated that 25% of the recharging is done in public stations.
- The emissions of the charged electricity are compared to the fuel needed for average combustion buses. Emissions may be avoided in two contexts:
  - When an electric bus replaces an existing bus
  - When an electric bus prevents the purchase of another new bus
- The emission factor of a charging station is calculated by the ratio of the carbon intensity of the production phase of the charging station and the energy charged during its lifetime. Electricity losses are also considered.
  - It is assumed that the electrical losses are 5%.
  - It is assumed that charging points have a lifetime of eight years.
  - The reference charging point for manufacturing emissions calculations weighs 6.2kg
- The emission factor of electricity is calculated using the carbon intensity pathway of electricity in each Member State over the entire life cycle of the charging point.
- The emissions factor of the thermal bus is estimated using the emission factor of a diesel bus purchased in 2020 in Europe. It is considered to be constant over time.
- Only electric charging stations projects have been included. In the absence of detailed information, it cannot be ensured hydrogen vehicles would avoid emissions. Hydrogen vehicles avoid emissions only if the hydrogen is produced from a renewable mix. If an emission factor is applied based on the average production of hydrogen by electrolysis in Europe, the CO2 emissions would be higher than those of diesel vehicles. As the energy mix used to produce hydrogen is not known in all cases, we choose not to calculate avoided emissions.

- It is assumed that the number of electric buses purchased with support under the RRF (for which the emission reduction is accounted for under intervention field ADHOC) is a small proportion of the electric bus fleet in the EU, and as such the electric charging stations are predominantly used by electric buses not supported under the RRF which makes double counting negligible.

Methodology for calculating avoided emissions of electric buses:

- Please refer to the methodology under intervention field 074 with these additional assumptions:
- Only electric vehicles projects have been included. In the absence of detailed information, it cannot be ensured hydrogen vehicles would avoid emissions. Hydrogen vehicles avoid emissions only if the hydrogen is produced from a renewable mix. If an emission factor is applied based on the average production of hydrogen by electrolysis in Europe, the CO2 emissions would be higher than those of diesel vehicles. As the energy mix used to produce hydrogen is not known in all cases, we choose not to calculate avoided emissions.
- For some projects, the quantified distinction between hydrogen vehicles and electric vehicles is not specified. In this case we choose not to calculate avoided emissions, as we consider that there are not avoided emissions with hydrogen vehicles. Avoided emissions could be underestimated.

Methodology for calculating avoided emissions of new zero-emission vehicles:

- Please refer to the methodology under intervention field ADHOC

Methodology for calculating avoided emissions of biogas stations (compressed and liquefied):

- **intermediary calculations**

Annual energy production of a CBG station (kg)	=	$\frac{\text{Biomethane demand (bcm}^1\text{) in Europe x share of gas station delivering biomethane (\%) x conversion in kg}}{\text{Total installed capacity (units) in Europe}}$
Carbon intensity of a CBG station manufacturing ($kgCO_2e$/unit)	=	Manufacturing emissions ($kgCO_2e$/unit)
Energy delivered by a CBG station over lifetime (kg)	=	Annual energy production of a CBG station (kg) x CBG station lifetime (years)
Emission factor for a CBG station ($kgCO_2e$/kg)	=	$\frac{\text{Carbon intensity of CBG station manufacturing ($kgCO_2e$/unit)}}{\text{Energy delivered by a CBG station over lifetime (kg)}}$ + CBG emission factor (including methane losses) ($kgCO_2e$/kg)
CBG emission factor of semi-trailer truck ($kgCO_2e$/kg)	=	CBG emission factor ($kgCO_2e$/kg) + Emission factor for a CBG station ($kgCO_2e$/kg)

Annual energy production of a LBG station (kg)	=	$\frac{\text{LBG demand (GWh) in France / conversion in m3 of gas x conversion in kg}}{\text{Total installed capacity of LBG stations (units) in France}}$
Carbon intensity of a LBG station manufacturing ($kgCO_2e$/unit)	=	Manufacturing emissions ($kgCO_2e$/unit)
Energy delivered by a LBG station over lifetime (kg)	=	Annual energy production of a LBG station (kg) x LBG station lifetime (years)
Emission factor for a LBG station ($kgCO_2e$/kg)	=	$\frac{\text{Carbon intensity of LBG station manufacturing } (kgCO_2e/\text{unit})}{\text{Energy delivered by a LBG station over lifetime (kg)}}$ + LBG emission factor (including methane losses) ($kgCO_2e$/kg)
LBG emission factor of semi-trailer truck ($kgCO_2e$/kg)	=	LBG emission factor ($kgCO_2e$/kg) + Emission factor for a LBG station ($kgCO_2e$/kg)

- **from intermediate to final results**

Assumptions:

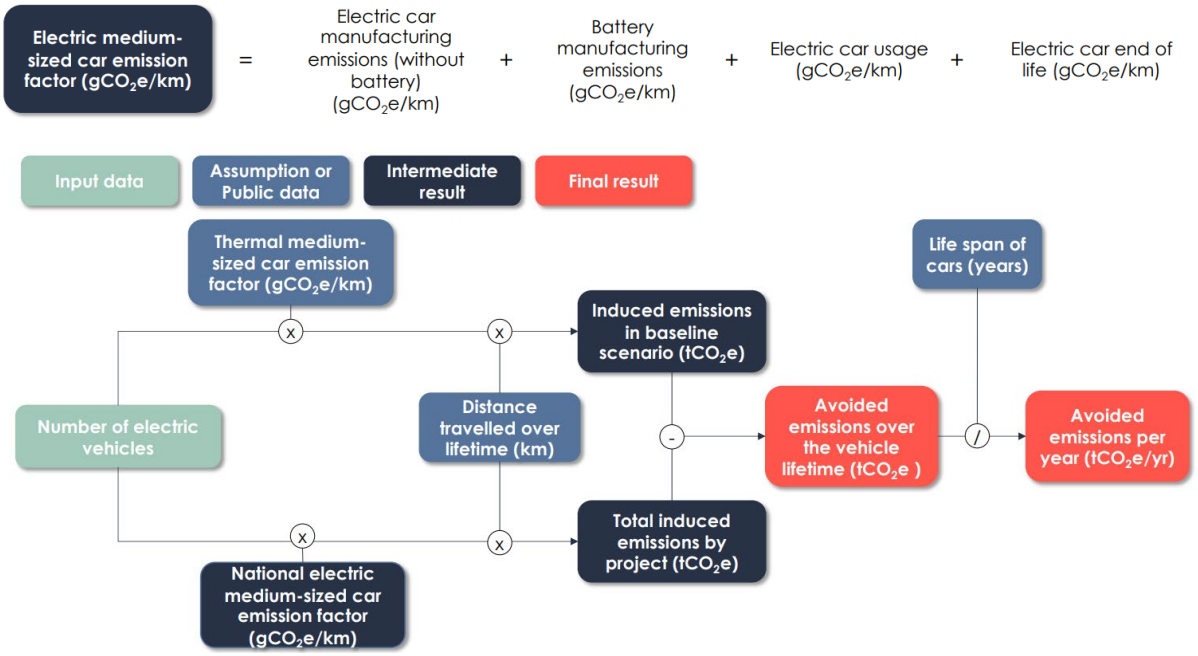
- The annual production of a CBG station is calculated using the total CBG consumption of biogas semi-trailer trucks in Europe and the total installed capacity. For this purpose, it is estimated that 25% of the gas stations are delivering biomethane. As no LBG consumption figures were available for Europe, a ratio based on LBG consumption in France was used to estimate the annual production of a LBG station.
- The emissions of the delivered biogas are compared to the fuel needed for average combustion semi-trailer trucks. Emissions may be avoided in two contexts:
  - When a biogas semi-trailer truck replaces an existing semi-trailer truck
  - When a biogas semi-trailer truck prevents the purchase of another new semi-trailer truck
- The emission factor of a station is calculated by the ratio of the carbon intensity of the production phase of the station and the energy delivered during its lifetime. It is assumed that stations have a lifetime of 50 years.
- Two different emissions factors are used for biogas stations:
  - A bio-CNG emission factor for CBG stations
  - A bio-LNG emission factor for LBG stations
  - These emissions factors are Well-to-Wheel (WTW) emissions factors, considering the full fuel life cycle. Methane slip, which is the impact of any unburned fuel that is released to the atmosphere, is included in the calculation of the emissions factors.
- The emission factor of the diesel semi-trailer truck is estimated using the emission factor of a diesel semi-trailer truck purchased in 2020 in Europe.
- In order to convert consumption data of biogas to biogas delivered by the stations, it is assumed that CBG density is 0.79 kg/m3, LBG density is 445 kg/m3, and high heating value of natural gas is 11.27 kWh/m3.

Intervention Field ADHOC

Ad hoc intervention field

The intervention field is not part of the list of climate intervention field in the methodological annex of the regulation establishing the Recovery and Resilience Facility. Nevertheless, under the regulation Member States may apply a climate coefficient to investments that are deemed climate relevant but outside of the scope of the methodology, subject to approval by the Commission. This option was primarily used to include zero-emission cars.

Methodology for calculating avoided emissions of electric cars:



Assumptions:

- It is assumed that both thermal and electric vehicles have a lifespan of 12 years.
- It is assumed that both thermal and electric vehicles travel 150,000 km over their entire life cycle.
- It is assumed that the purchase of electric vehicles replaces 100% of thermal vehicles.
- Baseline emissions factor: The reference factor of the thermal car is estimated using the emission factor of a medium-sized gasoline car purchased in 2020 in Europe. It is considered to be constant over time.
- Project emissions factor: The emissions induced by the use of an electric car (gCO2e/km) are equal to its electricity consumption (kWh/km) multiplied by the electricity emissions factor (gCO2e/kWh). In this methodology, the input data is the emissions induced by electric cars purchased in 2020 for a European electricity mix. It is assumed that electric cars financed by a Member State will be used in this Member State. Each Member State's electric car usage emissions factor is obtained as the product of the European electric car emissions factor and the share of the Member State's electricity emission factor of the European electricity mix emission factor.
- The emission factor of the electric car is calculated using the carbon intensity pathway of electricity in each Member State over the entire life cycle of the car.

- The cars emissions factors considered the entire life cycle (manufacturing, battery manufacturing (for electric vehicles), usage, and end of life).
- Only electric vehicles projects have been calculated. In the absence of detailed information, it cannot be ensured that hydrogen vehicles would avoid emissions. Hydrogen vehicles avoid emissions only if the hydrogen is produced from a renewable mix. If an emission factor based on the average production of hydrogen by electrolysis in Europe is applied, the CO2 emissions would be higher than those of a diesel vehicles. As the energy mix used to produce hydrogen is unknown, avoided emissions are not calculated.
- For some projects, quantified distinction between hydrogen vehicles and electric vehicles is not specified. In this case, avoided emissions were not calculated. Avoided emissions could be underestimated.
- It is assumed that the number of electric cars purchased with support under the RRF (for which the emission reduction is accounted for under intervention field ADHOC) is a small proportion of the electric car fleet in the EU, and as such the electric charging stations are predominantly used by electric cars not supported under the RRF which makes double counting negligible.

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