

# **Broken promises**

**The ECB's widening Paris gap**

# Broken promises: The ECB's widening Paris gap

A joint report by SOAS University of London, University of Greenwich, University of the West of England, and Greenpeace

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# 1 Introduction

The ECB's decarbonisation strategy is rapidly losing steam. In July 2021, the ECB presented its action plan to incorporate climate issues into its monetary policy operations.<sup>1</sup> As a follow-up, in July 2022, the ECB announced that it would adopt concrete measures to decarbonise its monetary policy framework, targeting both its corporate bond holdings and the collateral rules that govern its un/conventional lending to euro area monetary institutions.<sup>2</sup> Then, in October 2022, the ECB started tilting its corporate bond reinvestments through a 'carrots and sticks' strategy.<sup>3</sup> It would replace all maturing bonds by buying more from issuers with a strong climate performance and less from issuers with a weak climate performance.<sup>4</sup> But in February 2023, it clarified that it would only partially reinvest proceeds from bonds maturing, albeit under a stronger tilting approach that prioritised purchases of issuers with a better climate performance during the period of partial reinvestment.<sup>5</sup> This stronger tilting approach would only last 5 months. At the end of June the ECB would abandon reinvestments, and with it, its strategy to decarbonise the corporate bond portfolio. The ECB is now passively unwinding its corporate bond holdings, allowing the substantive stock of approximately EUR 385bn bonds to mature without replacing them.<sup>6</sup>

In short, the ECB has stepped back from cleaning its portfolio of dirty bonds. Yet both Isabel Schnabel, of the Executive Board, and Christine Lagarde, the ECB President, have accepted that this is clearly inconsistent with Paris commitments, and, critically, that the ECB needs to consider actively reshuffling its corporate bond portfolio towards greener issues.<sup>7</sup>

Indeed, the passive unwinding is inconsistent with the broader principle embedded in the ECB's climate approach that stresses climate action is within its mandate.<sup>8</sup> The ECB's decarbonisation interventions address the exposure of the banking system to climate risks and, critically, support the climate neutrality targets of the EU under the principle of double materiality to which the ECB subscribes.<sup>9</sup> Therein, Paris aligning its corporate bond holdings is crucial. Given its large holdings, the ECB's decarbonisation measures can have substantial effects both by affecting the cost of borrowing for non-financial corporations

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<sup>1</sup> See ECB presents action plan to include climate change considerations in its monetary policy strategy, press release, ECB, 8 July 2021.

<sup>2</sup> See ECB takes further steps to incorporate climate change into its monetary policy operations, press release, ECB, 4 July 2022.

<sup>3</sup> See ECB provides details on how it aims to decarbonise its corporate bond holdings, press release, ECB, 19 September 2022.

<sup>4</sup> It would also treat more favourable bonds with a strong climate performance in the primary market bidding process and would use maturity limits for climate laggards.

<sup>5</sup> See ECB decides on detailed modalities for reducing asset purchase programme holdings, press release, 2 February 2023.

<sup>6</sup> This includes both the Corporate Sector Purchase Programme (CSPP) and the Pandemic Emergency Purchase Programme (PEPP) corporate bond holdings.

<sup>7</sup> See Schnabel, I. (2023). Monetary policy tightening and the green transition, speech at the International Symposium on Central Bank Independence, Sveriges Riksbank, Stockholm, ECB, 10 January 2023; and Positive Money Europe, 14 June 2023.

<sup>8</sup> See Schnabel, I. (2023). Monetary policy tightening and the green transition, speech at the International Symposium on Central Bank Independence, Sveriges Riksbank, Stockholm, ECB, 10 January 2023.

<sup>9</sup> The ECB has supported the incorporation of the double materiality principle into the Corporate Sustainability Reporting Directive (CSRD); see Fabio, P. (2021). A global accord for sustainable finance, blog post, ECB, 11 May 2021.

and by providing signals to financial markets about the decarbonisation of the euro area financial system.

Equally important, the ECB's decarbonisation approach introduces two critical elements that can be applied to other monetary and financial policies (such as collateral rules and financial regulation) as well as to fiscal or industrial policies. First, the ECB has developed a climate scoring framework to evaluate the climate performance of companies that can be deployed in other climate policy areas. Second, the ECB's unique 'carrots and sticks' approach offers an effective climate approach since it allows for close monitoring and disciplining of climate laggards in the context of systemic greenwashing and market developments that incentivise dirty investments.

Yet the ECB's Paris gap is rapidly widening, despite initial ambitions and at a time of increasingly extreme climate events.<sup>10</sup> In this report, we focus on the ECB's decarbonisation of corporate bond holdings and argue that the ECB can and should return to a more ambitious approach, while sticking to its plan to unwind its corporate bond portfolio. First, we examine the operational details of the ECB's decarbonisation strategy to outline a greener climate scoring approach. Our greener approach minimises the potential for greenwashing by fine-tuning the ECB's climate scoring to (i) incorporate companies' absolute emissions, (ii) pay explicit attention to the climate profile of companies' activities, (iii) consider companies' plans about fossil fuel expansion, and (iv) differentiate between green bonds based on the climate performance of their issuers.

Then, we propose a Green Unwinding strategy whereby the ECB actively changes the composition of its outstanding corporate portfolio under three policy options that preserve the 'carrots and sticks' approach:

1. *Light tilting*: the ECB uses its climate scoring to replace bonds of poorly performing issuers with green/er bonds.
2. *Strong tilting*: the ECB uses our greener climate scoring framework to tilt its corporate holdings.
3. *Strong tilting plus*: on top of strong tilting, the ECB excludes fossil fuel companies with Paris inconsistent plans from its portfolio.

We show that these options lead to substantial decarbonisation of the ECB's corporate portfolio, the kind of active greening that both Mme Lagarde and Prof. Schnabel have recently called for.

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<sup>10</sup>For the ECB Paris gap, see Dafermos, Y., Gabor, D., Nikolaidi, M., van Lerven, F. and Vargas, M. (2022). The ECB Paris gap: substantive but treatable, Greenpeace; SOAS University of London; University of Greenwich; University of the West of England.

## 2 An overview of the ECB's decarbonisation approach

In a previous paper, we provided a systematic evaluation of the July 2022 decarbonisation strategy by comparing it with what we term a 'Paris decarbonisation benchmark' for both the corporate bond portfolio and the collateral rules.<sup>11</sup> While we welcomed both the commitment to abandon the carbon bias underpinning market neutrality, and the 'carrots and sticks' logic, we identified a significant Paris gap, larger for collateral rules than for the corporate bond portfolio (see Table 1).

**Table 1:** ECB climate action plan vs a Paris decarbonisation benchmark

	Corporate bond purchases		Collateral framework	
	ECB	Paris decarbonisation benchmark	ECB	Paris decarbonisation benchmark
<b>Guiding principle</b>	Climate neutrality?	Climate neutrality	Risk exposure reduction	Climate neutrality
<b>Scope</b>	Reinvestments only	All holdings	Non-financial corporate debt collateral	All private assets
<b>Metrics</b>	Company climate metrics + sectoral Scope 3 emissions?	Company climate metrics + activity type	Micro risk exposure	Company climate metrics + activity type
<b>Tilting/haircut adjustments</b>	Across and within sectors based on climate footprint?	Across and within sectors based on climate footprint	Risk-based	Across and within sectors based on climate footprint
<b>Exclusion</b>	None	Paris-misaligned high-carbon assets	Only limits on high-carbon assets pledged as collateral	Paris-misaligned high-carbon assets
<b>Timeline</b>	October 2022: reinvestments only	Immediate implementation	By the end of 2022: haircut adjustments 2024: limits on high-carbon assets	Immediate implementation for non-financial corporate assets; ASAP for other private assets

Source: Dafermos, Y., Gabor, D., Nikolaidi, M., van Lerven, F. and Vargas, M. (2022). The ECB Paris gap: substantive but treatable, Greenpeace; SOAS University of London; University of Greenwich; University of the West of England.

On collateral rules, we warned that the ECB's prioritisation of climate risk exposure for the Eurosystem – a single materiality approach that ignored the impact that the ECB's treatment of dirty collateral would have on the overall climate footprint of the respective borrowers – was falling significantly short of Paris ambitions. Our concerns were subsequently validated. In December 2022, the ECB announced that it would increase haircuts for marketable and non-marketable collateral to pre-pandemic levels and that, in light of this decision, it would not climate-adjust its haircut schedule to discriminate against dirty assets. It framed its decision through a single materiality, risk exposure logic: no 'empirical evidence that necessitates amendments to the haircut schedule based

<sup>11</sup>Dafermos, Y., Gabor, D., Nikolaidi, M., van Lerven, F. and Vargas, M. (2022). The ECB Paris gap: substantive but treatable, Greenpeace; SOAS University of London; University of Greenwich; University of the West of England.

on climate change considerations, as the updated haircut schedule is already sufficiently protective against climate-related financial risks'.<sup>12</sup> Under double materiality, 'sufficiently protective' is not just a question of the ECB's balance sheet. It is also a question of whether the ECB actively tries to shrink the climate footprint of the dirty borrowers it supports via its collateral framework, by increasing the haircuts of the securities that they issue or altogether excluding their debt from the list of eligible collateral. Given its overall weakening resolve, we do not expect that the ECB will limit the share of high-carbon assets pledged as collateral in the Eurosystem framework, as promised last year (let alone exclude some of these assets from the list of eligible securities).<sup>13</sup>

For the corporate bond holdings, the gap arose from the narrow scope of the ECB's plans. The ECB decided to limit its greening to the reinvestments of maturing corporate bonds (about EUR 30bn per year) rather than the entire portfolio (EUR 385bn), and without excluding issuers with fossil fuel expansion plans from its purchases. We warned that the gap could be even more substantive depending on the specific tilting details that the ECB would announce in autumn 2022. We suggested that the ECB's decarbonisation efforts would be better served by a set of metrics that would include not just bond issuers' performance based on emissions, but also the climate profile of the activities that they engage in. We further advocated that the tilting strategy – shifting purchases from dirty to green debt – should be organised both across and within sectors.

The climate scoring framework that the ECB uses to decarbonise its corporate bond holdings includes three sub-scores: i) the backward-looking carbon intensity sub-score, ii) the disclosure sub-score and iii) the forward-looking target sub-score.<sup>14</sup> The carbon intensity sub-score relies on Scope 1 and Scope 2 emissions data at the company level, as well as Scope 3 emissions data at the sectoral level.<sup>15</sup> The disclosure sub-score captures the quality of the emissions data provided by bond issuers. It is higher for those bond issuers whose emissions have been verified by a third party. The target sub-score is high for those companies that their targeted decarbonisation pathways are consistent with the Paris Agreement targets. The overall climate score for each bond issuer is calculated by assigning weights to these three sub-scores.<sup>16</sup>

Although the ECB climate scoring is in the right direction, it faces greenwashing risks. First, it over-relies on data about carbon intensity (i.e. carbon emissions over revenues) – an imperfect measure of the progress against the targets of the Paris Agreement. Instead, the ECB's backward-looking sub-score could have also incorporated the change in companies' past absolute emissions.<sup>17</sup> Second, the ECB does not sufficiently take into account how

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<sup>12</sup>See ECB reviews its risk control framework for credit operations, press release, ECB, 20 December 2022.

<sup>13</sup>See ECB takes further steps to incorporate climate change into its monetary policy operations, press release, ECB, 4 July 2022. Collateral limits informed by a climate risk exposure perspective is, in our view, the weakest approach in the decarbonisation of collateral toolkit.

<sup>14</sup>See ECB (2023). Climate-related financial disclosures of the Eurosystem's corporate sector holdings for monetary policy purposes, March.

<sup>15</sup>By using sectoral carbon intensities as one of the criteria in tilting its purchases, the ECB effectively stopped following the market neutrality principle which suggests that central bank asset purchases should not distort the representation of sectors in the financial markets. However, since the ECB confined the use of climate criteria only to its reinvestment, its portfolio only very partially departed from the market neutral benchmark.

<sup>16</sup>The ECB does not publish the climate scores of issuers. This is problematic: publishing these scores would provide clear signals to financial markets about which companies make progress against climate targets compared to others and would support EU's climate neutrality ambitions. In addition, the ECB does not provide sufficient details about its climate scoring framework so that this framework be properly replicated and assessed by researchers.

<sup>17</sup>See Bank of England (2021). Greening our Corporate Bond Purchase Scheme (CBPS), November 2021; and

carbon-intensive the activities of companies are. For example, in the ECB scoring a fossil fuel company that has low Scope 1 and Scope 2 carbon intensity relative to its peers and has some ambitious targets for reducing its Scope 1 and Scope 2 emissions in the future is very likely to receive a high climate score. The fact that the main activities of this company still rely on fossil fuels is only partially and insufficiently considered via the use of Scope 3 carbon intensities at the sectoral level. Relatedly, the ECB scoring framework also fails to consider whether companies have plans to expand fossil fuel activities. Finally, the ECB does not differentiate between green bonds issued by strong climate performers and green bonds issued by climate laggards. Although green bonds can be a useful tool for the green transition, green bonds issued by companies with a poor backward-looking and forward-looking climate performance should not be treated in the same manner as green bonds issued by companies with a strong climate profile.

In February 2023, the ECB decided that it would only partially reinvest the principal payments from maturing corporate bonds. It also recognised – in line with our evaluation – that its tilting strategy required strengthening, towards issuers with a better climate performance during the period of partial reinvestment. But only three months later, in May 2023, it decided that the stronger tilting strategy would be abandoned starting at the beginning of July 2023, when the ECB ceased all reinvestments of maturing bonds.<sup>18</sup>

The shift to unwinding sets aside climate issues. Instead, it is driven by, and reflects, political pressures on the ECB to fight inflation, be it with tools that are neither appropriate nor effective given the distinctive nature of inflationary pressures in the Eurozone. Behind unwinding rests the theoretically and empirically weak assumption that the size of central banks' balance sheets has a meaningful correlation with, and effect on, inflation.<sup>19</sup> But even within this unwinding strategy, the ECB has the option to be climate active instead of climate passive. A climate active unwinding via tilting the existing portfolio towards greener corporate bond issuers would tighten credit conditions via portfolio and signalling effects in a manner more consistent with the ECB's climate objectives.

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Dafermos, Y., Gabor, D., Nikolaidi, M., van Lerven, F. (2022). *An environmental mandate, now what? Alternatives for greening the Bank of England's Corporate Bond Purchases*, SOAS University of London; University of Greenwich; University of the West of England.

<sup>18</sup>See Monetary policy decisions, press release, ECB, 4 May 2023.

<sup>19</sup>This assumption relies on two ideas. The first is that central bank reserves drive inflation and the second is that declining central bank portfolios lead to higher interest rates and thus lower inflation. Central banks have recognised that '...the quantity of reserves per se is not a sufficient guide to the overall monetary policy stance. . . Reserves are therefore not a good corroborative indicator of the money and lending quantities of macroeconomic interest.' (see Bailey, A.J., Bridges, J., Harrison, R., Jones, J. and Mankodi, A. (2020). *The central bank balance sheet as a policy tool: past, present and future*, Bank of England, Staff Working Paper No. 899, p. 12). Moreover, there is a broad consensus that interest rate hikes are not the right answer to the current inflationary environment (see e.g. Weber, I. (2023). *A new economic policy playbook*, Project Syndicate, 13 March 2023.)



### 3 The ECB's tilting approach is incompatible with the Paris Agreement

To evaluate the ECB's tilting strategy, we compare the climate footprint of bonds matured between 30 September 2022 (the date before green reinvestments started) and 30 June 2023 (the date when green tilting was terminated) with that of bonds purchased during the same period through reinvestments. We first use the ECB's approach for capturing the climate footprint of bond issuers – and assign 0 to the poorest climate performers and 5 to the strongest climate performers. Since the ECB does not provide sufficiently detailed information about its climate scoring approach, we replicate the ECB's approach by selecting formulas and weights based on the ECB's verbal description of its climate scoring framework.<sup>20</sup>

The ECB's tilting resulted in a substantively lower representation of poor climate performers (scored from 0 to 2) in the Eurosystem reinvestments (based on bond outstanding amounts). This is matched by an increase in the share of bonds issued by stronger climate performers (scored 3 to 5) and the share of green bonds – the latter increased from less than 5% in the maturing portfolio to almost 30% in reinvestments (see first and second bar in Figure 1).<sup>21</sup>

However, this picture might be misleading since the ECB's scoring framework suffers from greenwashing risks: it does not evaluate whether past absolute emission reductions are consistent with the Paris Agreement, does not explicitly consider the greenness and dirtiness of the activities that bond issuers engage in, ignores fossil fuel expansion plans and does not consider the overall climate profile of the green bond issuers.

We develop an alternative greener scoring approach that addresses these issues. At the issuer level, our scoring considers both absolute emissions and carbon intensity, distinguishes between different types of activities based on their climate profile and penalises companies with fossil fuel expansion plans (see Appendix B). With our greener scoring, reinvestments look significantly weaker: there are no bond issuers with a 5 climate score and the proportion of bond issuers with a 4 climate score is much lower (see the last bar in Figure 1).<sup>22</sup>

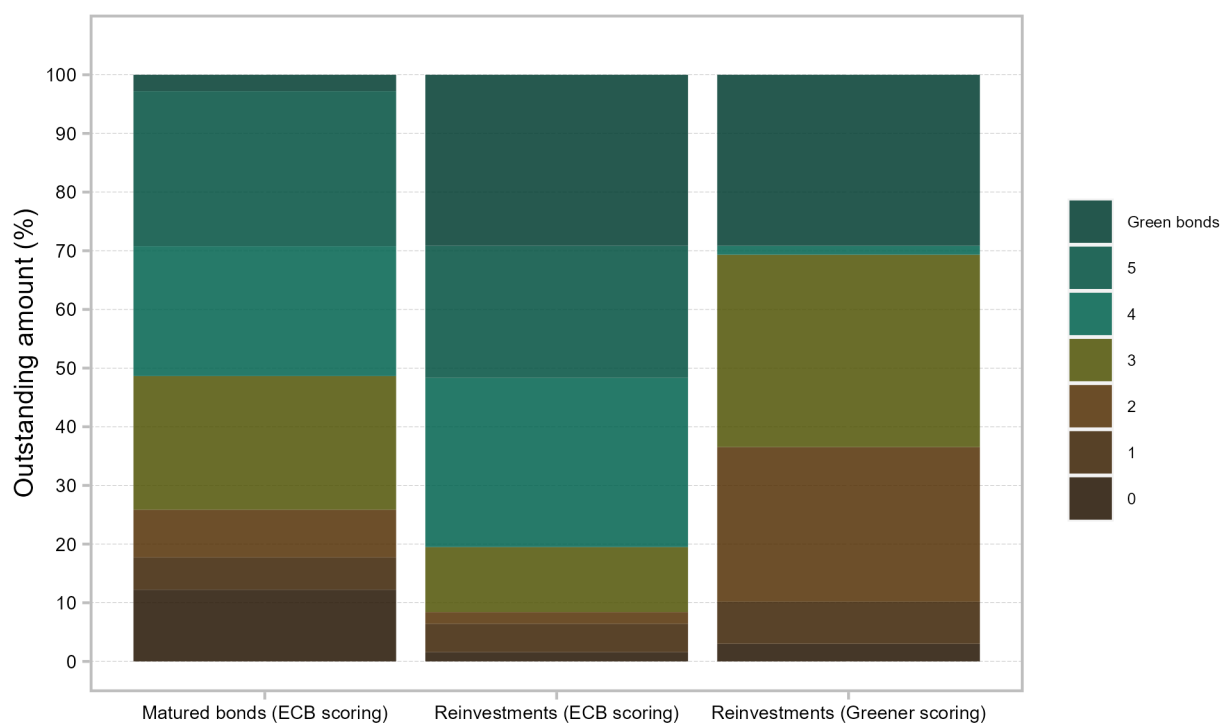
Many of the bonds that the Eurosystem bought as part of its reinvestments were issued by companies that engage in carbon-intensive activities even though they were not necessarily green bonds (Table 2). Particularly concerning is the purchase of a conventional bond issued by E ON SE, which has liquefied natural gas capacity under development and 50% of its revenues come from fossil fuels. Another concerning example is the purchase of one of the conventional bonds of EnBW Energie, which generates almost 40% of its power using coal. Furthermore, both E ON SE and EnBW Energie bonds have a relatively long average maturity, and will therefore remain in the Eurosystem corporate bond portfolio without an

<sup>20</sup>Our choices about formulas and weights have been made so that the distribution of issuer climate scoring in our analysis is as close as possible to the distribution of scoring provided by the ECB (see ECB (2023). Climate-related financial disclosures of the Eurosystem's corporate sector holdings for monetary policy purposes, March, p. 13, Chart 1). For more details, see Appendix A.

<sup>21</sup>Overall, the ECB divided its reinvestments across 41 green bonds and 103 conventional bonds.

<sup>22</sup>Note that in the figure we present green bonds separately both in the ECB and our greener scoring since we focus on the issuer climate scores.

**Figure 1:** Issuer climate scoring decomposition of matured bonds and reinvestments in the Eurosystem corporate bond holdings, 30 September 2022 - 30 June 2023



Source: Authors' calculations using data from the ECB (bond ISIN codes [30 September 2022 and 30 June 2023]) and Refinitiv Eikon (bond outstanding amount [September 2022 and June 2023]; NACE 4-digit codes; TRBC codes; financial and environmental variables [June 2023]).

Note: Since the figure shows issuer climate scores, green bonds are presented separately.

active green unwinding. Had the ECB used our greener scoring, the Eurosystem would not have purchased these bonds: our issuer climate scores for these companies are much lower than the replicated ECB scores.

We now turn to unpack the green bonds purchased by the Eurosystem under reinvestments (see Figure 2). According to the ECB's climate scoring, a significant proportion of these green bond purchases correspond to companies with low scores (0 or 1).<sup>23</sup> With our own greener scoring, this proportion is even higher. In addition, the share of bonds with high climate scores (3 or above) is much lower. Although green bonds can contribute to decarbonising poor climate performers, buying green bonds without considering the companies' overall climate performance entails greenwashing risks.

<sup>23</sup>Although the ECB publishes which corporate bonds the Eurosystem holds, it does not specify the amount that the Eurosystem holds per bond. To proxy the holdings per bond, we use the outstanding amounts per bond and assume that the Eurosystem holds a share of these outstanding amounts which is the same for all bonds. This bond holding share is calculated by dividing the total Eurosystem corporate bond holdings by the sum of the outstanding amount of all bonds that are included in these holdings. For more details, see Appendix C.

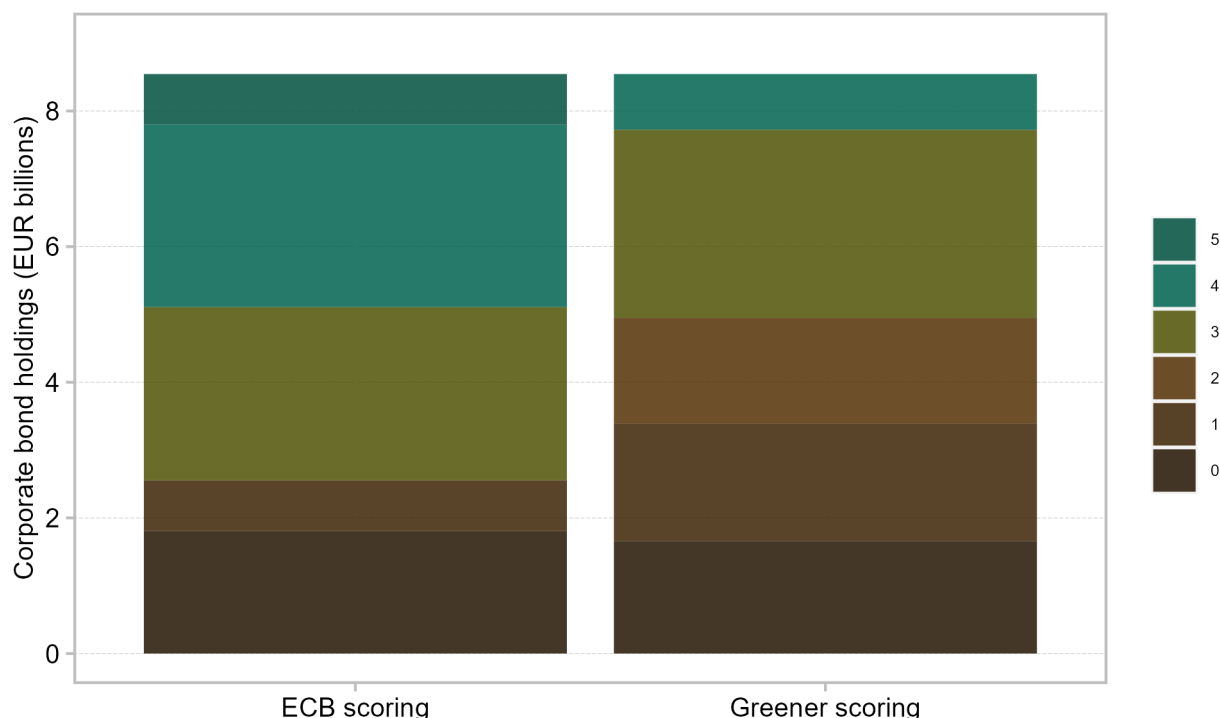
**Table 2:** Carbon-intensive issuers of bonds bought by the Eurosystem during the green tilting reinvestment period (beginning of October 2022 - end of June 2023)

Type of carbon-intensive activity	Company name	Issuer climate score – ECB replication	Issuer climate score – greener approach	Outstanding amount (EUR billions)	No. of green bonds	No. of conv. bonds	Bond average maturity (years)	Coal share of power production (%)	Fossil fuel share of revenue (%)	LNG capacity under development (in Mtpa)	Length of pipelines under development (in km)
Carbon-intensive buildings	Vonovia SE	4	3	1.50	1	1	5.65				
Carbon-intensive transport	Abertis Infraestructuras SA	3	0	0.60	0	1	6.11				
	Aeroporti di Roma SpA	3	1	0.80	1	1	6.84				
	Bayerische Motoren Werke AG	2	1	1.25	0	2	9.48				
	Mercedes Benz Group AG	3	2	2.00	2	0	5.42				
	Paccar Inc	4	1	1.00	0	2	2.65				
	Porsche Automobil Holding SE	1	0	4.10	3	3	3.90				
	Stellantis NV	4	1	1.25	1	0	6.71				
Carbon-intensive utilities	A2A SpA	4	2	0.50	1	0	10.61				
	Electricite de France SA	4	3	5.00	1	4	9.86				
Energy-intensive manufacture	Arkema SA	3	2	0.40	0	1	7.57				
	Orano SA	4	2	0.50	0	1	4.69				
Fossil fuel	E ON SE	5	1	1.80	1	1	8.04		50.00	1.22	0.00
	EnBW Energie Baden Wuerttemberg AG	4	0	1.75	2	1	7.13	38.96			
	Enel SpA	5	1	1.50	0	2	13.65	6.23			
	Engie SA	4	1	2.75	3	0	12.54		49.23	3.24	2.07
	Hera SpA	4	2	0.60	0	1	9.81				
	Neste Oyj	3	2	1.50	3	0	6.72				
	Snam SpA	3	0	0.30	1	0	3.44		88.07	0.00	505.00
	<b>Total</b>			<b>29.10</b>	<b>20</b>	<b>21</b>					

Source: Authors' calculations using data from the ECB (bond ISIN codes [30 September 2022 and 30 June 2023]), Refinitiv Eikon (bond outstanding amount [June 2023]); NACE 4-digit codes; TRBC codes; financial and environmental variables [June 2023]) and Urgewald (coal share of power production, fossil share of revenue, LNG capacity under development (in Mtpa) and length of pipelines under development (in km)).

Note: LNG stands for liquefied natural gas.

**Figure 2:** Climate issuer scoring decomposition of green bonds bought by the Eurosystem during the green tilting reinvestment period (beginning of October 2022 - end of June 2023)



Source: Authors' calculations using data from the ECB (bond ISIN codes [30 September 2022 and 30 June 2023]) and Refinitiv Eikon (bond outstanding amount [June 2023]; NACE 4-digit codes; TRBC codes; financial and environmental variables [June 2023]).

Note: Given that the ECB does not publish the holdings per bond, we have proxied these holdings by estimating a holding share that is the same for all bonds. We apply this share to the outstanding amount of all bonds. For more details, see Appendix C. This approximation implies that the value of reinvestment holdings shown in the figure might not be very accurate.

These greenwashing risks are real. Table 3 shows that about 23% of the green bond reinvestments correspond to bonds issued by fossil fuel companies (10 bonds in total), while an additional 30% of the green bond reinvestments correspond to other carbon-intensive companies.<sup>24</sup> Overall, the Eurosystem's purchase of green bonds issued by carbon-intensive companies is about EUR 4.5bn, more than half of total green bond reinvestments.

The greenwashing risks can be particularly high in the case of green 'transition' bonds. These bonds aim at financing projects that would green carbon-intensive activities, but the proceeds could in practice be used to support activities that extend the use of fossil fuels. Take for example the Bank of Italy's purchase of a green transition bond issued by SNAM, the company in the Eurosystem reinvestment portfolio with the largest share of revenues from fossil fuels (nearly 90%). According to DNV, which certifies SNAM's green bonds,<sup>25</sup> SNAM can use proceeds from transition bonds to finance the extension of its gas transmission network to allow the transport of hydrogen and other low-carbon gases.

<sup>24</sup>For the classification of companies based on the greenness and dirtiness of their main activities, see Appendix B.

<sup>25</sup>See SNAM (2020). *SNAM transition bond framework*, 8 June 2020.

**Table 3:** Activity decomposition of green bonds bought by the Eurosystem during the green tilting reinvestment period (beginning of October 2022 - end of June 2023)

Activity type	Reinvestments (EUR billions)	Share in total reinvestments (%)	No. of green bonds	Average bond maturity
Carbon-intensive buildings	0.22	2.62	1	7.41
Carbon-intensive transport	1.81	21.15	7	5.29
Carbon-intensive utilities	0.52	6.12	2	10.95
Environmental services & equipment	0.66	7.69	3	6.05
Fossil fuel	1.96	22.90	10	8.26
Green transport	0.33	3.85	2	7.90
Green utilities	1.64	19.23	8	9.27
Non-available	0.52	6.12	3	5.69
Other	0.66	7.69	4	5.40
Renewable energy	0.22	2.62	1	5.77
<b>Total</b>	<b>8.54</b>	<b>100.00</b>	<b>41</b>	

Source: Authors' calculations using data from the ECB (bond ISIN codes [30 September 2022 and 30 June 2023]) and Refinitiv Eikon (bond outstanding amount [June 2023]; NACE 4-digit codes; TRBC codes; financial and environmental variables [June 2023]).

Notes: For the classification of companies and their bonds based on their main activities, see Appendix B. Given that the ECB does not publish the holdings per bond, we have proxied the reinvestment amounts per bond by estimating a holding share that is the same for all bonds. We apply this share to the outstanding amount of all bonds bought as part of the reinvestments. For more details, see Appendix C. This approximation implies that the value of reinvestments shown in the figure might not be very accurate.

But, as ReCommon argues,<sup>26</sup> not all hydrogen is 'green' and mixing it with fossil gas is inconsistent with the urgency of the climate crisis. Furthermore, DNV notes that SNAM can use the funds from transition bonds to cover coupon and principal payments of its conventional bonds.<sup>27</sup> This suggests a loose link between the funds raised from SNAM's transition bonds and the 'transition' projects that these bonds are supposed to support.<sup>28</sup>

We now turn to another problematic aspect of the ECB's decarbonisation plans: the use of a flow-based (reinvestments only) instead of a stock-based (entire corporate bond portfolio) approach. The flow-based approach was inconsistent with the Paris Agreement even before the ECB decided to stop reinvestments.<sup>29</sup> It has now become even more problematic because it implies that the ECB terminated decarbonisation at the end of June 2023.

In Figure 3 we illustrate how the climate profile of the ECB's corporate bond portfolio

<sup>26</sup> See Gerebizza, E. and Taglieri, G. (2022). Snam's (not at all) green finance: how to finance fossil gas while talking about transition and sustainability, ReCommon, 2 May 2022.

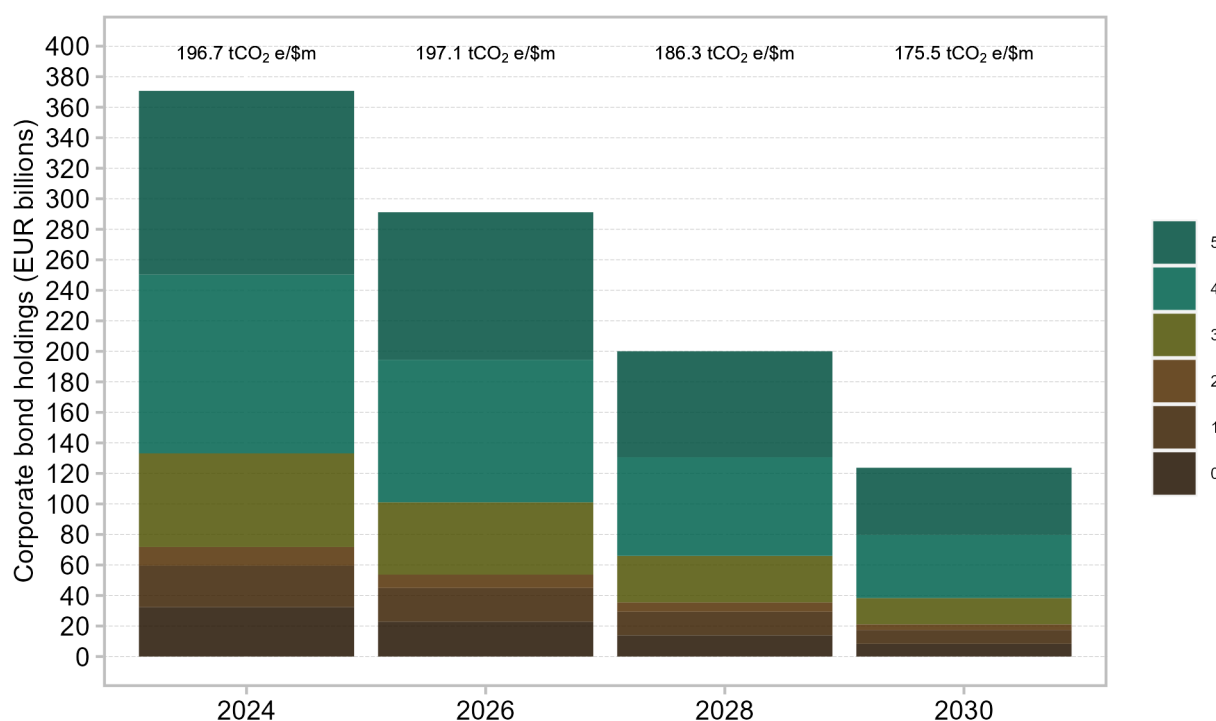
<sup>27</sup> See also Gerebizza, E. and Taglieri, G. (2022). Snam's (not at all) green finance: How to finance fossil gas while talking about transition and sustainability, ReCommon, 2 May 2022.

<sup>28</sup> The table in Appendix D shows the type of green bond flag that has been assigned to each of the bonds bought by the ECB. There are four different green bond flags in Refinitiv Eikon: (1) the CBI-aligned green bond flag, (2) the transition bond flag, (3) the EU Taxonomy bond flag and (4) the ICMA-aligned bond flag. All the bonds that have been bought by the ECB are ICMA-aligned. It is positive that the ECB has not bought any other transition bond apart from the one issued by SNAM.

<sup>29</sup> Dafermos, Y., Gabor, D., Nikolaidi, M., van Lerven, F. and Vargas, M. (2022). The ECB Paris gap: substantive but treatable, Greenpeace; SOAS University of London; University of Greenwich; University of the West of England.

will evolve in the coming years should the ECB refuse to shift to active greening, waiting instead for bonds to mature. We consider the case in which the carbon intensities of the issuers remain unchanged in the coming years and we use the ECB climate scoring, assuming that the scores of issuers will also remain the same until 2030.<sup>30</sup> The figure clearly shows that the ECB will continue to de facto subsidise poor climate performers. In addition, the Weighted Average Carbon Intensity (WACI) will remain high for several years.<sup>31</sup> In practice, the WACI might decline more than what is shown in Figure 3 since companies might reduce their carbon intensities irrespective of the actions of the ECB. But this would be a passive and very slow decarbonisation of the Eurosystem corporate bond portfolio.

**Figure 3:** Climate profile of the Eurosystem corporate bond portfolio under a no further decarbonisation strategy, replicated ECB bond scoring



Source: Authors' calculations using data from the ECB (bond ISIN codes [30 June 2023]) and Refinitiv Eikon (bond outstanding amount [June 2023]; financial and environmental variables [June 2023]).

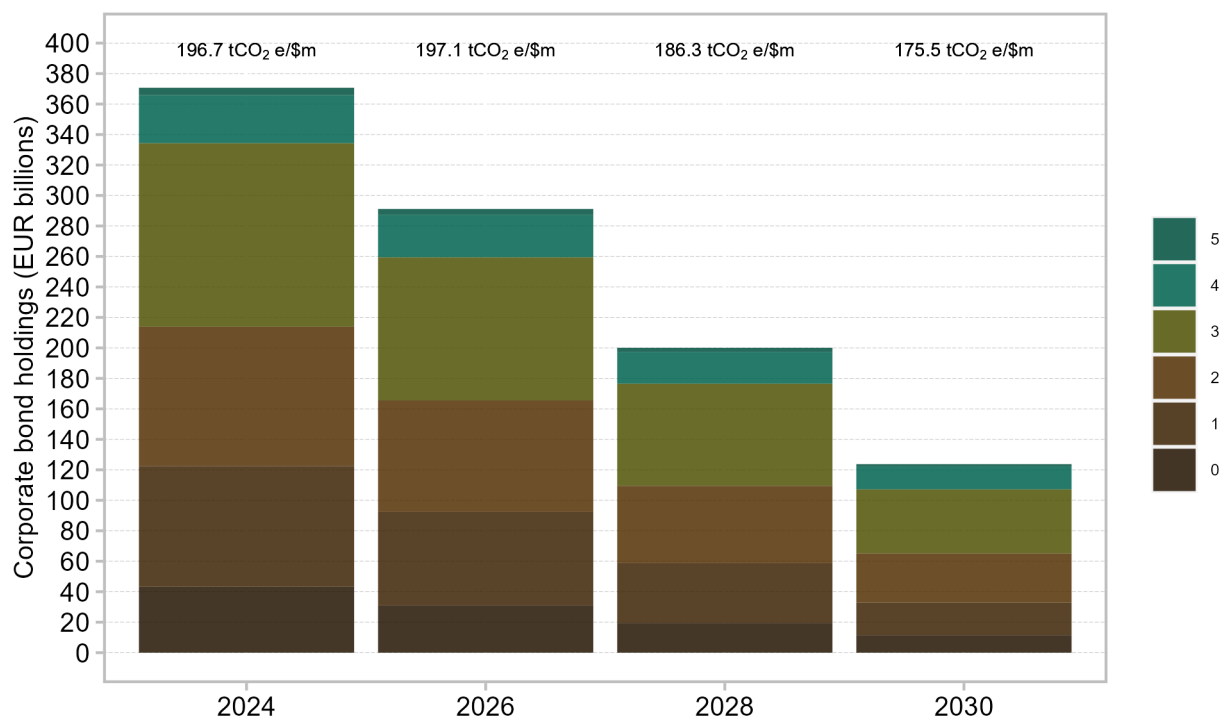
Notes: The figures above each bar show the Weighted Average Carbon Intensity (WACI) in tonnes of carbon dioxide equivalent emissions (tCO<sub>2</sub>e) per US\$ million. WACI has been estimated using Scope 1 and Scope 2 emissions. The carbon intensities and the climate scores of the bond issuers are assumed to remain unchanged until 2030. For the replicated ECB bond climate scoring, see Appendix A. According to this scoring, green bonds are assigned a 5 score. Given that the ECB does not publish the holdings per bond, we have proxied these holdings by estimating a holding share that is the same for all bonds. We apply this share to the outstanding amount of all bonds. For more details, see Appendix C.

<sup>30</sup>Our replicated ECB bond climate scoring applies the ECB issuer climate scoring to the bond level: conventional bonds are assigned the same scores as their issuers, but green bonds are assigned a 5 score irrespective of the profile of their issuers to reflect the preferential treatment of green bonds in the ECB's framework. For more details, see Appendix A.

<sup>31</sup>The WACI is calculated based on the Scope 1 and Scope 2 carbon intensities of the issuers weighted by their respective shares in the portfolio holdings.

When we use our greener climate scoring at the bond level (Figure 4),<sup>32</sup> the climate profile of the ECB holdings in the coming years looks worse: the share of holdings with a poor climate performance is higher. As in Figure 3, this profile does not improve as time passes.

**Figure 4:** Climate profile of the Eurosystem corporate bond portfolio under a no further decarbonisation strategy, greener bond scoring



Source: Authors' calculations using data from the ECB (bond ISIN codes [30 June 2023]) and Refinitiv Eikon (bond outstanding amount [June 2023]; NACE 4-digit codes; TRBC codes; financial and environmental variables [June 2023]).

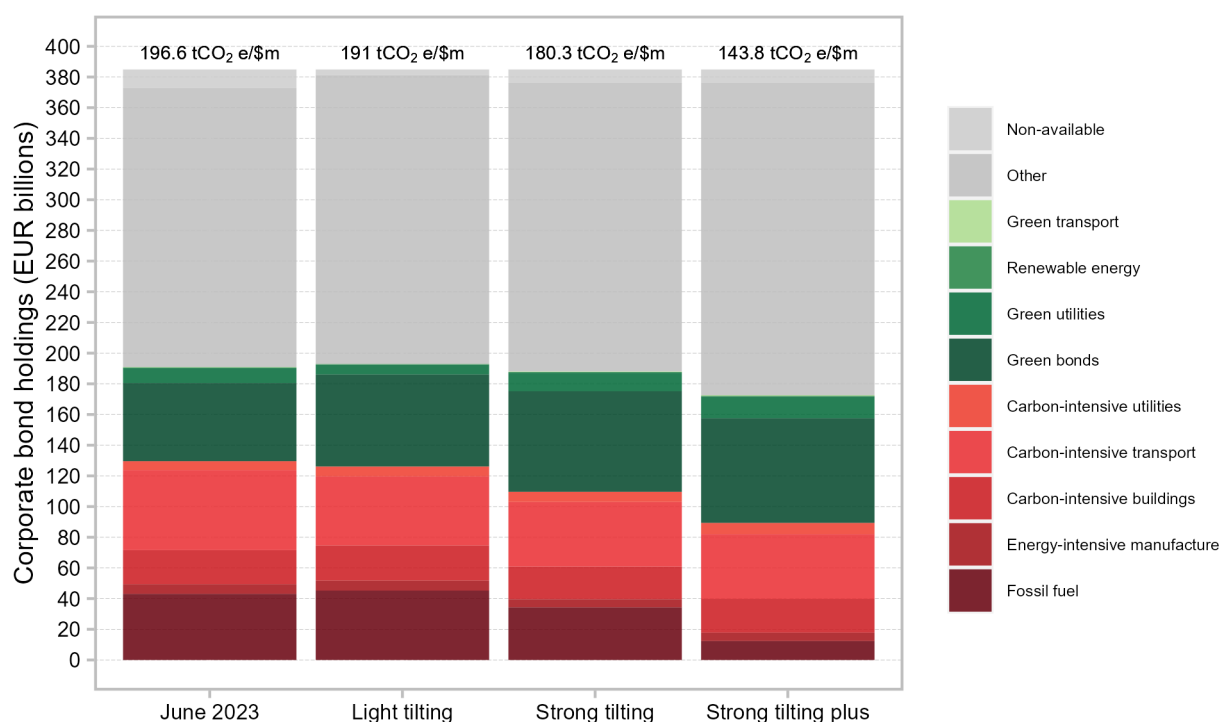
Notes: The figures above each bar show the Weighted Average Carbon Intensity (WACI) in tonnes of carbon dioxide equivalent emissions (tCO<sub>2</sub>e) per US\$ million. WACI has been estimated using Scope 1 and Scope 2 emissions. The carbon intensities and the climate scores of the bond issuers are assumed to remain unchanged until 2030. For the greener bond climate scoring, see Appendix B. According to this scoring, green bonds are assigned a 5, 4 or 3 score depending on how strong the climate score of their issuer is. Given that the ECB does not publish the holdings per bond, we have proxied these holdings by estimating a holding share that is the same for all bonds. We apply this share to the outstanding amount of all bonds. For more details, see Appendix C.

<sup>32</sup>Our greener bond climate scoring applies our issuer climate scores to bonds: conventional bonds are assigned the same score as their issuers, while green bonds are assigned a score of 3, 4 or 5 depending on how strong the climate score of their issuers is. Therefore, in contrast to the ECB climate scoring approach, our scoring framework takes into account the overall climate profile of green bond issuers: green bonds issued by poor climate performers are treated less favourably than green bonds issued by strong climate performers. For more details, see Appendix B.

## 4 Towards an active green tilting strategy

The ECB can adopt a more ambitious decarbonisation approach, as both Mme Lagarde and Prof. Schnabel have recognised. To illustrate that quantitatively, we show how the Eurosystem corporate bond portfolio would look like had the ECB adopted a more ambitious approach in June 2023.

**Figure 5:** Decomposition of the Eurosystem corporate bond holdings (in EUR billions) by activity type, and weighted average carbon intensity (WACI) (in tCO<sub>2</sub>e/\$m), green tilting strategies



Source: Authors' calculations using data from the ECB (bond ISIN codes [30 June 2023]) and Refinitiv Eikon (bond outstanding amount [June 2023]; NACE 4-digit codes; TRBC codes; financial and environmental variables [June 2023]).

Notes: The first bar captures the Eurosystem holdings on 30 June 2023. The figures above each bar show the WACI which has been estimated using Scope 1 and Scope 2 emissions. The details about the tilting strategies are provided in Appendix C. Given that the ECB does not publish the holdings per bond, we have proxied these holdings by estimating a holding share that is the same for all bonds. We apply this share to the outstanding amount of all bonds. For more details, see Appendix C.

We consider the following options:

1. **Light tilting:** The ECB applies tilting to all bonds that are included in its portfolio (stock-based approach). This means that the Eurosystem sells bonds with a poor performance and buys bonds with a relatively stronger performance. Under this option, the ECB keeps its climate scoring approach unchanged.
2. **Strong tilting:** On top of using a stock-based approach, the ECB replaces the existing climate scoring approach with our greener scoring framework.



3. **Strong tilting plus:** On top of the above, the ECB sells all bonds of fossil fuel companies that continue to expand their fossil fuel activities.<sup>33</sup>

Figure 5 and Figure 6 show the results. In Figure 5 we decompose the Eurosystem holdings by the type of activity of corporate bond issuers (treating green bonds separately), while in Figure 6 we decompose them using our greener climate scoring.

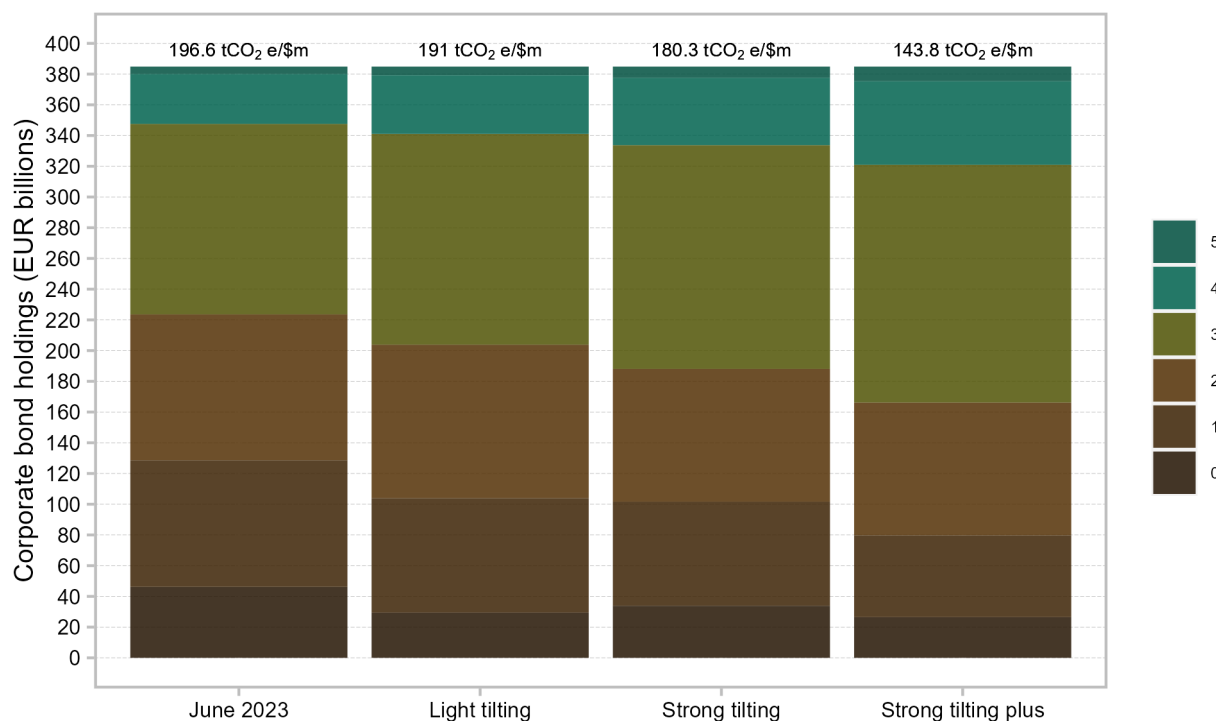
All strategies improve the Eurosystem corporate bond portfolio from a climate perspective. However, the *Strong tilting plus* strategy is the most effective one. First, it leads to the highest reduction in WACI, which is a metric that is often used to capture the climate performance of financial portfolios. Second, this strategy does not only result in a reduction of the representation of bonds issued by carbon-intensive companies, but it also removes from the Eurosystem portfolio conventional bonds issued by companies that have fossil fuel expansion plans which are clearly inconsistent with the targets of the Paris Agreement.<sup>34</sup> Third, the *Strong tilting plus* strategy increases the representation of bonds with higher climate scores, incentivising the reduction of emissions and the change in the business models of companies towards greener forms of production.

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<sup>33</sup>In particular, using data from Urgewald's GCEL/GOGEL lists, we exclude the bonds of (i) oil and gas companies that have expansion plans that are inconsistent with the IEA's Net Zero by 2050 scenario, make capital expenditures on exploration activities or have plans for expanding pipelines and liquefied natural gas terminals and (ii) coal companies that are planning to expand coal power generation. See Appendix B for more details.

<sup>34</sup>Note that the Banque de France has recently announced the exclusion of companies working on new fossil fuel extraction projects from its own fund and pension liabilities portfolio. See Responsible investment: the Banque de France steps up its climate commitments, press release, Banque de France, March 2023.

**Figure 6:** Decomposition of the Eurosystem corporate bond holdings (in EUR billions) by bond climate scores (greener scoring), and weighted average carbon intensity (WACI) (in tCO<sub>2</sub>e/\$m), green tilting strategies



Source: Authors' calculations using data from the ECB (bond ISIN codes [30 June 2023]) and Refinitiv Eikon (bond outstanding amount [June 2023]; NACE 4-digit codes; TRBC codes; financial and environmental variables [June 2023]).

Notes: The first bar captures the Eurosystem holdings on 30 June 2023. The figures above each bar show the WACI which has been estimated using Scope 1 and Scope 2 emissions. For the estimation of the bond climate scores based on our greener approach, see Appendix B. According to this scoring, green bonds are assigned a 5, 4 or 3 score depending on how strong the climate score of their issuer is. The details about the tilting strategies are provided in Appendix C. Given that the ECB does not publish the holdings per bond, we have proxied these holdings by estimating a holding share that is the same for all bonds. We apply this share to the outstanding amount of all bonds. For more details, see Appendix C.

## 5 Conclusion

Two years ago, the ECB developed a plan to incorporate climate issues into its monetary policy operations. Last year, it made some concrete commitments about its corporate bond holdings and collateral framework that, despite their weaknesses, created expectations that the ECB would escalate its decarbonisation strategy to support the EU climate neutrality targets. One year after, these climate commitments have been broken. This month the ECB effectively terminated the greening of its corporate bond holdings and it seems unlikely that any strong climate criteria will be included in its collateral framework in the near future.

The ECB can still reverse that. We have shown how the ECB can continue to decarbonise its corporate bond holdings in a way that is consistent with the Paris Agreement. We have suggested that, while unwinding its corporate bond portfolio, the ECB should start selling bonds of weak climate performers and buying bonds of strong climate performers. This

would provide strong climate signals to the financial markets about the need for bond issuers to get serious about the climate crisis. Green unwinding should rely on a fine-tuned climate scoring framework that uses stricter criteria to assess companies' climate performance to minimise greenwashing risks. The ECB should also apply this stricter climate scoring framework to the Eurosystem collateral framework.

## Appendix A: Replicating the ECB climate scoring

To replicate the ECB's (2023) climate scoring,<sup>35</sup> we calculate the following emissions-based sub-scores for each issuer:<sup>36</sup>

(1) *Relative carbon intensity sub-score (RCI)*: In the ECB climate scoring, this sub-score relies on a best-in-class metric and a best-in-universe metric. The best-in-class metric reflects the Scope 1 and Scope 2 carbon intensity of the issuers compared to the carbon intensity in the sector that they belong to. We capture this through the following formula:

$$RCI_{(1+2)ECBj} = 2 \frac{CI_{(1+2)j} - \min CI_{(1+2)Sector}}{\max CI_{(1+2)Sector} - \min CI_{(1+2)Sector}} \quad (1)$$

where  $j$  is the issuer,  $Sector$  refers to the sector that the issuer  $j$  belongs to,  $RCI_{(1+2)ECBj}$  is the Scope 1+2 relative carbon intensity of company  $j$ ,  $CI_{(1+2)j}$  denotes the Scope 1 and Scope 2 CO<sub>2</sub> equivalent GHG emissions (in tonnes) of the issuer over its revenues (in \$ millions),  $\min CI_{(1+2)Sector}$  is the minimum Scope 1 and Scope 2 carbon intensity in the sector that the issuer belongs to and  $\max CI_{(1+2)Sector}$  is the maximum Scope 1 and Scope 2 carbon intensity at the sectoral level.  $RCI_{(1+2)ECBj}$  takes values between 0 (strongest climate performance) and 2 (worst climate performance).

The best-in-universe metric is estimated by comparing the average Scope 3 carbon intensity in the sector that the issuer belongs to with the average Scope 3 intensities in other sectors. We use the following formula:

$$RCI_{3j} = 2 \frac{CI_{3Sectorj} - \min CI_{3Universe}}{\max CI_{3Universe} - \min CI_{3Universe}} \quad (2)$$

where  $RCI_{3j}$  is the Scope 3 relative carbon intensity of issuer  $j$ ,  $CI_{3Sectorj}$  is the mean Scope 3 carbon intensity in the sector that the issuer belongs to,  $\min CI_{3Universe}$  is the mean Scope 3 carbon intensity in the sector with the minimum intensity across the corporate universe and  $\max CI_{3Universe}$  is the mean Scope 3 carbon intensity in the sector with the maximum intensity across the corporate universe. Like  $RCI_{(1+2)ECBj}$ ,  $RCI_{3j}$  takes values between 0 and 2.

In our replication, sectors are defined as in the ECB's sectoral breakdown of the CSPP (Corporate Sector Purchase Programme) holdings.<sup>37</sup> The sectoral minimum and maximum Scope 1 and Scope 2 carbon intensities are identified based on the companies included in the Eurosystem corporate bonds holdings, while the average Scope 3 carbon intensities per sector are based on the corporate universe in Refinitiv Eikon. For all carbon intensity indicators, we use the CO<sub>2</sub> equivalent GHG emissions data for the last available fiscal year.

We define the overall relative carbon intensity ( $RCI_j$ ) as follows:

<sup>35</sup> See ECB (2023). Climate-related financial disclosures of the Eurosystem's corporate sector holdings for monetary policy purposes, March 2023.

<sup>36</sup> For the companies that engage in financial and insurance activities (NACE codes K.64, K.65 and K.66), we use the company-level and sectoral data that correspond to their ultimate parents and for the companies that engage in public administration and defence (NACE code O.84), we use the company-level and sectoral data that correspond to immediate parents.

<sup>37</sup> This breakdown is available here.

$$RCI_j = w_{RCI(1+2)ECB}RCI_{(1+2)ECBj} + w_{RCI3}RCI_{3j} \quad (3)$$

where  $w_{RCI(1+2)ECB}$  and  $w_{RCI3}$  are the weights assigned to  $RCI_{(1+2)ECBj}$  and  $RCI_{3j}$ , respectively. The ECB does not provide the values that it assigns to these weights.

The ECB specifies that companies that lack self-reported emissions data, are assigned worse values. To replicate that, we penalise issuers with estimated emissions data in Refinitiv Eikon by adding 0.5 to  $RCI_j$ . To the issuers with no emissions data in Refinitiv Eikon we assign a value of 2.

(2) *Disclosure sub-score (DISC)*: The ECB assigns the best value to this sub-score when issuers have climate-related financial disclosures verified by a third party. It assigns the worst value when issuers have no self-reported emissions data. In our replication, this sub-score takes a value of 0 when a company has self-reported emissions in Refinitiv Eikon and 2 otherwise. We do not have access to data about the verification of climate-related financial disclosures in order to more accurately capture this sub-score.

(3) *The forward-looking target sub-score (TARGET)*: According to the ECB, this sub-score is higher for those issuers whose targeted emissions are consistent with ambitious Paris-aligned decarbonisation pathways. To replicate that, we use the targeted emissions of companies provided by Refinitiv Eikon and we calculate the implied targeted annual emissions reduction rate. We call this the Forward-looking Decarbonisation Rate ( $FDR_j$ ). We then compare this targeted rate with 7.6%, which, according to UNEP, is on average in line with 1.5°C.<sup>38</sup> The higher the issuer's targeted reduction rate compared to 7.6% the lower the value of  $TARGET_j$ . We calculate  $TARGET_j$  as follows:

$$TARGET_j = \begin{cases} 0 & , \text{ if } FDR_j \geq 2DR_{ALIGNED}, \\ \min \left[ \frac{2DR_{ALIGNED} - FDR_j}{DR_{ALIGNED}}, 2 \right] & , \text{ otherwise.} \end{cases} \quad (4)$$

where  $DR_{ALIGNED}$  is the annual decarbonisation rate that is aligned with 1.5°C transition pathways. According to this formula,  $TARGET_j=0$  when a company has a target for its decarbonisation rate that is at least twice ambitious as the 1.5°C-aligned target (i.e.  $FDR_j \geq 2DR_{ALIGNED}$ ),  $TARGET_j=1$  when the target decarbonisation rate is equal to the climate-aligned rate (i.e.  $FDR_j = DR_{ALIGNED}$ ) and  $TARGET_j=2$  when the target is to keep the emissions at the same level as they are right now (i.e.  $FDR_j = 0$ ). Note that when the company has no target about the reduction of emissions according to Refinitiv Eikon, we set  $TARGET_j=2$ .

Following the ECB, issuers with no self-reported data or targets about the reduction of emissions, are assigned a value of 2 in  $TARGET_j$ . To take into account that the ECB assigns better scores to issuers with science-based validated targets, we subtract 0.5 from  $TARGET_j$  when we have an issuer with a decarbonisation target that is science-based

<sup>38</sup>To estimate the annual emission reduction rate that is required to keep global warming below 1.5°C, UNEP relies on the scenarios in the 2018 IPCC 1.5°C Special Report that limit warming to 1.5°C with no or limited overshoot. The specific UNEP scenario which is used to derive the 7.6% annual emission reduction rate limits maximum cumulative CO<sub>2</sub> emissions from 2018 until the time net-zero CO<sub>2</sub> emissions are reached (all model realisations in this scenario reach net-zero before 2100) to below 600 GtCO<sub>2</sub>, and cumulative 2018-2100 emissions to at most 380 GtCO<sub>2</sub>, when net negative CO<sub>2</sub> emissions in the second half of the century are included. For more details, see UNEP (2019). Emissions Gap Report 2019, UN Environment Programme.

and validated.<sup>39</sup>

In our replication, we combine the above sub-scores to construct what we call the ECB Emissions-based Climate Index ( $ECI_{ECBj}$ ). The  $ECI_{ECBj}$  is given by the following formula:

$$ECI_{ECBj} = w_{RCI}RCI_j + w_{DISC}DISC_j + w_{TARGET}TARGET_j \quad (5)$$

where the weights  $w_{RCI}$ ,  $w_{DISC}$  and  $w_{TARGET}$  correspond to  $RCI_j$ ,  $DISC_j$  and  $TARGET_j$ , respectively. The ECB does not specify how it weights these sub-scores.

## Issuer climate scores

By construction,  $ECI_{ECBj}$  takes values between 0 and 2. The higher the value of the index the poorer the climate performance of the company. However, the ECB (2023) uses a climate score between 0 and 5: the higher the climate score of the ECB the better the climate performance of the company. To replicate the ECB climate scores based on  $ECI_{ECBj}$ , we use the following formula:

$$SCORE_{ECBj} = 5 - 2.5ECI_{ECBj} \quad (6)$$

We assign scores to issuers based on  $SCORE_{ECBj}$ . In particular:

- Score 5 (strongest climate performers):  $4.5 \leq SCORE_{ECBj} \leq 5$
- Score 4:  $3.5 \leq SCORE_{ECBj} < 4.5$
- Score 3:  $2.5 \leq SCORE_{ECBj} < 3.5$
- Score 2:  $1.5 \leq SCORE_{ECBj} < 2.5$
- Score 1:  $0.5 \leq SCORE_{ECBj} < 1.5$
- Score 0 (poorest climate performers):  $0 \leq SCORE_{ECBj} < 0.5$

Although we lack information about the exact formulas that the ECB uses for its climate scoring and we do not use the same company-level database as the ECB, our replication generates a distribution of climate scoring that is not very far from the distribution that the ECB has reported for its portfolio (see Table A.1). For this replication we have used the following weights:  $w_{RCI(1+2)ECB} = 0.5$ ;  $w_{RCI3} = 0.5$ ;  $w_{RCI} = 0.5$ ;  $w_{DISC} = 0.25$ ;  $w_{TARGET} = 0.25$ .

The main difference between our replication and the ECB's actual scoring is in the lowest climate scores. The main reason behind this difference seems to be that in the Refinitiv Eikon database the number of bond issuers with self-reported emissions is lower than in the database used by the ECB. Therefore, our replication penalises a higher number of bond issuers by assigning lower scores to them.

This discrepancy does not change the essence of our main argument that the ECB climate scoring framework is not sufficiently strict. Actually, our replicated ECB scoring is stricter than the actual one, implying that the greenwashing risks of the ECB scoring framework that we discuss in our analysis might be even higher.

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<sup>39</sup>We use the data provided by Science Based Targets (SBTI) that can be found [here](#).

**Table A.1:** Share (%) of portfolio holdings by issuer climate score

ECB climate score	Actual share (%)	Replicated share (%)
0	3	11
1	7	8
2	13	4
3	25	20
4	34	36
5	18	21

Source: ECB (2023, p. 13, Chart 1) for the actual distribution and authors' calculations using data from the ECB (bond ISIN codes, 30 June 2023) and Refinitiv Eikon (financial and environmental variables [June 2023]) for the replicated distribution.

### From issuer climate scores to bond climate scores

Through the process described above, we assign climate scores to bond issuers irrespective of whether their bonds are green or conventional. However, when we calculate the bond climate scores we take into account that green bonds are treated favourably in the ECB's decarbonisation approach irrespective of the climate performance of the companies that issue them. To reflect that, in our replicated ECB bond climate scoring, conventional bonds are assigned the same climate scores as their issuers, while green bonds are assigned a 5 climate score.

## Appendix B: A greener climate scoring

Our greener climate scoring relies on a Company Climate Index (*CCI*) that we develop. This index is constructed using three sub-indices: (1) an Emissions-based Climate Index (*ECI*) which shares similarities with the emissions-based climate index that we developed to replicate the ECB climate scoring (see Appendix A); (2) an Activities-based Climate Index (*ACI*) that captures the greenness and dirtiness of the main activities of companies; and (3) a Fossil Expansion Index (*FEI*) that reflects the extent to which a company has fossil fuel expansion plans. We describe below these three sub-indices in turn.

### Emissions-based Climate Index (*ECI*)

For each issuer  $j$ ,  $ECI_j$  is given by:

$$ECI_j = w_{RCI}RCI_{(1+2)j} + w_{RBDR}RBDR_j + w_{TARGET}TARGET_j \quad (7)$$

where  $RCI_{(1+2)j}$  is the Scope 1 and 2 relative carbon intensity,  $RBDR_j$  is the Relative Backward-looking Decarbonisation Rate,  $TARGET_j$  is the forward-looking target sub-score, and  $w_{RCI}$ ,  $w_{RBDR}$  and  $w_{TARGET}$  are weights. We use the following weights:  $w_{RCI}=0.5$ ,  $w_{RBDR}=w_{TARGET}=0.25$ .  $TARGET_j$  is defined in Eq. (4) (see Appendix A).

The  $RCI_{(1+2)j}$  component of the  $ECI_j$  relies on the Scope 1 and Scope 2 carbon intensity of the issuers ( $CI_{(1+2)j}$ ) compared to the carbon intensity of their peers in the same sector ( $CI_{(1+2)Sector}$ ). We capture this through the following formula:

$$RCI_{(1+2)j} = \min\left[\frac{CI_{(1+2)j}}{medCI_{(1+2)Sector}}, 2\right] \quad (8)$$

where  $j$  captures the issuer,  $Sector$  refers to the sector that the issuer  $j$  belongs to,  $CI_{(1+2)j}$  denotes the Scope 1 and Scope 2 CO<sub>2</sub> equivalent GHG emissions (in tonnes) of the issuer over its revenues (in \$ millions) and  $medCI_{(1+2)Sector}$  is the median Scope 1 and Scope 2 carbon intensity in the sector that the issuer belongs to.<sup>40</sup>  $RCI_{(1+2)j}$  takes values between 0 (strongest climate performance) and 2 (poorest climate performance).

The  $RBDR_j$  component of the  $ECI_j$  is estimated based on the Backward-looking Decarbonisation Rate ( $BDR_j$ ). The latter is defined as the average annual percentage decline in Scope 1 and Scope 2 emissions over the last three years. To calculate the Relative Backward-looking Decarbonisation Rate for company  $j$  we compare the  $BDR_j$  with  $DR_{ALIGNED}$ , which is the annual decarbonisation rate that is aligned with a 1.5°C emissions pathway (as defined in Appendix A). We use the following formula:

$$RBDR_j = \begin{cases} 0 & , \text{ if } BDR_j \geq 2DR_{ALIGNED}, \\ \min\left[\frac{2DR_{ALIGNED}-BDR_j}{DR_{ALIGNED}}, 2\right] & , \text{ otherwise.} \end{cases} \quad (9)$$

The formula suggests that  $RBDR_j = 0$  when a company has achieved a decarbonisation rate that is at least twice higher than the climate-aligned rate (i.e.  $BDR_j \geq$

<sup>40</sup>The median sectoral carbon intensities have been specified based on the companies included in the Eurosystem corporate bond holdings.



$2DR_{ALIGNED}$ ),  $RBDR_j = 1$  when the past decarbonisation rate is equal to the climate-aligned rate (i.e.  $BDR_j = DR_{ALIGNED}$ ) and  $RBDR_j = 2$  when  $BDR_j \leq 0$ . Note that when Refinitiv Eikon reports no data about the past reduction of emissions for a company, we set  $RBDR_j = 2$ .

## Activities-based Climate Index ( $ACI$ )

To specify the Activities-based Climate Index ( $ACI_j$ ) for each issuer  $j$  we use as a starting point the NACE-based approach<sup>41</sup> of Alessi and Battiston (2022).<sup>42</sup> For each NACE activity, Alessi and Battiston (2022) define a Transition Exposure Coefficient ( $TEC_j$ ) which takes values between 0 and 1 and relies on the Climate Policy Relevant Sectors (CPRS) classification.<sup>43</sup> The value of 1 is assigned to activities that are considered to be very carbon-intensive and thus exposed to transition risks. Activities with zero transition risk exposure take a value of 0. Based on the EU Taxonomy of sustainable activities, Alessi and Battiston (2022) also define the Taxonomy Alignment Coefficient  $TAC_j$  for each activity. A fully green activity is assigned a  $TEC_j$  equal to 1, while activities that are not included in the EU Taxonomy are assigned a value of 0.

We define  $ACI_j$  as follows:

$$ACI_j = 1 + TEC_j - TAC_j \quad (10)$$

Companies that have as a main activity a very carbon-intensive activity are assigned an  $ACI_j$  equal to 2 (since  $TEC_j = 1$  and  $TAC_j = 0$ ) while companies with a fully green activity are assigned an  $ACI_j$  equal to 0 (since  $TEC_j = 0$  and  $TAC_j = 1$ ).

To identify the  $ACI_j$  for each issuer, we proceed in two steps. First, we identify the NACE code for the main activity of the issuer and we estimate a NACE-based  $ACI_j$  using the  $TAC_s$  and  $TEC_s$  provided by Alessi and Battiston (2022). According to the NACE-based  $ACI_j$ , we identify as carbon-intensive activities all those activities that have a NACE-based  $ACI_j$  between 1 and 2. Drawing on CPRS, we classify these carbon-intensive activities into the following categories:

- Fossil fuel
- Energy-intensive manufacture
- Carbon-intensive utilities
- Carbon-intensive transport
- Carbon-intensive buildings

We classify as green activities all those activities that take values in the NACE-based  $ACI_j$  between 0 and 0.5.

However, the mere reliance on the NACE classification has limitations since several NACE codes lack sufficient granularity. Hence, as a second step, we use two additional sources, the

<sup>41</sup>For the companies that engage in financial and insurance activities (NACE codes K.64, K.65 and K.66), we use the company-level data that correspond to their ultimate parents and for the companies that engage in public administration and defence (NACE code O.84), we use the company-level data that correspond to immediate parents.

<sup>42</sup>Alessi, L. and Battiston, S. (2022). Two sides of the same coin: Green Taxonomy alignment versus transition risk in financial portfolios. *International Review of Financial Analysis*, 84, p. 102319.

<sup>43</sup>This classification is available here. See also Battiston, S., Mandel, A., Monasterolo, I., Schütze, F. and Visentin, G., 2017. A climate stress-test of the financial system, *Nature Climate Change*, 7(4), 283-288.

Refinitiv Business Classification (TRBC) and Urgewald, and make adjustments to  $ACI_j$ .

TRBC has a specific category for fossil fuels. When a company's main activity is classified as fossil fuel based on the TRBC classification, we over-write its NACE-based classification. In that case,  $ACI_j$  is always equal to 2. TRBC also provides detailed information about green activities.<sup>44</sup> When an activity of a company is clearly green based on TRBC, we over-write both its NACE-based classification and  $ACI$ . The latter takes a value equal to 0. The combined use of NACE and TRBC allows us to specify the following categories of green activities:

- Renewable energy
- Environmental services & equipment
- Green manufacture
- Green utilities
- Green transport
- Green buildings

In addition, to make sure that no fossil fuel company has been mis-classified, we use the Urgewald Global Oil & Gas Exit list and Coal list provided by Urgewald.<sup>45</sup> Companies that are included in these lists are classified as fossil fuel companies. All these companies are assigned an  $ACI_j$  equal to 2.

## Fossil Expansion Index ( $FEI$ )

For companies included in the Urgewald lists, we calculate the Fossil Expansion Index ( $FEI_j$ ) based on indicators that Urgewald provides about companies' fossil fuel expansion plans. For the upstream expansion of oil & gas we use the 'IEA NZE Expansion Overshoot' indicator, which shows the share of a company's short-term expansion that is not aligned with the International Energy Agency (IEA)'s Net Zero by 2050 scenario (NZE), as well as the exploration CAPEX, which captures companies' capital expenditure on exploration activities. For the midstream expansion of oil & gas companies, we use the 'length of pipelines under development', which shows the aggregated prorated length (in km) of all proposed and under construction oil, gas and NGL (Natural Gas Liquids) pipeline projects, as well as the proposed and under construction 'annual capacity of LNG (liquefied natural gas) terminals'. Finally, for the expansion of coal companies we use the 'total expansion plans coal power (in MW)'.

If any of these indicators takes a positive value this means that the companies have fossil expansion plans and, therefore, we set  $FEI_j$  equal to 2. We also set  $FEI_j = 2$  when companies are included in Urgewald but no data is provided for these indicators. If companies take 0 in the indicators that correspond to their category, we set  $FEI_j = 0$ .

## Company Climate Index ( $CCI$ )

For each issuer,  $j$ , the  $CCI_j$  is given by:

$$CCI_j = w_{ECI}ECI_j + w_{ACI}ACI_j + w_{FEI}FEI_j \quad (11)$$

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<sup>44</sup>Examples of green TRBC activities are 'Photovoltaic solar systems & equipment', 'Wind electric utilities', 'Sustainable & energy efficient home builders' and 'Hydropower equipment'.

<sup>45</sup>The Urgewald Global Oil & Gas Exit list is available [here](#) and the Urgewald coal list is available [here](#).

For issuers included in the Urgewald lists, the weights take the following values:  $w_{ECI}=w_{FEI}=0.25$  and  $w_{ACI}=0.5$ . For issuers not included in the Urgewald lists,  $FEI_j$  is not calculated. Therefore, the weight  $w_{FEI}$  takes a value equal to 0 and the other two weights are assigned the same value (i.e.  $w_{CCI}=w_{ACI}=0.5$ ).

## Issuer climate scores

We specify the climate score ( $SCORE_j$ ) for each issuer as follows:

$$SCORE_j = 5 - 2.5CCI_j \quad (12)$$

Based on  $SCORE_j$ , we classify issuers as follows:

- Score 5 (strongest climate performers):  $4.5 \leq SCORE_j \leq 5$
- Score 4:  $3.5 \leq SCORE_j < 4.5$
- Score 3:  $2.5 \leq SCORE_j < 3.5$
- Score 2:  $1.5 \leq SCORE_j < 2.5$
- Score 1:  $0.5 \leq SCORE_j < 1.5$
- Score 0 (poorest climate performers):  $0 \leq SCORE_j < 0.5$

## From issuer climate scores to bond climate scores

In our greener climate scoring, green bonds are treated favourably as in the ECB's scoring framework. However, when we evaluate green bonds we also take into account the climate performance of their issuers: green bonds that have been issued by strong climate performers are considered to be superior from a climate perspective to bonds issued by poor climate performers.

To capture that, we classify green bonds into three categories:

- Green bonds A: These are green bonds issued by companies with 5 and 4 climate scores. We treat them in the same way as the conventional bonds issued by companies with a 5 climate score.
- Green bonds B: These are green bonds issued by companies with 2 and 3 climate scores. We treat them like the conventional bonds issued by companies with a 4 climate score.
- Green bonds C: These are green bonds issued by companies with 1 and 0 climate scores. We treat them like the conventional bonds issued by companies with a 3 climate score.

Therefore, when we assign climate scores to bonds in our greener climate scoring, conventional bonds receive the same score as their issuers and green bonds receive scores 5, 4 and 3 when they are classified as A, B or C bonds, respectively.

## Appendix C: Alternative tilting strategies

### Tilting factors and holdings

To explain the details behind our suggested alternative tilting strategies, we define as climate tilting factors the percentage change in the ECB holdings of bonds after tilting, compared to pre-tilting holdings.<sup>46</sup> Hence, the post-tilting holdings of bond  $i$  are given by:

$$HOLD_{i,POST} = (1 + tilt_i)HOLD_{i,PRE} \quad (13)$$

where  $HOLD_{i,POST}$  denotes the post-tilting holdings,  $tilt_i$  is the climate tilting factor for bond  $i$  and  $HOLD_{i,PRE}$  denotes the pre-tilting holdings. When  $tilt_i > 0$ , tilting leads to an increase in bond holdings; when  $tilt_i < 0$ , the holdings decline after tilting.

Although the ECB publishes which corporate bonds the Eurosystem holds, it does not specify the amount that the Eurosystem holds per bond. To proxy the holdings per bond, we use the outstanding amounts per bond and assume that the Eurosystem holds a share of these outstanding amounts which is the same for all bonds. This bond holding share is calculated by dividing the total Eurosystem corporate bond holdings by the sum of the outstanding amount of all bonds that are included in these holdings. For our calculations we use the June 2023 CSPP and PEPP holdings that are approximately equal to EUR 385bn. This gives a bond holding share of about 30%.

We use three different versions of climate tilting factors, which correspond to the *ECB tilting*, *Strong tilting* and *Strong tilting plus* options, respectively. We analyse them in turn.

### Light tilting

Under the *Light tilting* option, we increase the holdings of bonds with scores 5, 4 and 3, according to our replicated ECB climate score (see Appendix A), and reduce the holdings of bonds with scores 2, 1 and 0. In order for the value of holdings to remain the same after tilting, the following condition needs to hold:

$$\begin{aligned} & tilt_{5,LIGHT}HOLD_{5,PRE} + tilt_{4,LIGHT}HOLD_{4,PRE} + tilt_{3,LIGHT}HOLD_{3,PRE} \\ & + tilt_{2,LIGHT}HOLD_{2,PRE} + tilt_{1,LIGHT}HOLD_{1,PRE} + tilt_{0,LIGHT}HOLD_{0,PRE} = 0 \end{aligned} \quad (14)$$

where  $tilt_{5,LIGHT}$ ,  $tilt_{4,LIGHT}$ ,  $tilt_{3,LIGHT}$ ,  $tilt_{2,LIGHT}$ ,  $tilt_{1,LIGHT}$  and  $tilt_{0,LIGHT}$  are the climate tilting factors for the *Light tilting* option and  $HOLD_{5,PRE}$ ,  $HOLD_{4,PRE}$ ,  $HOLD_{3,PRE}$ ,  $HOLD_{2,PRE}$ ,  $HOLD_{1,PRE}$  and  $HOLD_{0,PRE}$  are the pre-tilting holdings for bonds with scores 5, 4, 3, 2, 1 and 0 respectively. The design of *Light tilting* suggests  $tilt_{5,LIGHT}, tilt_{4,LIGHT}, tilt_{3,LIGHT} > 0$  and  $tilt_{2,LIGHT}, tilt_{1,LIGHT}, tilt_{0,LIGHT} < 0$ . The subscript 'PRE' stands for 'pre-tilting'.

<sup>46</sup>See also Schoenmaker, D. (2021) Greening monetary policy, *Climate Policy*, 21 (4), 581-592; and Dafermos, Y., Gabor, D., Nikolaidi, M., van Lerven, F. (2022). An environmental mandate, now what? Alternatives for greening the Bank of England's Corporate Bond Purchases, SOAS University of London; University of Greenwich; University of the West of England.

We first select the climate tilting factor for Score 5 bonds:

$$tilt_{5,LIGHT} = \frac{tilt_{5,max}}{1 + \frac{HOLD_{5,PRE} + HOLD_{4,PRE} + HOLD_{3,PRE}}{HOLD_{2,PRE} + HOLD_{1,PRE} + HOLD_{0,PRE}}} \quad (15)$$

where  $tilt_{5,max}$  is the maximum value that  $tilt_{5,LIGHT}$  can take. Note that  $tilt_{5,LIGHT}$  converges towards  $tilt_{5,max}$  when the pre-tilting holdings of Score 5, 4 and 3 bonds are very close to 0.

We set the climate tilting factor for Score 4 bonds equal to 2/3 of the value of  $tilt_{5,LIGHT}$ :

$$tilt_{4,LIGHT} = \frac{2}{3} tilt_{5,LIGHT} \quad (16)$$

The climate tilting factor for Scope 3 bonds is set to 1/3 of the value of  $tilt_{5,LIGHT}$ :

$$tilt_{3,LIGHT} = \frac{1}{3} tilt_{5,LIGHT} \quad (17)$$

Similarly, the climate tilting factor for bucket 2 is 1/3 (in absolute terms) of the value of  $tilt_{0,LIGHT}$ :

$$tilt_{2,LIGHT} = \frac{1}{3} tilt_{0,LIGHT} \quad (18)$$

The climate tilting factor for bucket 1 is 2/3 (in absolute terms) of the value of  $tilt_{0,LIGHT}$ :

$$tilt_{1,LIGHT} = \frac{2}{3} tilt_{0,LIGHT} \quad (19)$$

To specify  $tilt_{0,LIGHT}$ , we substitute Eq. (16), Eq. (17), Eq. (18) and Eq. (19) into Eq. (14) and solve for  $tilt_{0,LIGHT}$ :

$$tilt_{0,LIGHT} = - \frac{(HOLD_{5,LIGHT} + 2/3HOLD_{4,LIGHT} + 1/3HOLD_{3,LIGHT})tilt_{5,LIGHT}}{1/3HOLD_{2,LIGHT} + 2/3HOLD_{1,LIGHT} + HOLD_{0,LIGHT}} \quad (20)$$

Note that  $tilt_{0,LIGHT}$  should not be allowed to take values lower than -1, since this would imply a higher than 100% decline in holdings (which is not possible). In our replication exercise, we set  $tilt_{5,max} = 0.9$  in Eq. (15). This is the highest value that we can have for  $tilt_{5,max}$  without getting  $tilt_{0,LIGHT} < -1$ . The qualitative implications of our analysis do not change if lower values  $tilt_{5,max}$  are used.

## Strong tilting

Under the *Strong tilting* option, the tilting approach is the same as in the Light tilting option. However, the climate footprint of bonds is identified based on the buckets that we have specified using our greener climate scoring linked to  $CCI_j$  (see Appendix B). The tilting factors that result from the strong tilting approach for climate scores 5, 4, 3, 2, 1 and 0 are denoted as  $tilt_{5,STRONG}$ ,  $tilt_{4,STRONG}$ ,  $tilt_{3,STRONG}$ ,  $tilt_{2,STRONG}$ ,  $tilt_{1,STRONG}$  and  $tilt_{0,STRONG}$ , respectively.

## Strong tilting plus

In the *Strong tilting plus* option, tilting is designed using the  $CCI_j$  as in the *Strong tilting* option. However, we also remove bonds of fossil fuel companies with fossil expansion plans according to Urgewald. To keep the overall size of the portfolio unchanged, we increase the holdings of bonds with a 5, 4 and 3 climate score that are already in the ECB corporate bond portfolio.<sup>47</sup>

To apply the *Strong tilting plus* option we first need to identify what we call ‘pseudo pre-tilting holdings’. These are the Eurosystem holdings per climate scores after the exclusion of the bonds associated with fossil fuel expansion. To estimate these pseudo pre-tilting holdings we apply the bond holding share discussed above to the outstanding amount of the bonds that remain in the Eurosystem portfolio after the removal of the bonds of companies with fossil expansion plans.

In order for the overall holdings to remain the same after tilting the following condition needs to hold:

$$\begin{aligned} & tilt_{5,PLUS}HOLD_{5,PS-PRE} + tilt_{4,PLUS}HOLD_{4,PS-PRE} \\ & + tilt_{3,PLUS}HOLD_{3,PS-PRE} + tilt_{2,PLUS}HOLD_{2,PS-PRE} \\ & + tilt_{1,PLUS}HOLD_{1,PS-PRE} + tilt_{0,PLUS}HOLD_{0,PS-PRE} \\ & = HOLD_{EXCL} \end{aligned} \quad (21)$$

where  $tilt_{5,PLUS}, tilt_{4,PLUS}, tilt_{3,PLUS} > 0$  and  $tilt_{2,PLUS}, tilt_{1,PLUS}, tilt_{0,PLUS} < 0$ .  $HOLD_{EXCL}$  are the holdings of bonds that have been excluded. The subscript ‘PS-PRE’ denotes ‘pseudo pre-tilting’ and the subscript ‘PLUS’ denotes the ‘Strong tilting plus’ option.

The climate tilting factors for the *Strong tilting plus* option are calculated in a similar way as in the other tilting options. However, since we do not wish to increase the holdings for bonds with Scores 2, 1 and 0 to increase, we keep the tilting factors for them unchanged. In particular, we use the same tilting factors as in the *Strong tilting* option. Hence:

$$tilt_{2,PLUS} = tilt_{2,STRONG} \quad (22)$$

$$tilt_{1,PLUS} = tilt_{1,STRONG} \quad (23)$$

$$tilt_{0,PLUS} = tilt_{0,STRONG} \quad (24)$$

For the tilting factors for bonds with scores 4 and 3, we have:

$$tilt_{4,PLUS} = \frac{2}{3} tilt_{5,PLUS} \quad (25)$$

$$tilt_{3,PLUS} = \frac{1}{3} tilt_{5,PLUS} \quad (26)$$

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<sup>47</sup>An alternative or complementary option would be to replace the bonds associated with fossil fuel expansion with bonds that are not currently in the holdings of the ECB but are eligible for purchases and are characterised by strong climate performance.

To specify  $tilt_{5,PLUS}$ , we substitute Eq. (22), Eq. (23) and Eq. (24), Eq. (25), Eq. (26), into Eq. (21) and solve for  $tilt_{5,PLUS}$ :

$$tilt_{5,PLUS} = -\frac{(tilt_{2,PLUS}HOLD_{2,PS-PRE}+tilt_{1,PLUS}HOLD_{1,PS-PRE}+tilt_{0,PLUS}HOLD_{0,PS-PRE})-HOLD_{EXCL}}{1/3HOLD_{3,PS-PRE}+2/3HOLD_{4,PS-PRE}+HOLD_{5,PS-PRE}} \quad (27)$$

## Appendix D: List of green bonds in the Eurosystem green reinvestments

Company name	CBI-aligned bond(s)	Transition bond(s)	EU taxonomy bond(s)	ICMA-aligned bond(s)	No. of green bonds
A2A SpA	No	No	Yes	Yes	1
Acciona SA	Yes	No	Yes	Yes	1
Acea SpA	Yes	No	No	Yes	1
Aeroporti di Roma SpA	Yes	No	Yes	Yes	1
Alliander NV	Yes	No	Yes	Yes	1
Covestro AG	Yes	No	No	Yes	1
E ON SE	Yes	No	Yes	Yes	1
EDP Energias de Portugal SA	Yes	No	Yes	Yes	1
EDP Finance BV	Yes	No	No	Yes	1
Electricite de France SA	Yes	No	Yes	Yes	1
Elia Transmission Belgium NV	Yes	No	Yes	Yes	1
EnBW Energie Baden Wuerttemberg AG	Yes	No	Yes	Yes	2
Engie SA	Yes	No	No	Yes	3
FCC Servicios Medio Ambiente Holding SAU	No	No	No	Yes	1
Ferrovie dello Stato Italiane SpA	Yes	No	Yes	Yes	2
Iberdrola SA	Yes	No	No	Yes	2
Koninklijke Ahold Delhaize NV	Yes	No	Yes	Yes	1
Mercedes Benz Group AG	Yes	No	No	Yes	2
Neste Oyj	Yes	No	No	Yes	3
Porsche Automobil Holding SE	Yes	No	Yes	Yes	3
Siemens Energy AG	Yes	No	Yes	Yes	1
Snam SpA	No	Yes	No	Yes	1
Stellantis NV	Yes	No	Yes	Yes	1
Suez SA (FR)	No	No	No	Yes	2
TenneT Holding BV	Yes	No	Yes	Yes	4
Vereniging Achmea	Yes	No	No	Yes	1
Vonovia SE	Yes	No	No	Yes	1
<b>Total</b>					<b>41</b>

Sources: Refinitiv Eikon and authors' calculations using data from the ECB (bond ISIN codes [30 September 2022 and 30 June 2023]) and Refinitiv Eikon (financial and environmental variables [June 2023])

Notes: The table refers to reinvestments from the beginning of October 2022 till the end of June 2023. CBI-aligned bonds are bonds that are aligned to the green bond principles and climate bond standards of the Climate Bonds Initiative. Transition bonds are bonds whose proceeds are used for transition from fossil energy to renewable energy; EU Taxonomy bonds are green bonds that conform to the EU Green Bond Standard/EU Taxonomy; ICMA-aligned bonds are bonds that are aligned to the International Capital Markets Association (ICMA) green bond principles.