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Accounting for climate policies in Europe's sovereign debt market

Marta Domínguez-Jiménez and Alexander Lehmann

Executive summary

INTERNATIONAL DEBT INVESTORS INCREASINGLY demand assets that are aligned with environmental, social and governance objectives. Sovereign debt is being belatedly swept up in this change. This huge asset class represents a uniquely long-term claim and funds a wide range of public expenditure, both brown and green. Public capital expenditures will be a central part of the roughly €3 trillion investment budget needed to pay for the European Green Deal.

EUROPEAN UNION COUNTRIES HAVE so far met investor appetite for climate-aligned assets through sovereign green bonds, the issuance of which has rapidly grown since 2017. The EU itself will also issue green bonds in large volumes. However, because of some inherent flaws in such instruments and as their still-weak frameworks, these bonds are unlikely to meet the environmental criteria demanded by investors, and will complicate established principles in sovereign debt management.

MUCH MORE COMPREHENSIVE INFORMATION is needed on the climate-related aspects of the public budgets of EU countries. Greater transparency in this respect would support stability and improve the functioning of capital markets, given that sovereign debt plays a pivotal role in all investor portfolios and also in regulatory and monetary policy.

ADOPTION BY SOVEREIGN ISSUERS of green budgeting principles, based on a common taxonomy of sustainable activities, would enhance transparency. It could also be driven by investors who, under new EU rules, must disclose the climate-related aspects of all financial instruments offered in the capital market..

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1 Introduction: shifts in sovereign debt markets

The European Climate Law, agreed in principle on 21 April 2021, makes net-zero greenhouse gas emissions legally binding for the European Union by 2050. Other advanced and emerging markets, including South Korea and Japan, and numerous municipalities and cities, have adopted similar targets. This low-carbon transition will require additional annual investment of around €340 billion in the EU alone, with the bulk to be financed by public sector budgets (EIB, 2021).

Capital markets could be a key source of funding for Europe's low-carbon transition. In a remarkable shift in debt capital markets, environmental, social, and corporate governance (ESG) measures have become central to the investment process. Investors have expanded their search for green assets beyond private issuers, for which carbon footprints and alignment with sustainable activities can be relatively easily pinned down, to sovereign issuers that support international climate goals.

Sovereign debt is by far the largest asset class in European capital markets, with €9.1 trillion of EU bonds owed by EU governments at all levels, and total debt equivalent to nearly 90 percent of GDP at end-2020[1]. It is the pivotal asset class that defines pricing of all other financial contracts, a core part of most investors' portfolios, and of course the largest holding on the balance sheets of the European Central Bank and other EU central banks.

Investor strategies in relation to sovereign debt are complicated by a lack of transparency about sustainability-related public expenditures

However, investor strategies in relation to sovereign debt are complicated by a relative lack of transparency about sustainability-related public expenditures, or about medium-term plans for such expenditures. An EU classification, known as the taxonomy[2], has defined what amounts to sustainable activities, yet green budgeting, which would consistently account for the alignment of national public expenditures under such a classification, is in its infancy in the EU, and even more so in national expenditure frameworks.

In an effort to appeal to investors who want to take into account ESG performance, EU states have started issuing green bonds, with ten having done so by March 2021 (see Table 1 in section 3), following in the footsteps of large supra-national issues including the World Bank and European Investment Bank. These instruments commit issuers to use funds raised for activities deemed sustainable, in particular climate mitigation and adaptation. With about €82 billion of cumulative issuance, EU sovereign green bonds are a niche market, though one that is expanding rapidly. A new asset type appears to have emerged in a market that to date was highly homogeneous.

Even though these bond issues have been eagerly taken up by investors, how they meet investors' needs for portfolios aligned with sustainability goals is unclear. Unlike corporate bonds, attributing government bond financing to any individual capital expenditure is made difficult by the integrated treasury management of EU member states' budgets. In some cases funds are largely dedicated to refinancing past expenditures, clearly undermining any notion that bond funding would incentivise additional climate-aligned capital spending. From the perspective of the issuer, the parallel trading of both conventional and green bonds fragments liquidity in the market and may in fact undermine the traditional objectives of efficient sovereign debt funding.

1 Figures refer to general government debt in the third quarter 2020, based on the Eurostat press release of 21 January 2021, available at https://ec.europa.eu/eurostat/documents/portlet_file_entry/2995521/2-21012021-AP-EN.pdf/a3748b22-e96e-7f62-ba05-11c7192e32f3.

2 See https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en.

In the EU, all asset managers and financial advisors must, since March 2021, disclose measures of sustainability of assets offered in the market[3]. A search is underway for metrics that could guide investors towards climate-aligned issuers, not just towards individual securities labelled as 'green'. Major asset managers are committed to full disclosure of the climate impact of their funds. European sovereign bonds of similar credit risk will show major differences in their 'warming potential', which could lead to a significant reallocation of capital.

This paper examines how information about the climate policies of EU member states, as reflected in their spending, could be more effectively communicated to sovereign debt investors. Three measures would create the needed transparency: publishing standardised measures of climate-relevant budget expenditures based on a common taxonomy of green activities; more rigorous green bond frameworks that deliver better on investor mandates; and metrics designed by financial firms that gauge the climate-alignment of national policies. Jointly, the measures we propose should help channel capital market funds to the sovereign issuers most aligned with the objectives of the European Green Deal. This would help bridge the widening gap between the low-carbon investment that is needed and funds actually mobilised.

We start by examining changing investor needs, which reflect ESG criteria but face the obstacle of very limited transparency in national budgetary policies. We then (section 3) review European sovereign green bonds as one way to overcome this information problem. We find these instruments will likely have limited value for investors who truly prioritise sustainability and in any case, they seem to make little difference in changing national expenditure policies. We therefore review (section 4) two other types of disclosure measure, which can be backward or forward-looking. We conclude in section 5 with some recommendations on green bond standards, financial disclosure metrics and transparency in national budgets.

2 ESG investors and sovereign debt

Investment oriented around environmental, social and governance criteria is quickly becoming the norm. The vast majority of institutional investors have subscribed to broad principles of responsible investing, even though verification and enforcement of such standards is often weak. Most investors will reflect some kind of ESG measure in their investment processes. There are also more specialised sustainability-oriented investment funds whose total assets under management in 2020 were estimated at €1.1 trillion within a roughly €25 trillion European asset management market[4]. But how can investors be sure that they are, in fact, investing sustainably? More than 1,000 different ESG measures are offered in the market, which may well lead to investor confusion and indecision and open the door to greenwashing by major issuers (Carney, 2020; Berg *et al*, 2019).

Bond investors have long displayed a short-term investment horizon as significant but distant risks show little impact on risk premia (ESMA, 2019). Fiscal risks from population ageing, for instance, have only recently been priced in a more systematic way. Risks from climate change are now also rapidly incorporated in investment processes on the back of better data and clearer climate scenarios. The understanding of the fiduciary duty of investment managers is also increasingly interpreted as requiring long-term risks to sustainability to be taken into account, and a number of EU provisions were amended to that

3 As per the Sustainable Finance Disclosure Regulation ((EU) 2019/2088), which applies since March 2021. The regulation is available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R2088&from=EN.

4 Figures are from the *Financial Times*, 16 February 2021, based on Morningstar, and EFAMA (2020). Growth in 2020 was particularly brisk, with 253 existing funds repurposed under an ESG mandate and 505 ESG funds launched.

effect in April 2021 (European Commission, 2021). Maturities in sovereign debt markets have generally lengthened, and several EU countries now regularly issue at maturities of 30 years and more. By the time such securities are redeemed and refinanced, adverse climate effects are bound to have materialised globally, affecting countries to varying extents.

In essence, ESG-oriented investors look for issuers with strategies that support national and global climate goals, and which can demonstrate resilience in the face of inevitable climate-related risks. For a sovereign-bond investor, three types of risk have now become relevant: credit risk as it is assessed based on traditional debt sustainability modelling over the space of a few years; exposure to climate-related transition and physical risks; and lack of alignment of national climate policies with international commitments. Note that none of these individual risk exposures needs to be correlated with either of the other two. A short-term investor may not be concerned by long-term climate risk and might continue to hold debt other investors would consider as stranded, issued for instance by a hydrocarbon exporter. An issuer might have sound debt dynamics and have limited exposure to adverse climate events, yet its debt might be shunned because of the government's weak support for global climate policy. Conversely, alignment with international climate commitments and the significant expenditures this support entails will not shield the country from adverse climate events, and may in fact undermine debt dynamics in the short term.

Already, portfolio allocations in Europe take into account climate change and climate risks. In late 2020, a first set of bond indices for euro-area sovereign debt was published. Shortly thereafter, Blackrock, the world's largest asset manager, announced the launch of a first exchange traded fund of euro-area government debt based on this index (FTSE Russell, 2020; *Financial Times*, 2020). Allocations according to this index would reflect issuers' exposures to physical and transition risks, but also their preparedness to cope with such risk exposures.

A sovereign bond investor funds the entire budget of the government. Investors' rights in case of insolvency, however imperfect, extend to all the issuer's assets and revenues. There may be separate accounts dedicated to social security, infrastructure or spending from the proceeds of a green bond, but these are still consolidated within the general government account and offer no additional protection. The frequent appropriation of such accounts by the central government in both emerging and EU markets underlines that there is no investor recourse or credit risk, other than that relating to the budget as a whole[5]. Given these fundamental realities of budget management, the ESG-oriented sovereign-debt investor should be interested in the climate aspects of the entire budget at central or general government level.

How green are Europe's budgets?

EU member states have long interpreted differently what constitutes a 'green' activity or asset. The EU itself uses the so-called Rio Markers[6] and has been criticised for the way investment projects with even a moderate contribution to climate objectives count towards climate spending targets. A common classification is therefore needed. While major parts of national expenditures (eg education or social security) have minimal climate impact, capital spending accounts for a large share of budget expenditures (at EU level roughly 9 percent). At present, the climate impact of public capital expenditures, let alone alignment with announced national emission-reduction targets, cannot be reliably compared across countries.

The classification of sustainable activities should no longer be a matter of interpretation. Private investors are likely to rely increasingly on the new EU's so-called sustainable invest-

5 State-owned enterprises, which are outside the consolidated accounts of the general government, are an exception to this observation. These entities could structure revenue or project bonds where investor recourse is specific to certain activities.

6 Under an adapted system of the Rio Markers developed in the OECD Development Committee, projects are distinguished as having a significant, moderate or insignificant contribution to climate-change objectives, and are counted with 100, 40 or 0 percent of spending, respectively (ECA, 2020; Sweatman and Hessenius, 2020).

ment taxonomy, which was adopted in June 2020 (the Taxonomy Regulation, EU 2020/852). Under the taxonomy, investments can only be considered green if they contribute to one of six objectives (climate mitigation and adaptation, sustainable water use, the circular economy, pollution prevention, and the eco system), while doing no significant harm to any other objective. Implementing legislation is set to come into effect in 2022 and technical criteria have so far been agreed only for the first two objectives: climate mitigation and adaptation. Where an issuer's activities or projects are in line with the taxonomy, additional funding options are likely to open up, including through 'labelled' financial instruments, such as green bonds.

Despite its narrow binary approach to identifying sustainable activities, which precludes many 'shades of green', the taxonomy will likely become a standard classification in the EU. Within a public budget, most parts of public green investment would of course be covered by the taxonomy, such as in green infrastructure, public-building energy efficiency, energy systems and research. Some current spending may also be included, for instance in reforestation. It is less clear whether public spending that may have favourable incentive effects, such as subsidies or tax rebates, would also be considered an eligible activity (Cotarelli, 2020).

In April 2021, the Commission finalised the taxonomy's technical criteria for climate-related activities, and how trade-offs could be evaluated under the 'do no significant harm' principle[7]. This will give much-needed clarity to enterprises and financial market participants. Yet, the Taxonomy Regulation creates no obligations for EU states, not even for investment projects proposed under the Recovery and Resilience Facility.

Investors must contend with limited information on which expenditures in the budgets of EU countries could be labelled green

Investors will therefore have to contend with the limited information on which expenditures in the budgets of EU countries could be labelled green, let alone how such expenditures will evolve over the coming years. Our review of member states' 2020 draft budgetary plans suggests that only a few – among them Ireland, Italy and France – made reference to national climate plans[8]. Only France in its 2021 budget comprehensively reviewed the sustainability aspects in a green budget, scoring each budget line for impact in the six taxonomy objectives (CGEDD and IGF, 2019). Such integrated reporting is still in the early stages in most other countries[9]. The European Commission's own analysis has, as of time of writing, not provided budgetary costs of member states' climate plans (European Commission, 2020a and 2020b).

In any case, budget expenditures explicitly linked to climate objectives seem modest. France listed €38 billion within a budget of €574 billion as having an unambiguously positive impact[10]. At present, EU climate-related government expenditure therefore pales in relation to the public investment that would be required for the low-carbon transition envisaged in the European Green Deal. Commission estimates in 2019 pointed to a green investment gap of about €260 billion per year (European Commission, 2019), though since then the targets for greenhouse gas reductions have been further raised. Additional annual investment requirements in the range of €340 billion seem more likely (EIB, 2021).

7 See https://ec.europa.eu/info/publications/210421-sustainable-finance-communication_en and European Commission (2021).

8 Draft budgetary plans 2020, available at: https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/stability-and-growth-pact/annual-draft-budgetary-plans-dbps-euro-area-countries/draft-budgetary-plans-2020_en#france.

9 See also recommendations from an expert commission in Germany (Sustainable Finance Beirat, 2021).

10 France's Green budget for 2021, in Public Financial Management blog, November 2020.

3 Sovereign green bonds: a piecemeal approach

Notwithstanding of the lack of a clear connection to climate policy in EU member states' budgets, governments have sought to appeal to ESG investors and hone their climate credentials. At central government level alone ten countries have issued sovereign green bonds, led by Poland and France and culminating in a €8.5 billion issue by Italy in March 2021 (Table 1). Cumulative issuance of €82 billion up to March 2021 amounted to less than one percent of the total EU sovereign bond market (with €9.1 trillion capitalisation outstanding at end-2020), though issuance volumes are expected to expand rapidly, as new issuers plan green bonds and existing issuers announce a re-opening of previous issues. Issuance of green bonds by central government comes on top of ongoing issuance by supranational entities (such as the European Investment Bank), sub-sovereign states, state-owned enterprises and banks. The EU itself is set to join this list of issuers, having announced that one third of the funding of the Next Generation EU programme will be in the form of green bonds (Lehmann, 2020).

Green bonds are a relatively recent innovation in capital markets and remain a niche product. A continued expansion in green bond issuance could result in greater tension with the underlying mandates of asset owners, and with the traditional objectives of sovereign debt management.

Table 1: Sovereign green bonds issued by EU countries

	Cumulative amount (€ billions)	Number of issues	Max maturity (years)
Poland, 2016	€ 3.7	3	30
France, 2017	€ 27	1	22
Hungary, 2020	€ 1.5	1	15
Ireland, 2018	€ 5	2	12
Netherlands, 2019	€ 12	1	20
Belgium, 2018	€ 5.7	1	15
Lithuania, 2018	€ 0.07	1	10
Sweden, 2020	$8.3	2	10
Italy, 2021	€ 8.5	1	24
Germany, 2020	€ 11.5	2	10
Total	€ 82	15	

Source: Bruegel.

All EU governments define the objectives of public debt management in published strategies, including more detailed issuance plans[11]. These are standard documents for any debt management office and essential in communicating to market participants how market liquidity will evolve. The traditional objectives of national debt management – to fund the budget efficiently and reliably and to build a liquid yield curve in the local market – seem to have been adapted to accommodate green bond programmes. One survey of issuers found several additional objectives in connection to green bonds, including reputational benefits, investor demand and curbing climate change (Climate Bonds Initiative, 2021).

The issuance of green bonds alongside conventional bonds presents national debt management offices with an acute dilemma. On the one hand, there may be benefits in terms of the traditional objectives of sovereign debt management. Green bonds attract additional

11 See https://europa.eu/efc/efc-sub-committee-eu-sovereign-debt-markets_en.

investors who are dedicated to the asset class, and demand for EU sovereign green bonds has indeed been very strong. The so-called clientele effect, arising from a captive investor base, may result in a yield discount (and higher price) in the primary auction (the so-called 'greenium'), even though the underlying credit risk of the instrument is the same as for a conventional bond[12]. A higher issuance price at the time of the primary auction seems to have been observed in a broader international sample in the survey carried out by the Climate Bonds Initiative (2021).

Yet, this potential pricing benefit for the issuer needs to be weighed against the costs of structuring a debt instrument with a distinct legal structure and documentation requirements. Moreover, the new bond may well turn out to be quite illiquid in secondary trading, in which case secondary issuance by the sovereign and private-sector issuance based on this benchmark would be less attractive. France has addressed this problem by repeatedly issuing the same instrument and in the process has established the largest single green bond of any issuer (€27 billion, nearly a third of the EU total). Germany has structured an as yet unique swap facility between green and conventional bonds, ensuring price alignment at all times. This addresses the problem of illiquidity in a parallel green instrument, though at the same time will make the emergence of a green risk-free yield curve impossible (Krämer, 2020).

From the investor's perspective, the benefits of investing in a green rather than a conventional bond may be that additional new green projects are generated, and that such projects will be attributed to the investor. However, this will depend on the strength of the underlying bond framework that forms the basis of issuance, the allocation of proceeds and reporting. Four criteria describe the quality of this framework:

- Which sectors and expenditure are eligible to be funded, and whether these are truly green and aligned with a recognised classification, such as the EU taxonomy;
- Whether past expenditures can be refinanced through the bond, in which case additionality would be undermined;
- The quality of internal budget management of proceeds in the government's central treasury system, and whether there is some form of ring-fencing of proceeds; and
- Verification of allocation and impact of the proceeds of the bond issue, including a review by independent entities.

Our review of the ten green bond issuance programmes (Table 2) suggests such benefits have been weak at best.

All countries have set out lists of eligible sectors for the allocation of bond proceeds, which are broadly in line with the six environmental objectives established in the EU Taxonomy Regulation. The early release of the taxonomy categories in 2018 seems to have guided some issuers. Only some areas listed by issuers would not have been eligible under the taxonomy (eg international cooperation with emerging markets or awareness-raising under the terms of the German green bond). The Hungarian bond of 2020, for instance, funded some diesel-fuelled rail transportation and track upgrades. Other issuers, by contrast, have been quite focused on just one activity: Lithuania on residential energy efficiency; Sweden on clean transport. This may have helped investors identify additional projects resulting from the bond.

More problematic has been the practice of re-financing past expenditures from green bond proceeds. For instance, over 80 percent of the Polish 2017 bond was allocated to projects initiated in the three years prior to issuance, although this has dropped substantially since then, to only 34 percent refinancing in 2019. In the case of Germany, all proceeds are allocated to the prior budget. In this case, the bond cannot possibly have generated additional green expenditures or projects. Some states have argued that under national budget laws the green bond issuance and prospectus cannot be made contingent on the subsequent

12 Investors' preferences showed a consistent though modest effect on yield discounts in a sample of private sector green bonds (Zerbib, 2018).

Table 2: Evaluation of green bond issuance by EU countries

	Eligibility of expenditure		Internal budget management: segregated accounts?	Verification of impact: independent review?
	Eligible expenditure: alignment with existing standards?	Refinancing of past expenditure?		
Poland 2016	Sustainalytics determined use of proceeds aligned with Green Bond Principles 2016, but minor indirect fossil fuel elements	Refinancing permitted, 2017: over 80% refinancing, 2019: 34% refinancing	Segregated in Green Cash Account	Annual impact report when feasible
France 2017	Vigeo-Eiris determined use of proceeds aligned with Green Bonds Principles	Refinancing permitted, over 50% must be current/ future budgets	Not segregated	Annual output report, impact report to maturity, review by independent council
Hungary 2020	CICERO determined alignment with Green Bond Principles, but provided rating of medium green/good given fossil fuel elements	Refinancing permitted	Not segregated	Impact report after full allocation, CICERO review
Ireland 2018	Sustainalytics determined eligible categories aligned with Green Bond Principles 2018	Refinancing permitted, 2018: 54% same-year expenditure	Not segregated; notional equivalence basis	Biennial impact report
Netherlands 2019	Certified, Climate Bonds Standard and Certification Scheme	Refinancing permitted, at least 50% must be current/future budgets	Not segregated	Annual impact report when feasible, Sustainalytics review
Belgium 2018	Sustainalytics determined eligible green expenditures aligned with Green Bond Principles 2017	Refinancing permitted, 2018: 47% same-year expenditure	Not segregated	Impact report when relevant
Lithuania 2018	Moody's determined alignment with sectoral categories of Green Bond Principles, rated A GB1 (Excellent)	Full allocation to new improvements	Segregated in green bond account	Annual impact report by ministry, based on independent BETA Agency assessment
Sweden 2020	CICERO determined alignment with Green Bond Principles, provided rating of excellent	Refinancing permitted, 2020: 49% same-year expenditure	Issuance amount fictitiously allocated to eligible portfolio, register/ virtual account	Annual impact report only if feasible
Italy 2021	Vigeo Eiris determined use of proceeds aligned with Green Bonds Principles	Refinancing permitted, stated estimated share of refinancing per issuance	Not segregated	Annual impact report
Germany 2020	ISS ESG determined use of proceeds aligned with Green Bond Principles, categories beyond EU taxonomy (eg international cooperation)	Refinancing only, all proceeds allocated to previous year	Not segregated	Impact report for each green sector, at least once in each bond's lifetime

Source: Bruegel, based on the green-bond frameworks of the countries listed, second party opinions for these countries whenever available, impact and allocation reports whenever available, and other research.

budgetary process and approval of specific projects. Most countries allocate proceeds relatively evenly between past and future projects, and only the small Lithuanian bond was entirely allocated to future spending.

A related question concerns the treatment of green-bond proceeds in the issuer's treasury system. The problem of attributing bond proceeds to specific projects is inherent in a bond structure in which the investor has recourse to the entire balance sheet of the issuer, as opposed to a project or revenue-based bond. Compared to a corporate issuer, this problem of attribution is more acute in the context of a national budget, in which expenditure programmes are wide-ranging and evolve based on parliamentary mandates. While all funds are fungible within the government budget, some form of segregation may prevent mixing of resources and will ensure the ultimate allocation of proceeds to expenditures earmarked as eligible. Poland for instance ring-fences proceeds in a green cash account which was set up under law. Most other countries designed weaker forms of earmarking.

Green bonds are essentially standard bonds that offer enhanced transparency about the use of proceeds for projects and expenditures linked to sustainability objectives. A key investor right under the terms of the bond prospectus is access to reports that enable the tracking of the allocation and use of proceeds. All sovereign issuers of EU green bonds provide an annual allocation report, which is sometimes externally audited. Sovereigns also typically provide impact reports, though at different frequencies. Additionally, a small number of companies in the EU offer second party opinions, both on the different green bond frameworks but also, in some cases, on their *ex-post* allocation and impact. While these firms are generally considered credible, they are paid by the issuer and face incentive problems that are familiar from the credit-ratings industry. In this area, France seems most advanced as it offers investors allocation reports, reporting on the outputs of eligible green expenditures and impact monitoring reports, which are also evaluated by an independent panel.

Our assessment under the four framework quality criteria highlights the underlying limitations of sovereign green bonds as instruments to satisfy investor demand for impact. First, the generation of additional public expenditure arising from the bond issuance is hard to demonstrate under even the best frameworks. Considering EU cumulative sovereign green bond issuance accounts for less than 1 percent of the sovereign debt market, it is easy to see how issuers could find planned expenditure to meet the eligibility criteria within their budgets, in particular as the EU taxonomy is not yet binding. Refinancing of past expenditures rules out any notion of additionality. Second, expenditures cannot be ring-fenced. Even where accounts are segregated, proceeds are ultimately consolidated within general government budgets. Finally, the nature of green bonds makes them hard to scale-up. Appropriately strict criteria with a single classification of eligible activities would mean they could only apply to a small share of public investment.

4 Climate alignment of sovereign portfolios

A government's ability to issue a green bond and the pricing of such a bond in no way reflects that issuer's alignment with international climate targets. Even with respect to the limited expenditures that are ostensibly financed by the bond, investors will exert only minimal discipline over the issuer. A widely available measure of the climate impact of all public expenditures, rather than of those ostensibly financed by an individual bond, would be much more effective.

Disclosure is a key element of securities market regulation. In the EU, it has been formalised through rules on security prospectuses or via obligations on asset managers offering products in the financial market. More onerous requirements normally apply where individual rather than professional investors are involved.

Disclosure of climate-related information presents significant new challenges, as many assumptions and modelling choices will be involved, and as factors such as technology and international climate policies are external to the underlying issuer, security or loan exposure. Unlike what is normally included in an investment prospectus, climate-related disclosures will be designed by investment managers and advisors. The definition of an international standard was initiated by the G20 and finalised in 2017 by the Task Force on Climate Related Financial Disclosures (TCFD). The main idea of TCFD (2017) was that every economic agent creates an internal governance framework and risk management for climate impact, discloses metrics and targets, and defines a strategy to meet those targets. Disclosure based on this standard is gaining ground in the financial sector, though remains the exception among large multinational firms.

Some European countries have already adopted regulations on climate disclosure by the financial sector. Asset managers in France, for instance, have been required since 2018 to assess climate risks and their contribution to the low-carbon transition, as defined in national law and by the investor's own targets[13]. This experience seems encouraging as specialised private firms have designed a number of metrics that are now widely used and allow comparison of the climate impact of portfolios of listed bonds and equities (AMF, 2020; Institut Louis Bachelier, 2019).

EU-wide climate disclosure rules have also largely followed the TCFD standard. In the financial sector the Commission argued that this would require some harmonisation, given the pervasive information problems and the rapid growth of financial instruments which are marketed based on their sustainability characteristics[14]. The 2019 Sustainable Finance Disclosure Regulation (SFDR, EU 2019/2088) has made disclosures obligatory since March 2021 for most asset managers and financial advisors. However, more specific implementing legislation that specifies the metrics that should be used in making disclosures, will only apply from early 2022. To fill the gap, large asset managers have already announced a variety of metrics that will describe the sustainability aspects of their investment products. Most go beyond the baseline defined in the regulation (Joint Committee, 2021).

Carbon footprint pitfalls

The rationale for disclosure of climate-related information for sovereign bonds is the same as for bonds issued by companies. The end investor requires a comprehensive measure of the climate impact of his portfolio; exempting sovereign bonds from this requirement would bias portfolio selection away from private issuers. Yet, the long-term maturity of a sovereign bond, the government's powers in taxation and regulation, and wide-ranging expenditures make assessment more challenging.

A casual observer might suggest that the climate impact of a country's sovereign debt is captured by the national carbon footprint[15]. But, as a backward-looking measure, carbon footprints would omit much information about national climate policies and their credibility.

There are also a number of technical problems. The first obstacle in computing the carbon footprint of a sovereign issuer is the definition of the relevant scope of emissions. Defining this scope narrowly, based on the emissions from central government facilities and their operation, and embodied in energy consumed (so-called scopes 1 and 2) would clearly fall short. This would be akin to a commercial bank being held accountable only for energy consumed within its facilities. The standard for companies is scope 3, reflecting emissions arising in upstream and downstream value chains. For central government this kind of

13 Under Art. 173 VI of the French Energy Transition for Green Growth Act, certain financial firms are obliged to integrate climate change related risks into the portfolio allocation process, and to disclose such risks.

14 A 2016 directive required pension funds to carry out climate risk assessments (IORP II Directive, EU 2016/2341) but still gave member states considerable discretion over how to facilitate further the allocation of occupation pension funds into long-term low-carbon assets.

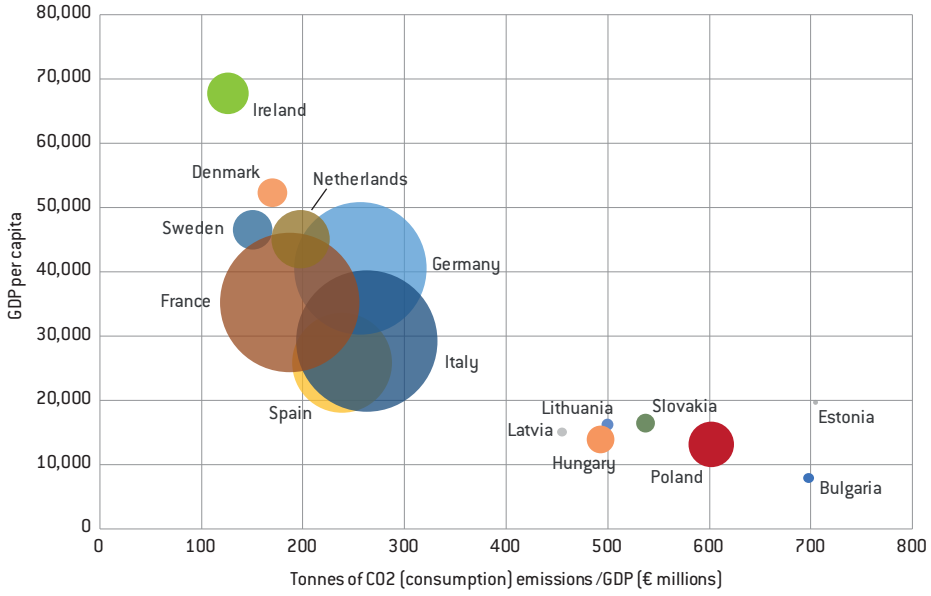
15 Implementation of the SFDR indeed suggests a uniform measure across all types of financial products – essentially the comprehensive carbon footprint (Joint Committee, 2021).

comprehensive calculation would be particularly complex, given its extensive network of funding relationships with other public entities. The government would then essentially be treated as just another economic agent (Trucost, 2018).

The central government of course has a formative role in determining the future path of carbon emissions through its powers in regulation, taxation and the still widespread use of fossil-fuel subsidies. Other disclosure measures therefore attribute *all* emissions within a country to the central government as debt issuer. But combining sovereign and private-sector bonds then results in a more intractable double-counting problem. Once such a wider scope on a national basis is adopted, the next question is whether the emissions included should be those that are locally generated (from domestic emissions or emissions embodied in exported goods), those that are locally consumed (domestic emissions and those embodied in trade, netting out exports), or those that are attributed to the economy from domestic emissions, imports and exports. In almost every EU country, consumption-based emissions are higher than those arising from local production.

Figure 1 shows the energy intensity of key EU countries, based on this second consumption-based measure, relative to their GDP[16]. While key countries are within the central part of the distribution, about 29 percent of total EU debt is held by countries below the lower bound (this includes France and the Netherlands). The remaining outliers with very high emission intensities are less-advanced countries in central and south-eastern Europe, which historically have very high carbon intensity.

Figure 1: Consumption-based emissions in 2018, tonnes of CO2/GDP (€ millions), the size of the bubble representing aggregate public sector debt



Source: Bruegel, based on Global Carbon Budget, Friedlingstein *et al* (2020), consumption emissions updated from Peters *et al* (2011). Eurostat for GDP data. Notes: Values in tonnes of CO2 divided by GDP (in millions of euro). Consumption emissions represent an adjustment of territorial emission inventories with estimates of the net emission transfers via international trade. The net emission transfers represent the CO_2 *emissions in each country to produce exported goods and services minus the emissions in other countries to produce imported goods and services, and are sometimes called the "balance of emissions embodied in trade".*

16 Denominators could also be based on population (favouring low-income countries) or total debt issued by the sovereign (favouring established issuers with high debt stocks).

The 'warming potential' of a bond

As more companies and states announce emission targets and strategies, investors will need to disclose indicators that reflect future carbon pathways, judging the credibility of the announced targets within evolving global climate scenarios[17].

A number of institutional investors and central banks, such as the Bank of France, have already published details of the so-called 'warming potential' of their assets[18]. In essence, the warming potential of a sovereign bond is presented as an implied global temperature rise over pre-industrial levels. This is an estimate of a country's expected future emissions, based on the issuer's current greenhouse gas emissions and other assumptions. These indicators are based on a hypothetical carbon budget for each country derived from projected GDP and population growth. Actual emissions in each country and bond funding to the public sector can then be expressed in terms of an equivalent global warming pathway[19]. As the few figures that have been disclosed make clear (Table 3), there are large differences between individual countries.

Such indicators have their own drawbacks. They involve several crucial assumptions and modelling choices and models may remain impenetrable to outsiders. Varying assumptions about emissions policies and climate scenarios could result in abrupt revisions of metrics (TCFD, 2020). However, such indicators offer an intuitive measure that lends itself more easily to portfolio aggregation. Based on a credible policy to deliver on the EU net-zero target, a market-weighted portfolio of EU sovereign debt would then be rated with a 1.5 degrees Celsius implied temperature rise, consistent with the Paris Agreement. A key question for investors would be how to treat EU states which have collectively committed to an EU-wide net zero target, but individually will show diverging emission intensities over the long term.

Table 3: The warming potential of European sovereign bonds

	Intensity (in CO2/GDP), 2015	Warming potential (Celsius)
Austria	193.8	2.6
Belgium	253.8	3.1
France	173.1	1.9
Germany	262.9	3.1
Italy	216.5	2.5
Netherlands	266.2	3.3
Spain	247.9	2.5
Japan	281.9	3.5
USA	321.6	5.5
Switzerland	69.4	1.8

Source: Bruegel, based on AXA (2019). Note: CO2 intensity is domestic greenhouse gas emissions in tons per million $ of GDP.

17 Forward-looking estimates are already encouraged by a number of financial sector supervisors, including in the European Central Bank's recent guide to banks on climate-related risks, and in the future Bank of England climate stress tests of banks and insurers. One such measure is 'value-at-risk', which measures the potential portfolio loss over a certain time horizon arising from climate change. ECB (2020): Guide on climate-related and environmental risks: supervisory expectations relating to risk management and disclosure.

18 IIF (2019) surveyed practice in key insurance, banking and asset management institutions.

19 Portfolio Alignment Team (2020). Among the several modelling assumptions, this measure requires the allocation of a global carbon budget consistent with a 2 degrees Celsius pathway to individual sectors and countries. Giraud *et al* (2018) proposed methods that are independent of the political process.

5 Recommendations

Additional investments of up to €340 billion annually may be required in the EU's transition to net zero. Public expenditures in EU countries at central, state and municipal government level could account for almost half of the required investment budgets. But it is far from clear how much is being spent at present, let alone what member states' pathways for climate-related expenditures are over the coming years.

Greater transparency is needed to allocate bond market investment and to cover the shortfalls in climate-related investment at EU and member-state level. As a first step, the EU should give up its own outdated method for tracking climate-related spending based on the Rio Markers, which has led to inflated climate spending claims. The EU has promoted the new taxonomy to the private sector, and should adopt this classification itself for its own budget. The taxonomy classification should also gradually be adopted to track the sustainability impact of capital expenditures in the budgets of member states, most urgently of course within the Recovery and Resilience Facility. The EU could also promote consistent climate-impact accounting in the budgetary plans of member states within the European Semester, and this could be supported by the European Fiscal Council.

Without such better ways of measuring the sustainability of national budgets, sovereign issuers will continue to use green bonds in larger volumes and with increased frequency. This primarily aims at building a reputation for responsible climate policies and allows investors to gain an exposure to the sustainable expenditures that are ostensibly financed. The evident demand for green bonds, issued by both public and private entities, underlines that few good measures to describe the climate impact of the issuer currently exist. However, sovereign green bonds fund only a small share of national budgets, while overall expenditures and tax and subsidy policies may lend little support to climate goals.

A credible green bond standard

The existing green bond frameworks have been defined by member states, are not comparable and are often weak in terms of encouraging additional expenditures or reporting on the allocation and impact of funds raised.

Green bonds are inherently limited in generating additional sustainability-oriented spending or projects, let alone as a means to discipline national budget policies. The EU Green Bond Standard could help raise standards, though at time of writing no political agreement had been found on a proposal made in 2019 (Technical Expert Group, 2019). The Commission's updated sustainable finance strategy, which is due in mid-2021, offers a chance to relaunch this initiative. Sovereign issuers should be more central to the strategy than when these proposals were first drafted, in particular in light of the likely substantial additional issuance of EU green bonds planned from late 2021.

A new class of EU green bonds should have a uniform quality across the EU and should be limited to financing well-defined activities as they are set out in the EU taxonomy. Unlike in the original proposal for a green bond standard, refinancing of past expenditures and subsidy and tax schemes should not be accommodated. A perception that the green-bond frameworks of individual sovereign issuers are weak, or that they greenwash fundamentally unreformed national budget policies, would undermine the entire asset class, also for private issuers. Verification and reporting should therefore be done only by accredited service providers, based on common methodologies, and should be publicly disclosed. This should also include backward-looking impact analysis of public sector current and capital expenditures, as well as other subsidy schemes. Over half of green bonds issued globally are euro-denominated, so the future EU green bond rules will set an important standard.

A standardised measure for financial sector climate disclosure

Since the EU disclosure regulation came into effect in early 2021, asset managers and financial advisors have been required to publish sustainability and climate-related information for the financial instruments offered in the market. These metrics, in addition to financial aspects and credit risk, will increasingly determine portfolio allocation.

The rationale for disclosure is in principle the same for private and sovereign bonds but there is no single correct metric that addresses all investor mandates and allocation criteria. The nature of sovereign funding requires a more comprehensive measure than can be designed for a private issuer. Forward-looking measures should be preferred over past carbon footprints as they reflect national climate policies and science-based scenarios. Net-zero commitments could in principle be rewarded with a lower climate impact attributed to the issuer in investor portfolios and, conversely, a revision of global climate scenarios could be reflected in every issuer's warming potential. Ultimately, metrics that describe the climate-alignment of a sovereign issuer may become a more powerful incentive for sustainability-oriented public expenditures than green bonds. On the basis of such a measure, an EU sovereign bond fund, just like a fund composed of private sector securities, could ultimately be marketed to international investors as supporting international climate goals.

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