Study on the potential of green bond finance for resource-efficient investments

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Study on the potential of green bond finance for resource-efficient investments

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ABSTRACT

Green bonds could play a key role in helping to finance the investment needed to achieve the EU's 2030 Climate and Energy objectives and the UN Sustainable Development Goals.

This report presents an analysis of the development and functioning of the green bond market, including the main actors and sectors, with specific focus on financing investments into improved resource efficiency. It summarizes the key bottlenecks limiting the development of the market in specific countries and sectors. It identifies a set of possible public sector measures to overcome these bottlenecks, supported by examples of good practices. The report also assesses the regulatory feasibility and expected impacts of specific standardization options on the liquidity and size of the market. Finally, the report presents a set of recommendations addressed at the EU and its Member States.

A Policy Toolbox provides additional detail on possible public sector measures on the demand and supply side. Nine country case studies support the analysis, focusing on Bulgaria, France, Germany, Italy, the United Kingdom, as well as China, Mexico, Norway, and the United States.

EXECUTIVE SUMMARY

A green bond is differentiated from a regular bond by its label, which signifies a commitment to exclusively use the funds raised to finance or re-finance "green" projects, assets or business activities. Green projects are projects that promote progress on environmentally sustainable activities. Green bonds provide an opportunity to mobilize capital for green investments. They offer an opportunity to investors to make informed, explicit decisions to invest in green projects. Green bonds are a means of attracting new investors and hence mobilizing liquidity for green investments.

The main actors in the market[1] can be categorized as issuers (entities with green projects needing funding or refunding), underwriters (financial institutions arranging the issuance of the green bonds), external reviewers (verifying the "greenness" of the underlying projects) including rating agencies, intermediaries (such as stock exchanges), and investors (particularly those with a mandate to invest in green assets). Issuers of green bonds may benefit from reputational gains[2] and upgraded environmental risk management processes due to commitments to green disclosure. On the other hand, bond investors, especially long-term and responsible investors, are provided with an emerging class of green assets and more opportunities to actively engage with issuers on ESG (Environmental, Social, Governance) factors related to the financed projects.

The green bond market can provide an additional source of green financing to bank lending and equity financing, and enable long-term financing for green projects in geographies where the supply of long-term bank loans can be limited. Today, green bonds mainly finance projects within renewable energy (45.8% of the issuance globally in 2015), energy efficiency (19.6%), low carbon transport (13.4%), sustainable water (9.3%), and waste & pollution (5.6%). The demand for green bonds has been growing exponentially with pension funds and insurance companies diversifying their investment portfolios. The total issuance of green bonds was USD 41.8 bn. in 2015 and reached USD 65.4 bn. by November 2016. In the light of the global commitment to shift to a low carbon economy, the green bond market is likely to continue to grow, while attracting more diverse issuers and investors.

Key developments in the evolution of the green bond market have included:

- The green bond market emerged in 2007-08 with the first few issuances by Multilateral Development Banks.
- Private sector issuers, including corporates and banks joined the market in 2013-2014, supported by the launch of the Green Bond Principles. From 2013, there was a surge in the issuance of labelled green bonds.
- More countries joined the green bond market in 2015, contributing to a total annual issuance of USD 41.8 bn. Corporate green bonds accounted for 36% of the issuance – the highest share ever, followed by municipalities with 15% and by banks with 12%.
- Today, the annual green bond issuance continues to grow rapidly and current estimates for 2016 range from USD 70 to USD 100 bn., with much of this growth being the impact of Chinese issuers in the market.

[1] The referred main actors are active in both the primary and secondary bond markets. See more details in the Glossary (Annex A)

[2] For example, corporate issuers of green bonds whose business model is not oriented towards developing sustainable solutions can flag a responsible and long-term oriented product to investors.

The EU green bond market has developed well compared to other green bond markets because it is built on top of the existing finance infrastructure. Besides, the EU market has experienced participants and an increasing political support from the EU institutions. Yet significant differences exist between EU Member States.

Despite of its rapid growth, globally the green bond market still only constitutes a very small share (around 0.13%) of the bond market. Therefore, there is a huge potential for unlocking further growth, which could contribute to the EU's 2030 climate and energy objectives, and commitments to the UN's Sustainable Development Goals.

This study identifies five **key bottlenecks** that hamper the further growth of the green bond market:

1. Lack of green bonds and green project pipelines
2. Lack of aggregation mechanisms for green projects
3. Lack of green bonds definition and framework
4. Lack of information and market knowledge
5. Lack of clear risk profile of green investments

The public sector can play an important role in reducing these barriers. However, there are divergent views on the need and form of public intervention. While some experts consider the growth of the market to be driven mainly by private actors and see a very limited role for governments in fostering the already nascent green bond market, other stakeholders have called for the public sector to play a larger role than hitherto and to actively support the development of the green bond market.

Against this background, the study explores a broad range of potential **policy measures** for the public sector to address the bottlenecks summarized above. On the one hand, this includes policy measures that facilitate green bond issuance or purchase without prescribing or sanctioning certain types of behaviour. By facilitating cooperation between green bond market actors, the privately driven character of the green bond market is maintained. Actors can share their knowledge and experiences and engage in constructive dialogue with governments, thereby ensuring buy-in from the parties involved. Public sector support for aggregation and securitization, for example through the establishment of warehousing facilities, would allow smaller green projects to enter the green bond market while reducing analytical burden for bond issuers and investors. Public issuance of green bonds would increase the size of the market and allow interested market actors to get familiar with this new type of bond before deciding to issue themselves. Despite general support for such measures, they still need to be designed carefully in order to avoid potential downturns.

The study also discusses possible policy measures in the form of market interventions by public actors. Such measures are viewed more critically by certain experts as they can potentially have unintended consequences. Measures such as public investment in green bonds, credit enhancement, fiscal incentives for green bonds or preferential treatment of green bonds in credit regulations could lead to an unjustified altering of risk profiles, thereby threatening the financial stability of the participating market actors. Such far-reaching interventions should thus only be considered and implemented if they can be well justified by profound evidence.

Based on in-depth analysis of such public sector measures, as well as on the input provided by experts and stakeholders, the study concludes that the following **EU interventions** are possible for the European context:

- Raise awareness of the benefits of green bonds (e.g. through a guide supporting the green bond market development addressed at national authorities)

- Lead, establish or join a coordination mechanism with the main market actors
- Collect, disseminate or maintain a list of planned green investments to support the development of a green project pipeline, and thus support the supply of green bonds (e.g. through requiring such lists from each Member State)
- Require mandatory disclosure of green indicators regarding bond issuances and investments[3]

At the national level, EU Member States could take the following measures:

- Raise awareness on the benefits of green bonds, and thus increase supply
- Support capacity building and knowledge sharing
- Provide stronger support to local entities (e.g. municipalities) to issue green bonds
- Issue sovereign green bonds (as announced recently by France)

Furthermore, establishing and implementing common standards for green bonds is an important step for developing a robust green bond market. In this context, the study identifies six key **standardization measures** as possible options for the European green bond market, grouped in three green bond life-cycle stages. These measures are:

- Pre-issuance stage:
    1. Project Eligibility and Selection Criteria
    2. Pre-issuance External Review
- Investment Decision stage:
    3. Pre-issuance report
- Post-issuance stage:
    4. Management of proceeds
    5. Post-issuance External review
    6. Periodic reporting

Most of these measures will likely increase the demand and liquidity through increasing transparency and investors' confidence. These measures will also ensure that the proceeds from green bonds are used for funding genuinely *green* projects with clear and measurable environmental objectives.

Some measures could have a negative effect on the size of the green bond market, at least in the short run, due to increased transaction costs associated with issuing green bonds in line with such requirements. However, these measures are likely to increase the size of the market in the long run, once the common standard becomes the norm.

Although these standardization measures are presented as separate policy options for the EU, essentially they are interlinked components of an overall standardization framework. So for each of these policy options to be fully effective, they should be gradually introduced to form a comprehensive common European Green Bond Standard.

[3] Such as the French regulatory requirement (Article 173), which provides for mandatory climate disclosure by investors.

Based on in-depth analyses of the described standardization measures as well as on the input provided by experts and stakeholders, the study concludes that the following **EU interventions** as regards to common standards are possible options in the European context:

- Support the emergence of a common European Green Bonds Standard based on the key suggested standardization measures and building on the existing market led initiatives such as the Green Bonds Principles and the Climate Bonds Standards.
- Encourage the Member States to learn from good practice elsewhere. For instance, France has developed a public label for green investment funds, with the potential to be replicated in the European context.
- Promote the different standardization measures with varying degrees of regulatory intensity to ensure alignment/compliance with the framework.

RÉSUMÉ ANALYTIQUE

Une obligation verte se différencie des obligations courantes par sa catégorisation, qui correspond à l'engagement de n'utiliser que des fonds levés dans le but de financer ou de refinancer des projets, des actifs ou des activités commerciales « vert(e)s ». Les projets verts sont des projets qui favorisent l'avancée d'activités durables sur le plan environnemental. Les obligations vertes constituent une opportunité de mobiliser des capitaux pour des investissements verts. Elles donnent aux investisseurs l'occasion d'adopter des décisions informées et expresses d'investissement dans des projets verts. Les obligations vertes constituent un moyen d'attirer de nouveaux investisseurs, mobilisant ainsi des liquidités pour les investissements verts.

Les principaux acteurs du marché[4] peuvent être classés selon les catégories suivantes: les émetteurs (les entités qui détiennent des projets verts nécessitant un financement ou un refinancement), les souscripteurs (les institutions financières qui organisent l'émission des obligations vertes), les examinateurs externes (qui vérifient le « caractère vert » des projets sous-jacents) dont notamment les agences de notation, les intermédiaires (comme les bourses de valeurs), et enfin les investisseurs (et en particulier, ceux mandatés pour investir dans des actifs verts). Les émetteurs d'obligations vertes peuvent bénéficier de gains en termes de réputation[5] et de processus de gestion du risque environnemental améliorés, en raison des engagements entourant les obligations d'information en matière d'obligations vertes. D'autre part, les investisseurs obligataires, notamment les investisseurs sur le long terme et les investisseurs responsables, se voient proposer une nouvelle classe d'actifs verts, ainsi que davantage d'opportunités d'interagir activement avec les émetteurs sur les facteurs environnementaux, sociaux et de gouvernance d'entreprise (ESG) afférents aux projets financés.

Le marché des obligations vertes peut constituer une source additionnelle de financement vert, au côté des emprunts bancaires et du financement sur fonds propres, et permettre un financement sur le long terme pour des projets verts sur des territoires dans lesquels la disponibilité des prêts bancaires à long terme peut s'avérer restreinte. À l'heure actuelle, les obligations vertes financent principalement des projets dans les secteurs des énergies renouvelables (45,8 % des émissions mondiales en 2015), de l'efficacité énergétique (19,6 %), des transports à faibles émissions de carbone (13,4 %), de la gestion durable des ressources en eau (9,3 %) et des déchets et de la pollution (5,6 %). La demande d'obligations vertes a augmenté de manière exponentielle avec la diversification des portefeuilles d'actions des fonds de pension et des compagnies d'assurance. Les émissions totales d'obligations vertes se sont élevées à 41 800 milliards USD en 2015, pour atteindre 65 400 milliards USD en novembre 2016. À la lumière des engagements mondiaux pour passer à une économie sobre en carbone, le marché des obligations vertes devrait continuer de prendre de l'ampleur, tout en attirant des émetteurs et des investisseurs plus variés.

Parmi les développements clés dans l'évolution du marché des obligations vertes figurent notamment les suivants :

- Le marché des obligations vertes est apparu en 2007-2008, avec les premières rares émissions lancées par des banques multilatérales de développement.

[4] Les principaux facteurs susvisés jouent un rôle actif aussi bien sur le marché obligataire primaire que sur celui secondaire. Pour en savoir plus, veuillez consulter le glossaire (annexe A).
[5] Ainsi, par exemple, les sociétés émettrices d'obligations vertes dont le modèle d'entreprise n'est pas tourné vers le développement de solutions durables peuvent se prévaloir d'un produit responsable et axé sur le long terme auprès des investisseurs.

- Les émetteurs du secteur privé, dont les sociétés et les banques, ont rejoint ce marché en 2013-2014, s'appuyant sur le lancement des principes pour les obligations vertes (Green Bond Principles). Depuis 2013, on constate une forte progression de l'émission d'obligations vertes labellisées.
- Davantage de pays ont rejoint le marché des obligations vertes en 2015, contribuant ainsi à atteindre le montant annuel d'émissions de 41 800 milliards USD susvisé. Les obligations vertes émises par des sociétés y représentaient 36 % des émissions (la part la plus élevée jamais enregistrée), suivies par les municipalités (avec 15 %) et les banques (avec 12 %).
- Aujourd'hui, les émissions annuelles d'obligations vertes continuent d'augmenter rapidement, et les estimations actuelles pour 2016 se situent entre 70 et 100 milliards USD, sachant qu'une bonne partie de cette hausse correspond à l'impact des émetteurs chinois sur le marché.

Le marché des obligations vertes de l'UE s'est bien développé par rapport à d'autres marchés analogues, et cela car il repose sur l'infrastructure financière existante. Par ailleurs, le marché de l'UE a bénéficié des participants et du soutien politique croissant des institutions de l'Union. Néanmoins, il existe des différences de taille entre les États membres de l'UE en la matière.

En dépit de sa croissance rapide, le marché mondial des obligations vertes ne constitue toujours qu'une part très faible (environ 0,13 %) du marché obligataire. Aussi, il existe un énorme potentiel de croissance, ce qui contribuerait à la satisfaction des objectifs de l'UE du cadre pour le climat et l'énergie à l'horizon 2030, ainsi qu'à honorer les engagements adoptés dans le cadre des objectifs de développement durable des Nations unies.

La présente étude identifie cinq obstacles clés qui gênent la croissance du marché des obligations vertes, à savoir :

1. le manque de pipelines d'obligations vertes et de projets verts ;
2. le manque de mécanismes d'agrégation pour les projets verts ;
3. le manque de définitions et de cadres en matière d'obligations vertes ;
4. le manque d'informations et de connaissances sur le marché ;
5. le manque de profils de risque clairs pour ce qui est des investissements verts.

Le secteur public peut jouer un rôle important dans la réduction de ces obstacles. Néanmoins, il existe des avis divergents quant à la nécessité et aux modalités d'une intervention publique. En effet, alors que certains experts estiment que la croissance du marché ne peut venir que des acteurs privés et accordent donc un rôle très limité aux gouvernements dans la promotion d'un marché des obligations vertes déjà naissant, d'autres parties prenantes appellent le secteur public à jouer un rôle plus grand que celui adopté à ce jour, pour soutenir activement le développement d'un marché des obligations vertes.

Dans ce contexte, la présente étude examine un large éventail de mesures politiques potentielles qui permettrait au secteur public supprimer les obstacles listés ci-dessus. D'autre part, cet éventail comprend des mesures politiques qui faciliteraient l'émission d'obligations vertes, ou leur acquisition, sans prescrire ou sanctionner certains types de comportements. En facilitant la coopération entre les acteurs du marché des obligations vertes, la nature privée de ce dernier est préservée. Les acteurs peuvent partager leurs connaissances et expériences, et mener des dialogues constructifs avec les gouvernements, s'assurant ainsi l'adhésion des parties intéressées. Le soutien du secteur public à une agrégation et une titrisation, en créant par exemple des installations

d'entreposage, permettrait aux projets verts plus modestes de pénétrer le marché des obligations vertes, tout en allégeant la charge analytique qui pèse sur les émetteurs d'obligations et les investisseurs. L'émission publique d'obligations vertes contribuerait à l'augmentation de la taille du marché et permettrait aux acteurs du marché intéressés de se familiariser avec ce nouveau type d'obligations avant de décider de les émettre eux-mêmes. En dépit d'un soutien généralisé de ces mesures, celles-ci doivent encore être conçues avec soin, afin d'éviter des ralentissements potentiels.

La présente étude examine également des mesures politiques envisageables sous la forme d'interventions sur le marché des acteurs publics. Ces mesures sont perçues de manière plus critique par certains experts compte tenu de leurs conséquences indésirables potentielles. Des mesures telles que les investissements publics dans les obligations vertes, le rehaussement du crédit, les incitations fiscales en faveur des obligations vertes ou le traitement préférentiel accordé à ces dernières dans la réglementation du crédit pourraient donner lieu à une altération injustifiée des profils de risque, menaçant ainsi la stabilité financière des acteurs participant au marché. Aussi, de telles interventions de grande envergure ne pourraient être envisagées et mises en œuvre que si elles s'appuyaient sur des éléments de preuve bien étayés.

Fondée sur une analyse approfondie de ces mesures du secteur public, ainsi que sur les contributions d'experts et de parties prenantes, la présente étude conclut que sont envisageables dans le contexte européen les interventions de l'UE suivantes :

- faire connaître les avantages des obligations vertes (par exemple, sous la forme d'un guide soutenant le développement du marché des obligations vertes à l'attention des autorités nationales) ;
- mener, créer ou rejoindre un mécanisme de coordination avec les principaux acteurs du marché ;
- dresser, diffuser ou tenir à jour une liste des investissements verts prévus en vue de soutenir le développement d'un pipeline de projets verts, et soutenir ainsi l'offre d'obligations vertes (par exemple, en demandant à chaque État membre de dresser une telle liste) ;
- imposer la divulgation obligatoire d'indicateurs verts concernant les émissions et les investissements obligataires[6].

Sur le plan national, les États membres de l'UE pourraient adopter les mesures suivantes :

- faire connaître les avantages des obligations vertes, et augmenter ainsi leur offre ;
- encourager le renforcement des capacités et le partage des connaissances ;
- soutenir davantage les entités locales (par exemple, aux municipalités) en vue de l'émission d'obligations vertes ;
- émettre des obligations vertes souveraines (comme annoncé récemment par la France).

En outre, l'établissement et la mise en œuvre de normes communes pour les obligations vertes constitueraient une étape importante dans le développement d'un marché des obligations vertes solide. Dans ce contexte, la présente étude identifie six mesures de normalisation clés en tant qu'options envisageables pour le marché des obligations

[6] Tel est le cas de la réglementation française (décret de l'article 173), qui prévoit une obligation d'information contraignante en matière climatique à la charge des investisseurs.

vertes européen, regroupées selon trois stades du cycle de vie de ces dernières. Il s'agit des mesures suivantes :

- Stade préalable à l'émission :
    1. critères concernant l'éligibilité et la sélection des projets ;
    2. examen externe préalable à l'émission.
- Stade de décision d'investissement :
    3. rapport préalable à l'émission.
- Stade ultérieur à l'émission :
    4. gestion des recettes ;
    5. examen externe ultérieur à l'émission ;
    6. rapport périodique.

La plupart de ces mesures devraient contribuer à accroître la demande et la liquidité, en renforçant la transparence et la confiance des investisseurs. Ces mesures garantiront également que les recettes tirées des obligations vertes sont utilisées pour financer des projets réellement verts, avec des objectifs environnementaux clairs et mesurables.

Certaines mesures pourraient avoir des effets négatifs sur la taille du marché des obligations vertes, du moins sur le court terme, en raison de l'augmentation des frais de transaction associés à l'émission d'obligations vertes conformément à ces exigences. Néanmoins, ces mesures devraient accroître la taille du marché sur le long terme, une fois que la norme commune sera devenue la règle.

Bien que de telles mesures de normalisation soient présentées comme étant des options politiques distinctes pour l'UE, il s'agit essentiellement d'éléments imbriqués au sein d'un cadre de normalisation général. Aussi, pour que chacune de ces options politiques soit pleinement efficace, elles devraient toutes être introduites progressivement, sous la forme d'une norme européenne commune globale en matière d'obligations vertes.

Fondée sur des analyses approfondies des mesures de normalisations décrites, ainsi que sur des contributions d'experts et de parties prenantes, la présente étude conclut que sont envisageables dans le contexte européen, pour ce qui est des normes communes, les interventions de l'UE suivantes :

- soutenir la création d'une norme européenne commune en matière d'obligations vertes, fondée sur les mesures clés de normalisations suggérées et s'appuyant sur les initiatives du marché existantes, telles que les principes pour les obligations vertes (Green Bonds Principles) et les Climate Bonds Standards ;
- encourager les États membres à tirer des enseignements des bonnes pratiques d'autres pays. Ainsi, par exemple, la France a créé un étiquetage public pour les fonds d'investissement verts, qui pourrait être reproduit à l'échelle européenne ;
- promouvoir les différentes mesures de normalisation à divers degrés d'intensité règlementaire, afin d'assurer l'alignement/la conformité par rapport au cadre.

ABBREVIATIONS

ABS	Asset Backed Securities
AFD	Agence Française de Développement
ANZ	New Zealand Bank
AUD	Australian Dollar
AXA	French Multinational insurance company
BGF	Business Growth Fund
BGN	Bulgarian Lev
BICA	Bulgarian Industrial Capital Association
BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
BNB	Bulgarian National Bank
BOT	Buoni Ordinari del Tesoro
BRL	Brazilian Real
BTFs	Bons du Trésor à taux fixe et à intérêts précomptés
BTP	Buoni del Tesoro Poliennali
CAB	Climate Awareness Bond
CAD	Canadian Dollar
CalSTRS	California State Teachers' Retirement System
CBI	Climate Bonds Initiative
CBRC	China Banking and Regulatory Commission
CCT	Certificati di Credito del Tesoro
CEFIA	Clean Energy and Finance Authority
CIB	China Industrial Bank
CICERO	Center for International Climate and Environmental Research Oslo
CLEERE	Climate Change, Energy Efficiency and Renewable Energy lending facility for environmental projects
CLOs	Collateralized Loan obligations
CNY	Chinese Yuan Renminbi
CREBs	Clean Renewable Energy bonds
CRR	Capital Requirements Regulation
CSRC	China Securities Regulatory Commission
CTZ	Certificati del Tesoro Zero Coupon
DBEDT	Hawaii State Department of Business, Economic Development and Tourism
DG ENV	Directorate-General for Environment
EBA	European banking Authority
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECON	Soluciones Energéticas Integrales
EDF	Électricité de France
EFC	New York State Environmental facilities Corporation

EIB	European Investment Bank
EIF	European Investment Fund
EPC	Energy Programs Consortium
ESCOs	Energy Service Companies
ESG	Environmental, Social and Governance
EU	European Union
EUR	Euro
FTSE	Financial Times Stock Exchange
GB	Green Bond
GBA	Green Bonds Assessment
GBP	Green Bond Principles
GBP	British Pound
GCF	Green Climate Fund
GIB	Green Investment Bank
GIIC	Green Infrastructure Investment Coalition
HSBC	Hongkong and Shanghai Banking Corporation
IADB	Inter-American Development Bank
ICMA	International Capital Market Association
ICMIF	International Cooperative Mutual Insurers Federation
IEA	International Energy Agency
Infonavit	Instituto del Fondo Nacional de la Vivienda para los Trabajadores
KBN	Kammunalbanken Norway
KEXIM	Export-Import Bank of Korea
KfW	Kreditanstalt für Wiederaufbau
LSE	London Stock Exchange
LSEG	London Stock Exchange Group
MCWT	Massachusetts Clean Water Trust
MDB	Multilateral Development Bank
MEDDE	Ministry of Ecology, Sustainable Development and Energy
MIT	Massachusetts Institute of Technology
MTA	Metropolitan Transport Association
MTA	New York's Metropolitan Transportation Authority
NAB	National Australian Bank
Nafin	Nacional Financiera
NASEO	National Association of the State Energy Officials
NDRC	National Development and Reform Commission (China)
NGO	Non-governmental organization
NIB	Nordic Investment Bank
NJEIT	New Jersey Environmental Infrastructure Trust
NOK	Norwegian Krone
Norsif	Norwegian Sustainable Investment and Finance Association
NREL	National Renewable Energy Laboratory
NTE	Nord-Trøndelag Elektrisitetsverk

NWB	Nederlandse Waterschapsbank
NYSERDA	New York State Energy Research and Development Authority
NZD	New Zealand Dollar
OATs	Obligations assimilables du Tresor
OECD	Organisation for Economic Co-operation and Development
OPIC	Overseas Private Investment Corporation
OSE	Oslo Stock Exchange
OTC	Over The Counter
PACE	Property Assessed Clean Energy
PBoC	People's Bank of China
PPA	Power Purchase Agreement
PRONASE	Mexico's National Programme for Sustainable Energy Use
PV	Photovoltaic
QECBs	Qualified Energy Conservation Bonds
R&D	Research and Development
REIT	Real Estate Investment Trust
RMB	Renmimbi
RWA	Risk Weighted Assets
S&P	Standard & Poor's
SAPC	Solar Access to Public Capital
SEB	Skandinaviska Enskilda Banken
SEBI	Securities and Exchange Board of India
SEU	Sustainable Energy Utility
SMEs	Small and Medium Sized Enterprise
SPV	Special Purpose vehicle
SRF	State Revolving Fund
SRI	Sustainable Resource Investment
SSA	Sub-sovereign, Supranational and Agency
SWFI	Sovereign Wealth Funds Institute
TCAM	TIAA-CREF Asset Management
TEE	Energy and Ecology Transition Act
TfL	Transport for London
TRY	Turkish Lira
UN	United Nations
USD	US Dollar
VEHBFA	Vermont's Educational and Health Buildings Financing Agency
VEOLUS	Veolus Energía y Gestión Técnica
WB	World Bank
WCAP	Water Capital
WHEEL	Warehouse for Energy Efficiency Loans
ZAR	South African Rand
ZWS	Center for Solar Energy and Hydrogen Research Baden Württemberg

INTRODUCTION

Background

Reforms to the finance sector are necessary to support investment in clean technologies and their deployment, ensure that the financial system can finance growth in a sustainable manner over the long term, and contribute to the creation of a low carbon, climate resilient economy. Such reforms are essential to meet climate and environment objectives and international commitments including the delivery of the EU's commitments under the Paris Agreement on climate change and the objectives of the 2015 Circular Economy package (COM (2016) 601). Improving resource efficiency is an integral component of Europe 2020, the European Union's strategy for smart, sustainable and inclusive growth. To this end, the European Commission has adopted a "Roadmap for a Resource Efficient Europe" in 2011 (COM (2011) 571) in order to ensure the transition, investments in resource efficiency related activities and technologies.

The Green Paper on Building a Capital Markets Union (COM (2015) 63 final) identifies green bonds (GB) as a sound emerging investment category for "projects and activities that promote climate or other environmental sustainability related purpose". In the Action Plan on Building a Capital Markets Union (COM(2015) 468 final) the Commission committed to continue assessing and supporting the green bond market development, and monitor the need for EU green bond standards, to help investors benefit from a more long term sustainable approach to investment decisions. As put forward in the Action Plan on Building a Capital Markets Union, green bonds can support a shift in investments to support the 2030 climate and energy objectives of the EU and on EU's commitments to the Sustainable Development Goals. The Commission supports alignment of private investments with climate, resource-efficiency and other environmental objectives, both through policy measures and public investment.

Green bonds are debt instruments where the proceeds are exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible green projects. Green projects are projects that promote progress on environmentally sustainable activities. Green bonds provide an opportunity to mobilize capital for green investments. They offer an opportunity to investors to make informed, explicit decisions to invest in green projects. Green bonds are a means of attracting new investors and hence mobilizing liquidity for green investments. A liquid bond market provides greater flexibility and more options to exit the investment for project equity and longer-term project finance debt held by banks constrained by deleveraging and regulations. In this way, bonds can help to increase the speed at which capital can be "recycled" back into development, construction and early stage risk. The speed at which green bond markets develop and mature will be determined by many variables, including policy and regulatory factors, market conditions and financing trends.

Green bonds support projects that fit within eligible categories of investment. These projects must have material, positive net benefits for the environment. Currently several broad categories of eligibility are recognized by the Green Bond Principles (GBP). The broad categories are: 1. Renewable energy; 2. Energy efficiency; 3. Pollution prevention and control; 4. Sustainable management of living natural resources; 5. Terrestrial and aquatic biodiversity conservation; 6. Clean transportation; 7. Sustainable water management; 8. Climate change adaptation; and 9. Eco-efficient products, production technologies and processes.

All designated green project categories must provide clear environmental benefits, which should be assessed and, to the extent feasible, quantified by the issuer before issuing a green bond. Where proceeds are used to attain specific environmental objective (e.g. GHG reduction) the targeted impacts should be reported using recognized metrics (e.g. tonnes of CO_2 equivalent) and measured against suitable counterfactu-

als. This latter point is crucial for the credibility of green bond standards and to avoid accusations of greenwash, and reputational risk.

The contribution made by green bonds to the overall portfolio of green investment should be considered against the backdrop of existing policies to encourage investment into green projects. For example, where the incentives for investment in renewable energy are strong (e.g., in respect of favourable feed-in-tariffs), the tendency will be for new investments in energy to be in the renewables sector, making 'green' investments the norm. On the other hand, where such tariffs are less favourable, then green bonds may play a greater role by leveraging finance into green projects, which would not otherwise be forthcoming.

In this context, with this study, the European Commission seeks to understand better the different mechanisms of leveraging, in particular, private sector financing. The aim is to provide support on the potential of the bond market for resource efficiency finance at the EU and at national level. The study has the following specific objectives:

1. To give a comprehensive overview of the functioning of the green bond market globally and in the EU, and its ongoing development and specific sectors;
2. To study the opportunity of implementing concrete public sector measures to boost the green bond market;
3. To analyse whether developing common EU standards can increase the size and liquidity of the market for green bonds;
4. And to organize a stakeholder meeting with the key market actors.

To execute the objectives above, the European Commission has contracted a consortium led by the consultancy company COWI. The analysis in the study has the following key sources of information:

- Literature review of a wide range of published background material, including access to green bonds data (for the period 2007-2016);
- Country case studies representing markets in and outside the EU, prepared based on country-specific desk research and complemented by interviews with national stakeholders;
- Individual interviews with key stakeholders and feedback received during a stakeholder meeting organized in the European Commission in June 2016.

The selection of countries in the EU (Bulgaria, France, Germany, Italy, United Kingdom) and outside the EU (China, Mexico, Norway, United States) takes into account considerations with respect to their green bond market developments, the role of the public sector and the use of standards. Both countries with a developed and nascent bond market are analysed.

Contents

The contents of this report are as follows**:**

- **Chapter 1** analyses the development of the green bond market and provides an overview of its functioning, ongoing development and key bottlenecks. It presents the main market participants including issuers, underwriters, assurance providers, index providers and investors. It analyses the issuance of green bonds in specific sectors such as renewable energy, energy efficiency, low carbon transport, sustainable water, waste and water pollution, climate adaptation, and agriculture and forestry sectors. It furthermore details the role of both EU and non-EU based institutions in the development of the green bond market and points to specific examples in nine selected countries. The country analyses also exemplify the use of market-driven and governmental initiatives to standardization.
- **Chapter 2** analyses the public sector role and the opportunity in implementing concrete public sector measures to boost the green bond market at EU and Member State level. It presents key bottlenecks for the development of the green bond market and illustrates specific bottlenecks on a country level in the selected countries. Based on this analysis, it identifies and presents in detail good practice public sector measures in the selected countries (summarized in a policy toolbox in Annex D).
- **Chapter 3** analyses the opportunity and feasibility of developing EU standards for green bonds. It considers the definition and scope of standards, and various components of them, including how market bottlenecks (described in Chapter 2) can be reduced by developing and implementing green bond standards. Finally, this chapter identifies possible key standardization measures for the EU, and analyses their feasibility and potential impacts.
- **Annex A** (Glossary) presents key concepts used in this report, which are relevant to the green bond market.
- **Annex B** (Stakeholder Feedback) provides aggregated responses from over 20 interviews with key stakeholders from the green bond market.
- **Annex C** (Policy Toolbox) provides additional detail on individual good practice public measures in the form of a "Policy Toolbox", complementing Chapter 2.
- **Annex D** (Country Studies) details nine country studies representing different green bond markets – five within the EU (Bulgaria, France, Germany, Italy, United Kingdom) and four outside the EU (China, Mexico, Norway, United States).
- **Annex E** (Bibliography) lists the background literature that has been reviewed during the study.

1. ANALYSIS OF THE GREEN BOND MARKET

1.1 Green bond market

Globally, around USD 93 trillion of assets are under management by institutional investors (USD 30 tn. by pension funds, USD 30 tn. insurers, USD 27 tn. fund managers, USD 6 tn. sovereign). Green bonds only represent 0.13% of the bond market, but the green bond market is growing rapidly with strong demand from investors.

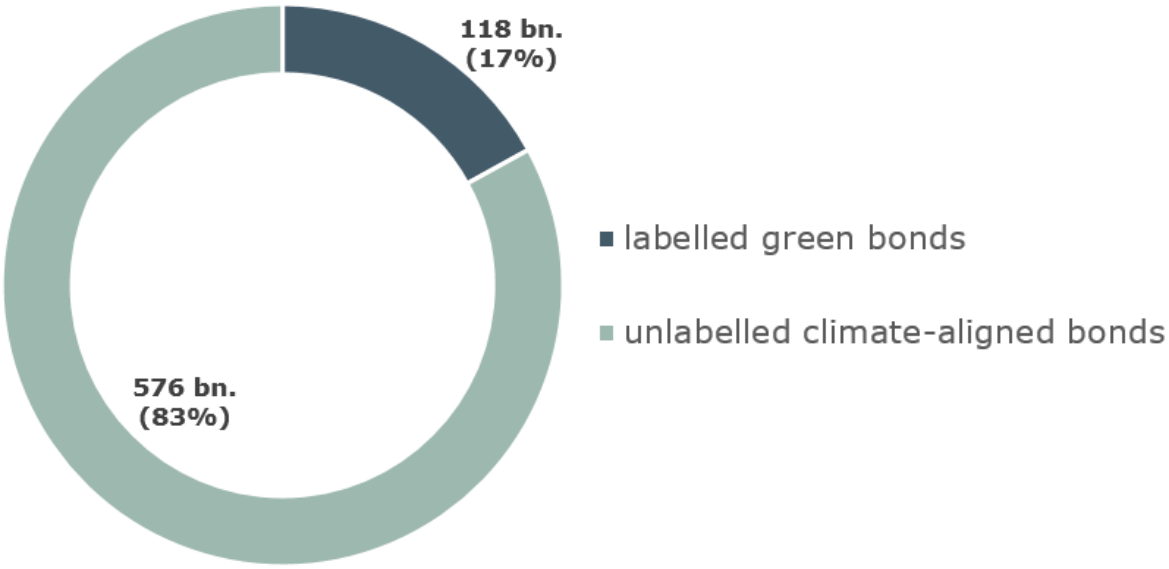
Labelled green bonds are those bonds that earmark proceeds for climate or environmental projects and have been labelled as 'green' by the issuer. In 2015, USD 41.8 bn. of labelled green bonds were issued and up until September USD 54.1 bn. have been issued in 2016.

Unlabelled bonds are those bonds where the proceeds are not specifically earmarked for climate or environmental projects, but the underlying assets are "climate-aligned" i.e. fall into one of the eligible categories of green projects. In 2015, the issuance of climate-aligned bonds was USD 538.1 bn.

Proceeds from labelled green bonds can be used for a wide variety of environmental projects in eligible categories, however in practice proceeds have generally been allocated to projects such as low carbon and climate-resilient infrastructure in a similar way as to unlabelled bonds.

The analysis below refers to the total global market of climate-aligned bonds covering both the labelled green bonds and unlabelled climate-aligned bonds. As of mid-2016, the share of issued labelled green bonds is 17% (USD 118 bn.), and 83% for the unlabelled bonds (USD 576 bn.) as illustrated in Figure 1-1. The data covers 3,590 bonds from 780 issuers during the period 2005 to mid-2016, which in total account to USD 694 bn. (only a tiny fraction of the global bond market).

Figure 1-1 Outstanding climate-aligned bonds in bn. USD (as of 31 May 2016)

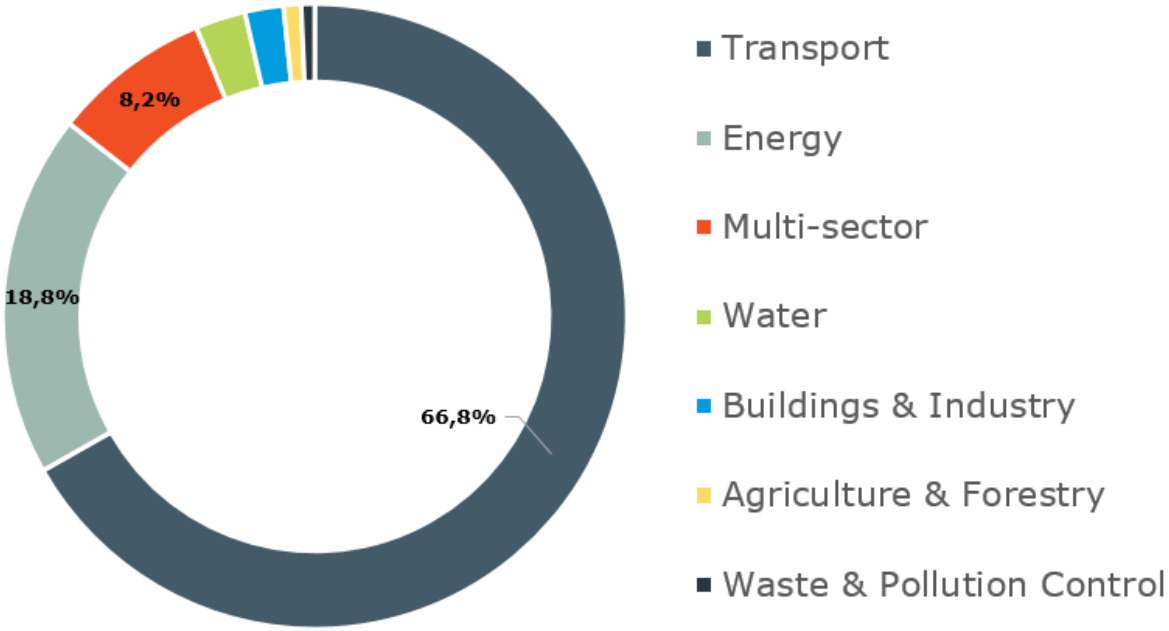


Source: CBI[7]

[7] CBI, Bonds and Climate Change, The State of the Market 2016

As illustrated in Figure 1-2, the transport sector, and in particularly railways, dominate the climate-aligned bond market with 67% of all outstanding bonds. The second largest sector is energy with 19% of outstanding bonds. Other sectors such as water, buildings and industry, waste and pollution control, agriculture and forestry make up around 6% of the bonds. The rest of the climate-aligned bonds (8%) finance multiple sectors at once.

Figure 1-2 Outstanding climate-aligned bonds per sectors (as of 31 May 2016)

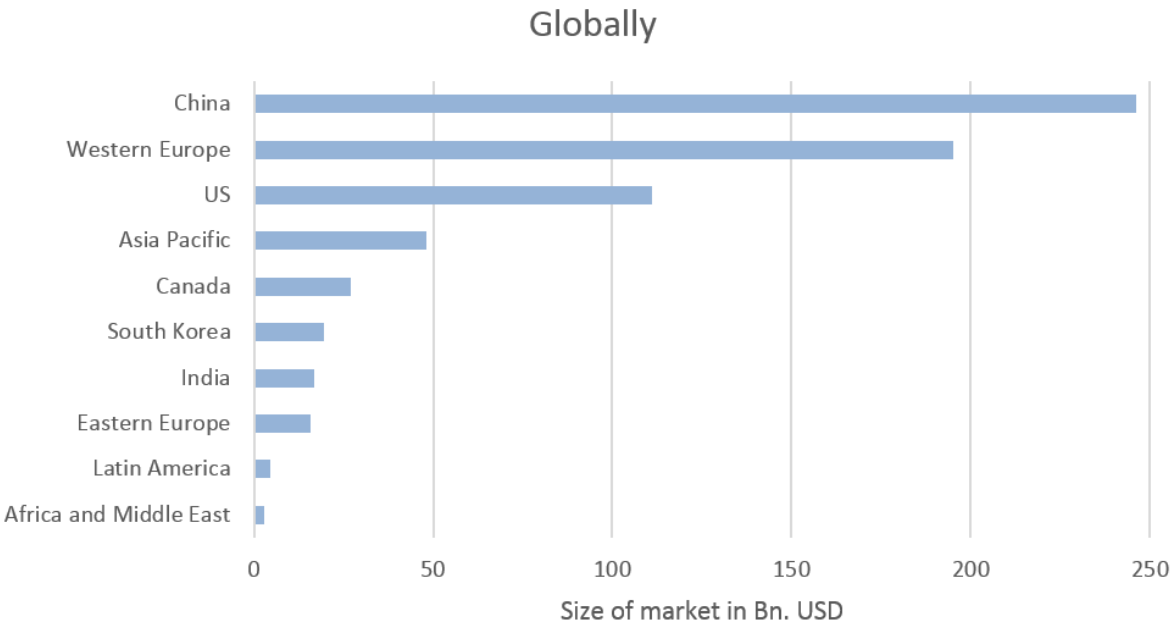


Source: CBI

The majority of climate-aligned bonds (78%) are investment grade (i.e. rating BBB or higher) and are issued from governmental entities such as local governments, MDBs, agencies and state owned entities. Climate-aligned bonds are issued in many different currencies, but the majority of them are issued in CNY, USD, EUR and GBP respectively.

Globally the largest market for climate-aligned bonds is China (USD 246 bn. outstanding), followed by Western Europe (USD 195 bn.) and the US (USD 111 bn.). Even though the US has the world's largest bond market, the climate related issuance has not been as large as in China. Furthermore, the size of the climate-aligned bond market in the Asian Pacific region is approximately USD 48 bn., followed by Canada (USD 27 bn.), Eastern Europe (USD 15.7 bn.) and Latin America (USD 4.4 bn.). Figure 1-3 illustrates the geographic spread of climate-aligned bonds in mid-2016.

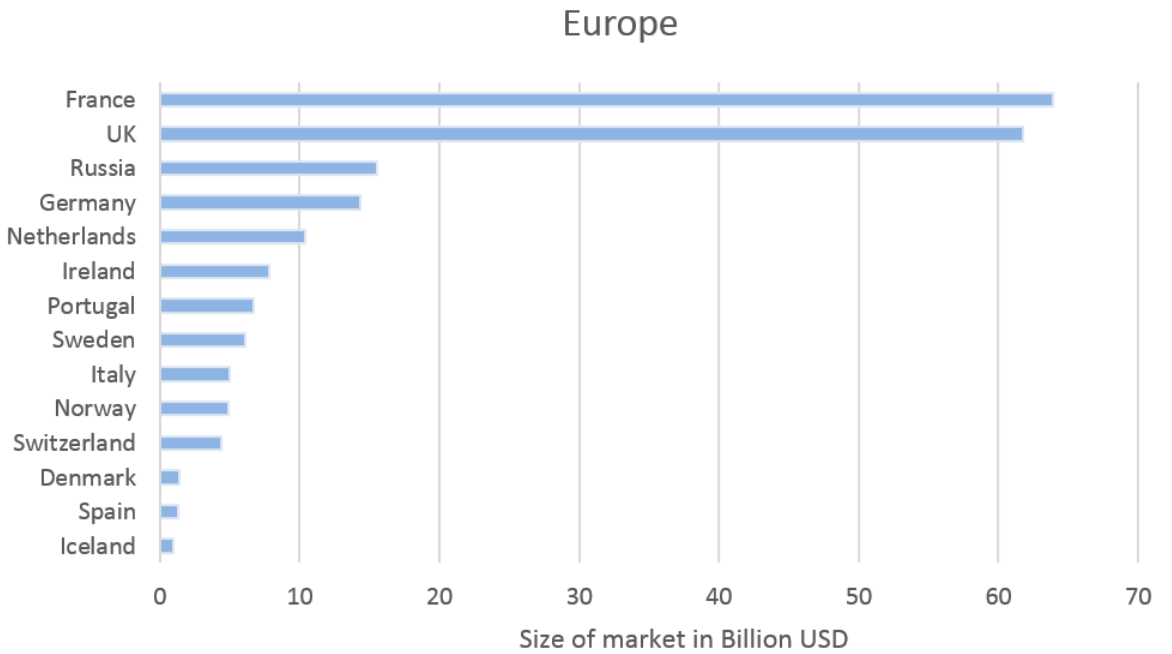
Figure 1-3 Geographic spread of climate-aligned bonds in mid-2016 (Globally)



Source: Bloomberg and CBI, 2016 (June)

In Western Europe, the largest national issuances have come from France (USD 63.9 bn.) and the UK (USD 61.8 bn.). In Eastern Europe, Russia accounts for the largest proportion, followed by smaller issuances in Hungary, Estonia and Latvia. Figure 1-4 below details the geographic spread and size of the climate-aligned bond markets in European countries.

Figure 1-4 Geographic spread of climate-aligned bonds in mid-2016 (in Europe)



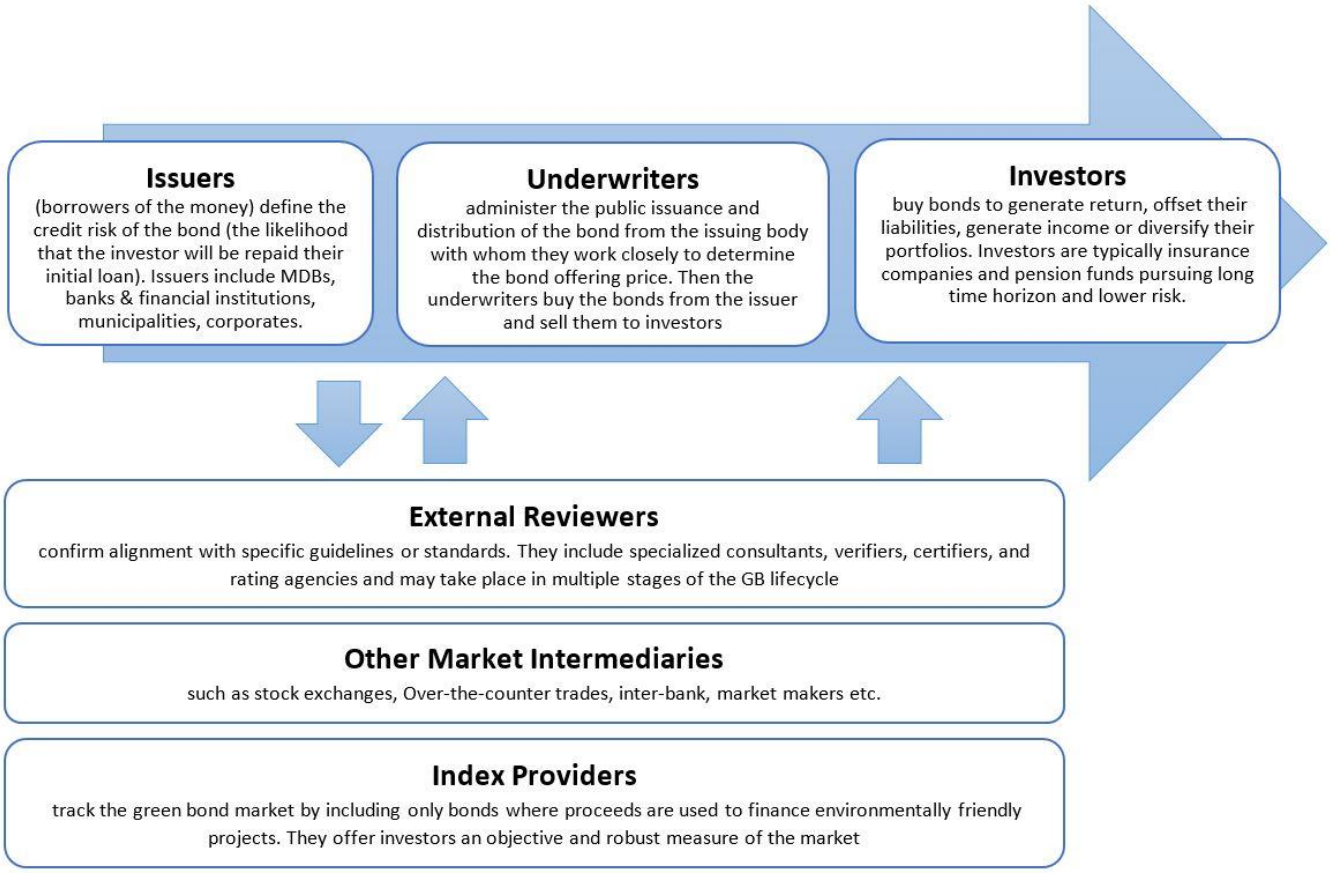
Source: Bloomberg and CBI, 2016 (June)

Main actors in the green bond market

The main actors in the green bond market can be categorised as issuers, underwriters, external reviewers, market intermediaries (such as stock exchanges), index providers, and investors. Civil society, multi-stakeholder groups and policy makers, which promote transparency and disclosure, also play an important role in the green bond market development.

The interaction between the main market actors and their core roles are illustrated in a simplified green bond value chain (1-5). It is important to note that the sequence of interaction could differ, as it is not necessarily linear. For example, external reviewers typically are involved multiple times in different stages of the green bonds lifecycle, depending on specific circumstances.

Figure 1-5 Green bond value chain



Source: COWI, 2016

The **issuers** are the borrowers of the money, typically MDBs (e.g. EIB, WB, IFC, EBRD), banks and financial institutions (e.g. KfW, Credit Agricole, DNB, Bank of America, Agricultural Bank of China), municipalities (e.g. Ile de France, Gothenburg, Massachusetts) and corporations (e.g. Apple, Vestas, Toyota). The quality of the issuer determines the credit risk of the bond. The Green Bond Principles (GBP) are a key framework, which provides the issuers with guidance on the key components in launching a credible green bond.

The **underwriters** administer the public issuance and distribution of the bond. They work closely with the issuers to determine the bond-offering price. In 2015, some of the largest underwriters in terms of volume were Bank of America Merril Lynch, Credit Agricole, HSBC, J.P. Morgan, HSBC, CITI, Morgan Stanley, SEB and Barclays respectively. The GBP assist the underwriters by moving the market towards expected disclosures, which facilitates the transactions.

The **external reviewers** provide independent opinion by confirming alignment of the green bond with specific guidelines or standards. External reviews are key to investors in assuring them that their investments qualify as green. As suggested in the GBP, the issuers can publicly disclose an external review of their green bond or associated green bond framework, assessing alignment with the core components of the GBP. An external review may be partial, covering only certain aspects of an issuer's green bond

or associated green bond framework or full. Specifically, external reviewers can provide:

1) Consultant Review (including second opinions): An issuer can seek advice from consultants and/or institutions with recognized expertise in environmental sustainability or other aspects of the issuance of a green bond, such as the establishment/review of an issuer's green bond framework. "Second opinions" may fall into this category. The second opinion providers with the largest market share are CICERO, VIGEO, Oekom, DNV GL and Sustainalytics. In 2015, 60% of total green bond issuance has officially incorporated a second-party opinion.
2) Verification: An issuer can have its green bond, associated green bond framework, or underlying assets independently verified by qualified parties, such as auditors. In contrast to certification, verification may focus on alignment with internal standards or claims made by the issuer. In 2015, 40% of green bonds have audited assurance reports or benchmark measures to assess the use of proceeds and impact.
3) Certification: An issuer can have its green bond, or associated green bond framework or use of proceeds certified against an external green assessment standard. An assessment standard defines criteria, and qualified third parties / certifiers test alignment with such criteria. The third party review is the most rigorous form of assessment, which reviews the bond criteria, project selection and evaluation, internal processes of tracking proceeds, non-financial data on environmental outcomes, and processes for preparing progress reports.[8] Currently, only the Climate Bond Standard (CBS) is designed for certification of green bonds.
4) Rating: An issuer can have its green bond or associated green bond framework rated by qualified third parties, such as specialized research providers or rating agencies. Green Bond ratings are separate from an issuer's ESG rating as they typically apply to individual securities or green bond frameworks / programmes. In this context, S&P Global Ratings has developed a Green Bond Evaluation tool, and an ESG evaluation framework and scoring methodology for corporate issuers. Moody's Investor Services also has a methodology for assessing green bonds.

Other market intermediaries, such as stock exchanges, dedicate green bond segments with listed green bonds fulfilling a set of relevant green criteria. Today 11 stock exchanges offer green bond listings, demonstrating that exchanges are supporting the transition to a green economy[9]. Some of them also develop green bond platforms for trading environmentally friendly securities (e.g. the Luxembourg Stock Exchange).

Index providers are usually banks or credit rating agencies, sometimes in collaboration with other parties, who design indexes to help investors benchmark green bonds performance. Each index has its own requirements for eligible green bonds. The launch of numerous green bond indices such as the S&P Green Bond Index, the S&P Green Project Bond Index, the China Climate-Aligned Bond Index, the Bank of America Merrill Lynch index and indices by the rating agencies MSCI and Barclays are a sign of the market's growing maturity.

Investors could be institutional investors (i.e. national development banks, insurance companies, pension funds, public pension reserve funds, foundations, endowments and other forms of institutional savings) and private investors (i.e. commercial banks, households savings). Most active in the green bond market are pension funds and in-

[8] KPMG, Gearing up for green bonds, 2015
[9] United Nations Sustainable Stock Exchanges, A Paper Prepared For The Sustainable Stock Exchanges, 2016

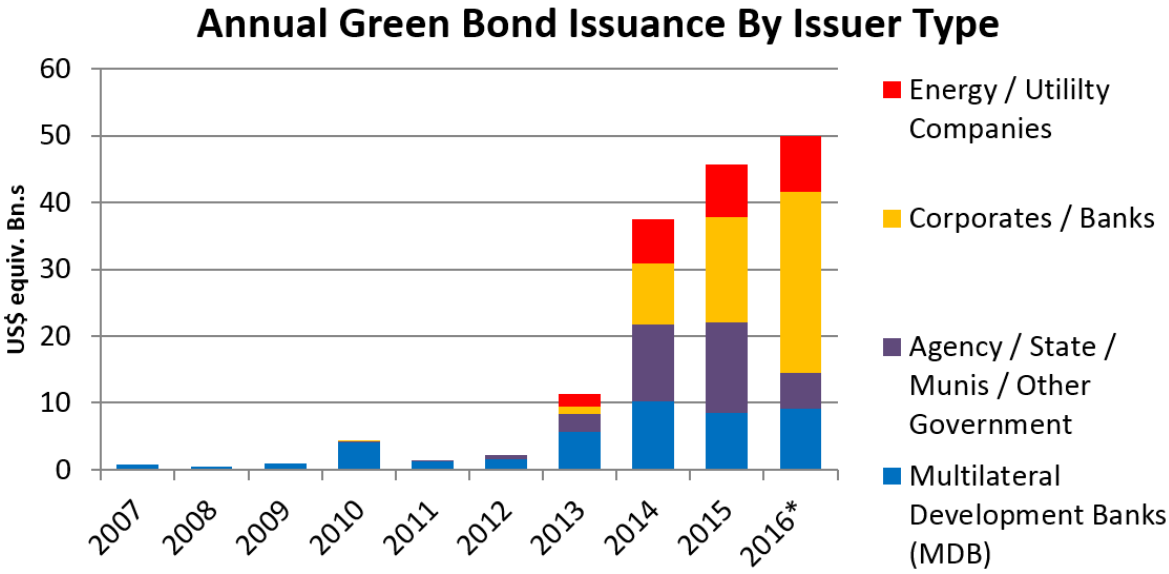
surance companies. The GBP aid investors by promoting availability of information necessary to evaluate the environmental impact of their green bond investments.

Evolution of the green bond market

Multilateral Development Banks (MDBs) initiated the development of the green bond market in 2007/2008, with the European Investment Bank (EIB) and the World Bank (WB) leading the way. In July 2007, the EIB issued the first green bond called Climate Awareness Bond (CAB) worth EUR 600 million, which focused on renewable energy and energy efficiency. The following year, the WB launched its first green bond of approximately USD 440 million in response to specific demand from Scandinavian pension funds (Länsförsäkringar, Skandia, AP3, AP2) seeking to support climate-focused projects.[10] In 2010, the International Finance Cooperation (IFC), European Bank for Reconstruction and Development (EBRD) and other public entities (governments, agencies and municipalities) joined and issued USD 4 bn. worth of green bonds.

Until 2013, the issuance was dominated by small transactions. Nevertheless, the public sector issuers used the time to raise awareness and develop frameworks for transparent reporting on the use of green bonds for green investment. The turning point in the market growth was reached when EDF, Bank of America and Vasakronan issued the first corporate green bonds in 2013.[11] The same year, the market evolved beyond Sub-sovereign, Supranational and Agency (SSA or MDBs). Municipalities and local governments joined the market with the first time issuance by Ile de France (the Paris region, France) in 2012 followed by Gothenburg (Sweden), Massachusetts (USA), State of California (USA), Province of Ontario (Canada). At the end of 2013, the green bond market tripled in size reaching USD 11 bn. and since then, the market has continued to grow in volume. Figure 1-6 illustrates the market development for green bonds from 2007 to present 2016 (September).

Figure 1-6 Annual green bond issuance by issuer type 2007-2016



Source: Bloomberg and World Bank, 2016 (September)

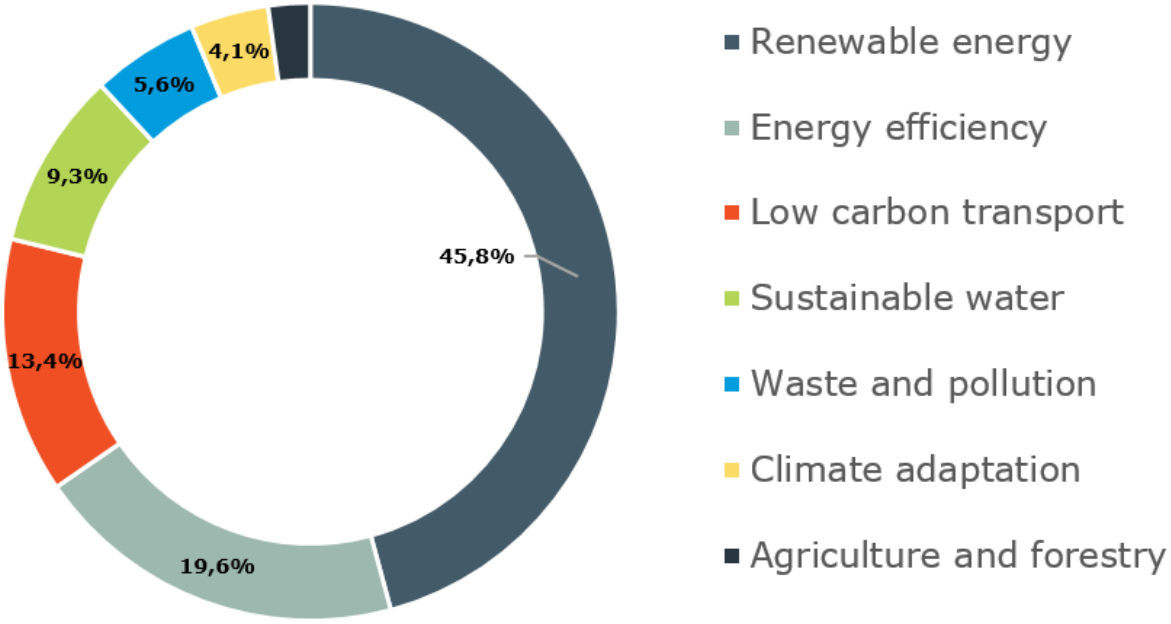
As illustrated above, the market continued to grow rapidly in 2014, reaching a total of USD 36.6 bn. issuance with 73 issuers. This growth was mainly attributed to the increased corporate (33% of total green bonds) and municipal (13%) issuance. The

[10] World Bank, Understanding Green Bonds
[11] Climate Bonds Initiative, Explaining Green Bonds History 2014

corporate green bonds were dominated by energy, utilities, consumer goods and real estate sectors. The largest corporate issuance of green bonds was from the utility company ENGIE (former GDF Suez), which raised USD 3.44 bn. to finance renewable energy and energy efficiency projects. Other corporations have extended the green bond label to asset backed securities, starting with Toyota's 2014 sale of securities with the proceeds used to invest in electric and hybrid vehicles. The same year, the first emerging market municipal green bond was issued by Johannesburg (South Africa) to finance renewable energy and transport projects. Additionally, the first high yield green bonds were successfully issued by NRG Yield and a Spanish renewable energy service company Abengoa Greenfield in September 2014. The issuance introduced more diverse credit ratings to the market.

In 2015 more countries (and regions) joined the green bond market including: Brazil, Denmark, Estonia, China, India, Latvia, and Mexico, contributing to a total annual issuance of USD 41.8 bn. Corporate green bonds accounted for 36% of issuance – the highest share ever, followed by municipalities with 15% and by banks with 12%. Among the most notable newcomers in the green bond market were: the 1st Chinese RMB offshore green bonds by Agricultural Bank of China (USD 994.5m), the 1st Mexican green bonds by National Financiera (USD 500m), the 1st Indian green bonds by YES Bank (USD 161.5m), the 1st Brazilian green bonds by food producer BRF (USD 500m), and many others. Approximately 45% of labelled green bond proceeds were allocated to renewable energy, with low carbon buildings being the second biggest use of proceeds. Green bonds for low carbon buildings were represented across all the issuer types: development banks (e.g. Development Bank of Japan), corporates (e.g. Regency, Vornado Realty, Vasakronan) and municipalities (e.g. those in the US). However, in 2015 the labelled green bonds has also diversified, with green bonds issued to finance sustainable water, transport and waste projects. Figure 1-7 illustrates the distribution among different eligible categories and sectors of types of projects financed by green bonds in 2015.

Figure 1-7 Types of projects financed by green bonds (2015)



Source: CBI, 2015

On the supply side in 2015, the largest single issuer was the EIB with green bonds worth USD 4.3 bn. in different currencies (USD, CAD, GBP, EUR and TRY).[12] KfW was

[12] Environmental Finance, Green bond Market on a high as it breaks record, 2016

also among the top issuers with USD 3.9 bn. under its own programme 'Made by KfW'. Puget Sound Transit issued the largest municipal bond worth USD 942.8m. In addition, the first covered bond issuance by Berlin HYP occurred along with further growth in ABS and project bonds. On the demand side, investors put forward an increasing number of specialized green bond funds. These included green bond funds managed by AXA, SPP, SEB, Nikko, BlackRock, Calvert, Shelton and State Street. Furthermore, the demand for green bonds has been growing with factor five oversubscriptions in some cases. A few organizations expressed their commitments to invest in green bonds, particularly ACTIAM (EUR 1 bn.), Deutsche Bank (EUR 1 bn.), HSBC (USD 1 bn.), Barclays (GBP 2 bn.), Zurich Insurance (USD 2 bn.) and KfW (EUR 1 bn.). Notably, Norway's sovereign wealth fund has expressed an intention to invest in green bonds, though they see the relatively small size of the market as a limitation to invest.

As of November, the amount of green bonds issued in 2016 reached USD 65.4 bn. With strong investor interest and the adoption of the UN Sustainable Development Goals (SDG), the green bond market is expected to continue to grow rapidly beyond 2016. Market outlook predictions forecast that the issuance of green bonds in 2016 is expected to range between USD 70 and 100 bn. with much of the growth coming by China. For example, CBI targets reaching USD 100 bn. by the end of the year. Other forecasts are made by HSBC (USD 85 bn.), SEB (USD 80 bn.), Moody's (USD 75 bn.) Bloomberg New Energy Finance (USD 72 bn.) and S&P (USD 70 bn.). The median of the above forecast estimates is USD 77.5 bn. (which, if reached, would be an over 50% annual increase in comparison with 2015).

Overall, beyond 2016, the market is likely to continue growing in size and expanding in geographies, based on a strong investor demand and numerous on-going and upcoming supporting initiatives by diverse market stakeholders and policy makers. Generally, the market is also moving towards green ratings and more investors are integrating Environmental, Social and Governance (ESG) factors in measuring the sustainability impact of their investments, which will help to further drive the growth of the green bond market.

Furthermore, according to OECD, the annual global investments needed for renewable energy, energy efficiency and low-emission vehicles to limit global warming to a 2°C scenario are USD 839 bn. (2015-2020), 2,230 bn. (2021-2025), 2,404 bn. (2026-2030) and 4,340 bn. (2031-2035)[13], i.e. large amounts for which long-term sources of debt capital such as green bonds would be needed. Indeed, as low-carbon technologies mature and become more standardized, and the costs of physical assets fall, the role played by green bonds could expand rapidly. Property assets hold a large potential for future issuance of green bonds (above 30%), mainly to finance improvements in energy efficiency.

However, one challenge is to translate climate change policy aims into investible propositions for pension funds and other investors. Another important factor is ensuring that the proceeds from green bonds are actually used in projects with real environmental benefit, which would not have happened otherwise. Therefore, the environmental impacts of green bonds need to be measured and reported in a harmonized way. However, assessing the additional impact of green bonds requires high-quality quantitative data, which is presently lacking in the green bond market. Important first steps to overcome the lack of data on environmental performance have already been taken by MDBs that have developed harmonized frameworks for impact reporting in the sectors of renewable energy and energy efficiency. Moreover, stakeholders like CBI collect data regarding the size of the climate-aligned bonds and the size of the issued labelled green bonds, which could indicate the additional green effect generated from bonds labelled as green over a certain time horizon. CBI also suggests that label-

[13] OECD, Green Bonds mobilizing the debt capital markets for a low-carbon transition (2016)

ling existing climate-aligned bonds would increase investor buy-in, while allowing bonds to expand towards lower ratings and future assets. However, whether the labelling will create additional green investments is questionable, as green bonds are sometimes criticized for re-packaging' or re-labelling of traditional bonds, without bringing additional environmental benefits.

1.2 Market development and functioning in the EU

The EU green bond market has developed well compared to other green bond markets, because it is built on top of the existing finance infrastructure. Besides, the EU market has experienced participants and an increasing political support from the EU institutions[14]. Yet significant differences exist between EU Member States.

There are significant differences in the green bond market development within Europe. This is mainly due to the differences in the national bond market developments and political support from governmental authorities. For example, the market is particularly strong in the Nordic countries, France, the Netherlands, Germany, Switzerland and the UK[15], and less advanced in for example Bulgaria (where no bonds labelled as green have been issued to date). This study focused on five EU countries (Bulgaria, France, Germany, Italy and the UK) in order to obtain a snapshot of the EU market development and to shed more light on some of the differences within the EU market (see the country studies in Annex D).

EU institutions are playing an important role in the development of the green bond market. For example, the Europe 2020 Project Bond Initiative led by the EIB with the European Commission supports capital market financing of projects and promotes increasing the use of bond financing at the project level. This initiative aims to increase the market share of asset-based securities in the EU. However, project finance has so far not been a major part of the traditional fixed income space, where issuance is measured in EUR trillions. So far, investors have mainly entered the green bond market at high quality ratings (AAA) with yields close to that of non-green bonds. It should further be noted that Bloomberg's yield curve analytics observed that green bonds generally trade at lower yields than their non-green peers over time due to the supply and demand mismatch[16].

Main actors

The main national actors analysed during the country studies (Annex D) in the selected Member States are presented in Table 1-1 below.

Table 1-1 Main actors in the selected countries in the EU

Country	Main actors
Bulgaria	Bulgarian Development Bank, Bulgarian Industrial Capital Association, Bulgarian Stock Exchange-Sofia, Pension Insurance Company Saglasie
France	Regions: Ile-de-France Region, City of Paris, Nord-Pas de Calais. Banks: Agence Française de Développement, Crédit Agricole CIB, BDPC. Utilities: EDF, Schneider Electric, ENGIE, Paprec, SNCF.
Germany	KfW, Landwirtschaftliche Rentenbank, NRW Bank, BerlinHyp, Deutsche Bank, Commerzbank AG, Landesbank Baden-Württemberg (LBBW), MBB Clean Energy

[14] In terms of market size, the EU green bond issuance in 2016 is 24 times higher than 2012. However, during the period 2014-2016 the overall global growth is coming mainly outside of Europe (e.g. by Asian, North American, Latin American and Supranational issuers)
CBI, Green Bonds Quarter 3 Round-Up: Issuance by Region - The long view, 2016
[15] SEB, The Green Bond 2016
[16] Bloomberg, How Increasing Demand for Green Bonds Affects Yields, 2015

	AG, PNE Wind AG
Italy	SunPower Corp., Hera, Enna Energia, Innovatec, Metro5, UniCredit
UK	London Stock Exchange, Green Investment Bank (GIB), Transport for London, Shanks Group, Unilever, HSBC

Source: COWI, 2016

Key sectors/eligible categories

The proceeds of green bonds issued in the five selected EU countries are used largely to finance projects within renewable energy and energy efficiency, followed by low carbon transport and infrastructure, water and waste management, biodiversity, agriculture and forestry. In the renewable energy sector, utilities play an active role, whereas in the energy efficiency sector municipalities are more active. For example, in France, the utility companies are among the main issuers of green bonds, where most of the proceeds have been allocated to renewable energy projects such as wind, solar, photovoltaics (PV), hydro-electric power and biomass. In addition, French municipal bonds are commonly used for energy efficiency projects like construction and renovation of buildings as well as low-carbon transport and infrastructure. A small share of proceeds is used to finance biodiversity and agriculture projects as well as forestry. The French green bond market is also characterized by the allocation of proceeds to finance R&D projects in the area of energy efficiency and the connection of the renewable energy solutions to the grid.

Table 1-2 below summarizes the key sectors in the selected EU countries with specific examples.

Table 1-2 Key sectors in the selected countries in the EU

Country	Key sectors	Examples
Bulgaria	There are only non-labelled climate-aligned bonds, which finance energy efficiency, renewable energy and municipal solid waste.	**Varna's municipality** issued municipal bonds for financing the modernization of the city's street lighting system.
France	Renewable energy (wind, solar, Photovoltaics (PV), hydro and biomass), energy efficiency (especially municipalities), low carbon transport and infrastructure, small share allocated to biodiversity, agriculture and forestry.	**ENGIE** issued a green bond worth EUR 2.5 bn. to finance its renewable energy projects such as wind farms and hydroelectric plants as well as energy efficiency projects with smart metering.
Germany	Renewable energy (especially wind sector), energy efficiency (buildings), water management.	**KfW** issued a green bond worth EUR 1.5 bn. used for projects from the KfW loan program "Renewable Energies – Standard" to finance wind power and photovoltaic plants.
Italy	Renewable energy and climate mitigation projects like district heating, GHG reduction, projects aiming to increase clean water and sustainable waste management.	**SunPower** issued the first climate-related project bond to finance the construction of two PV facilities in Italy.
UK	Renewable energy (wind), energy efficiency, low carbon transport (railways), waste management.	**Transport for London**, a UK government owned corporation, issued a £400million green bond to finance green railway projects.

Source: COWI, 2016

Use of standards

The Green Bond Principles (GBP), which are voluntary guidelines that recommend transparency and disclosure and provide clarification on the approach for issuance of a green bond are broadly accepted by the market in the EU. Most labelled green bonds are in line with the GBP and/or other initiatives that integrate the GBP, such as the Climate Bond Standards (CBS). For instance, the French government has consulted the GBP Executive Committee in order to develop an official governmental label for green funds, which makes alignment with the GBP a requirement. Table 1-3 summarizes the use of standards in the selected EU countries.

Table 1-3 Use of standards/guidelines in the selected countries (in the EU)

Country	Examples
Bulgaria	Presently, no evidence for the use of green bond standards has been identified in Bulgaria.
France	The Ministry of Ecology, Sustainable Development and Energy (MEDDE) joined the Climate Bonds Initiative Partnership Programme and announced the development of a **public quality label for green investment funds** in September 2015. Ile-de-France region, EDF, ENGIE and Crédit Agricole are members of the Green Bond Principles. Vigeo France is the main actor in certifying compliance with the GBP and developing eligibility criteria for the selection of projects to which green bond proceeds will be allocated.
Germany	Deutsche Bank, one of the lead managers of the "Green Bonds – Made by KfW", was involved in the development of the Green Bond Principles in cooperation with twelve international financial institutions. KfW and the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety developed **minimum requirements for the quality of green bonds** in 2015. Quality standards include transparency of projects to be financed and the use of funds, detailed and regular reports on the financed projects and provision of external experts´ opinion. Following the further development of the market, KfW and the Federal Ministry for the Environment are planning to gradually raise minimum requirements for the German green bond market. Additionally, KfW announced plans to support the establishment of sophisticated green bonds market by the implementation of market initiatives and discussions with third parties.
Italy	Hera is an issuer whose bonds are aligned with the **GBP.** DNV GL provided second party opinion for use of proceeds, process for project evaluation and selection, management of proceeds as well as reporting. UniCredit is a member of the GBP.
UK	HSBC is supportive of the **GBP** and the introduction of common regional standards if public authorities chose to use incentive structures and increase risk capacity to scale up the green bond market. In addition, HSBC sees Moody's decision to commence assessment of green bonds as a positive development, which should help facilitate a greater standardization. London Stock Exchange Group is suggesting improving the current system of third party verification. FTSE International Ltd (part of the LSE Group) is currently developing **a self-reporting tool** for issuers, so that investors can ultimately decide the best way to verify the green credentials of bonds.

Source: COWI, 2016

1.3 Market development and functioning outside the EU

The study focused on four countries (China, Mexico, Norway and the US) in order to obtain a snapshot of market development outside of the EU (see Annex D). The emerging markets are playing an active role in the global green bond market development and some examples from emerging markets are described below.

China's State Council reaffirmed its commitment to see the green bond market as part of the country's shift to green development. In April 2015, China's central bank (PBoC) initiated a proposal, which covered the definition of what is green, a valuation system for allocation of funds and environmental impacts of green bonds, tax incentives and other aspects. In China, the green bonds are tapping into the bond market for infrastructure, for example with green urbanization projects.

The first Indian corporate green bond was issued by YES Bank (worth USD 161.5m), and this was followed by a larger green bond USD 500m issued by the Export Import

Bank of India. Both countries are committed to development of national standards and principles for the issuance of green bonds. Mexico, which has the largest bond market in Latin America, is now playing an important role in the global green bond market development. The country has established the Green Bond Market Development Committee, which is led by the Mexican Stock Exchange, with the purpose to launch the first green bond segment.

In the developed markets, the US surpassed the supranational institutions, becoming the largest green bond issuing country (USD 10.5 bn. issued) globally in 2015. The US green bond market is largely driven by US states and municipalities. Furthermore, Norway's existing bond market structure has allowed the green bond market to develop fast. For instance, Oslo Stock Exchange (OSE) has played an active role in the development of the green bond market, though mainly in Scandinavia. OSE was the first stock exchange globally to create a separate list for green bonds.[17] Two separate green bond lists were set up in late 2015, one listed on OSE and other one on Nordic ABM marketplace. This creation of the separate lists helps to drive standards in the market by setting up requirements to be listed on the stock exchange.

Main actors

Table 1-4 illustrates the main actors in the selected countries outside the EU in both emerging and developed markets.

Table 1-4 Main actors in the selected countries outside the EU

Country	Main actors
China	State institutions: China's State Council, Ministry of Finance, Central Bank (PBoC), National Development and Reform Commission (NDRC), China Banking Regulatory Commission (CBRC), China Securities Regulatory Commission (CSRC). Rating agencies: China Chengxin International Credit Rating, China Lianhe Credit Rating and Dagong International Credit Rating. Investors: commercial banks, mutual funds and insurance companies. Banks: Shanghai Pudong Development Bank Co., China Industrial Bank, Agricultural Bank of China, Bank of Qingdao. Utilities: China Datang Renewable Power Corporation, China Railway Corp., Xinjiang Goldwind Science & Technology Co., CLP Holdings, Yalong River Hydropower Development Co., Guodian Technology and Environment Group Corporation, Chaowei Power
Mexico	Nacional Financiera (Nafin), Mexican Stock Exchange, Infonavit, The Inter-American Development Bank (IDB), The International Finance Corporation (IFC)
Norway	Oslo's Stock Exchange, Nordic ABM, Norway's sovereign wealth fund, Kommunalbanken Norway (KBN), Norwegian Sustainable Investment and Finance Association (Norsif), CICERO, Nord-Trøndelag Elektrisitetsverk (NTE), Nordic Investment Bank (NIB), SEB
US	Federal Government: US Treasury, Overseas Private Investment Corporation (OPIC). Rating agencies: Standard & Poor's (S&P), Moody's and Fitch. Investors: asset management companies (State Street Global Advisors, TIAA-CREF Asset Management, BlackRock, Vanguard Group and Breckinridge Capital Advisors), insurance companies and public pension funds (California State Teachers' Retirement System). Banks: Bank of America ML, Morgan Stanley, Connecticut's green bank, the Clean Energy and Finance Authority (CEFIA). Municipalities: U.S. State of Massachusetts, Massachusetts Institute of Technology (MIT), Massachusetts Clean Water Trust (MCWT), New York City, California, and others

Source: COWI, 2016

[17] CBI, Oslo Stock Exchange announces 1st green bond list, 2014

Key sectors/eligible categories

In the emerging markets, green bonds have largely been used to finance renewable energy, low carbon transport and energy efficiency.

In China, the bond markets have traditionally been used to fund large infrastructure projects.[18] With regard to green bonds, the vast majority of bonds outstanding are funding transport and rail projects, followed by renewable energy projects. Whereas in Mexico, green bonds have been used to finance projects within renewable energy and energy efficiency sector. In 2015, the Inter-American Development Bank (IDB) together with Green Climate Fund (GCF) approved financing to establish a regional Energy Efficiency Green Bond Facility (USD450 million) to underwrite energy efficiency projects.[19] Mexico is the first country to implement this type of programme.

In the US, green bonds have primarily been used to finance renewable energy and energy efficiency projects, resulting from federal government legislation (the Clean Energy Victory Bonds Act) and its bond support programmes, namely Clean Renewable Energy Bonds (CREBs) and the Qualified Energy Conservation Bonds (QECBs) programmes. In addition, municipal green bonds have been used for projects related to water quality improvement, water infrastructure, and wastewater and water efficiency. After Massachusetts Institute of Technology (MIT) issued green bonds in order to refinance green buildings in 2014, other public universities such as Cincinnati (USD 30m), Indiana (USD 59m), Arizona (USD 183m) and Virginia (USD 98) joined the green bond market. The same trend occurred after the municipal utility "District of Columbia Water and Sewer Authority" issued a green bond worth USD 350m for a sustainable water project; Indiana (USD 204m), Chicago (USD 225m) and Iowa (USD 321.5m) also issued green bonds.

In Norway, green bonds have financed projects within renewable energy (wind), energy efficiency, climate resilient growth and sustainable development. Entra is the first real estate company in Norway to issue a green bond.

Table 1-5 presents the key sectors in the selected countries in both emerging and developed markets.

[18] HSBC, Green Bonds in China, 2015
[19] IDB, Latin America boosts energy efficiency, 2015

Table 1-5 The key sectors in the selected countries outside the EU

Country	Key sectors	Examples
China	The vast majority of the green bonds outstanding are funding transport and rail projects, followed by renewable energy (solar and hydropower)	**China Railway Corp. and Chaowei Power**'s issued climate-aligned bonds for the development of electric bike batteries.[20]
Mexico	Renewable energy (wind) and energy efficiency	**IDB** approved financing together with **Green Climate Fund** to establish a regional **Energy Efficiency Green Bond Facility** (USD450 million) to underwrite energy efficiency projects in Mexico.
Norway	Renewable energy (wind), energy efficiency and climate resilient growth and sustainable development.	**Kammunalbanken Norway (KBN)** issued the first green bond worth USD 500 million to finance environment friendly projects, which focus on renewable energy and energy efficiency as well as climate resilient growth and sustainable development.
US	Renewable energy (solar and wind), energy efficiency (buildings), water management, transport, environment (protection and habitat restoration)	**The US State of Massachusetts** issued the first labelled municipal green bond to fund a range of environmental projects including public building energy efficiency improvements, habitat restoration and water quality improvements

Source: COWI, 2016

[20] Climate Bonds Initiative, Bonds and Climate Change, 2015

Use of standards

Table 1-6 summarizes the use of standards in the selected countries outside the EU.

Table 1-6 Use of standards/guidelines in the selected countries (outside the EU)

Country	Examples
China	**China's Green Bond Guidelines** set out standards for the use of green bonds, including criteria for the management of proceeds and requirements on disclosure. More specifically, green bond issuers are obliged to ensure that proceeds only go to those green assets disclosed in the bond issuing process. This may not be a problem for green bond issuers with specific environmental units (e.g. some of the large commercial banks, including Industrial Bank of China), issuers without environmental departments, however, are required to set up specialized accounts. Regarding the environmental dimension, the China's Green Bond Guidelines offer a "localized definition of green to the market". They emphasize pollution prevention and ecological protection, hereby addressing the country's most pressing environmental challenges. In addition to the Green Bond Guidelines, PBoC has published a **Green Bond Endorsed Project Catalogue**. It describes the type of projects that are eligible for green bonds and is based on Chinese environmental policies and international standards. The catalogue classifies six project categories; including energy conservation, pollution control, recycling, clean transport, clean energy, as well as ecological conservation and adaptation.
Mexico	The only labelled green bond in Mexico was issued by Nafin to finance wind energy projects. The joint lead managers for this issuance were Bank of America Merrill Lynch, Credit Agricole CIB, and Daiwa Capital Markets America. Sustainalytics provided the second review for this bond and it was verified as being compliant with the **Climate Bonds Standard**.
US	In the US, several stakeholders have contributed to development and use of standards in the green bond market, both at international and at national level. A number of US banks (e.g. Citi, Bank of America and JP Morgan) actively supported the establishment of the **Green Bond Principles** in 2014. The Climate Bond Initiative's standard scheme is supported by the Bank of America, which provides funding for the initiative. Moreover, the Standards Scheme and the California State Treasurer, as well as the pension fund CalSTRS are among the members of **Climate Bond Standards Board**. In the US, banks are among the main drivers for green bond standardization. For instance, S&P's and Bank of America launched green bond indices in July and November 2014, respectively. Another initiative for standardization at national level in the US concerns the securitization of solar projects. The National Renewable Energy Laboratory (NREL) of the Department of Energy has set up a working group for solar securitization to develop standardized loan contracts for solar panels, including operations and management standards.
Norway	Oslo's Stock Exchange (OSE) takes an active role in the green bond market development and helps to drive standards by setting up the **requirements for the green bonds to be listed on the stock exchange**. According to OSE, green bonds must be used for environmentally friendly purposes, and a second opinion on the project has to be sought in order to be listed on the green list. It is also a requirement that the second opinion is made publicly available. In addition, the issuer's ongoing disclosure obligations from issuing a green bond should also be made publicly available through stock exchange announcements. The requirement by OSE that an issuer provides a second opinion and make it publicly available is an important step towards defining the standards for green bonds. These requirements are stricter than the current market guidelines such as the GBP, which only recommend a second opinion.

Source: COWI, 2016

2. ANALYSIS OF THE PUBLIC SECTOR ROLE

In spite of its recent growth, the green bond market remains very small compared to the total bond market. Against this background, stakeholders have called for the public sector to play a larger role to support the development of the green bond market. Yet, there is no common agreement on the exact scope and extent of this role.

This chapter describes the key bottlenecks for green bonds and assesses their relevance for different countries and sectors. *Possible* public interventions for promoting green bonds are introduced and good-practice public sector measures are summarized. More information on the policy measures and best-practice examples is provided in the policy toolbox (Annex C) and the country case studies (Annex D).

2.1 Key bottlenecks

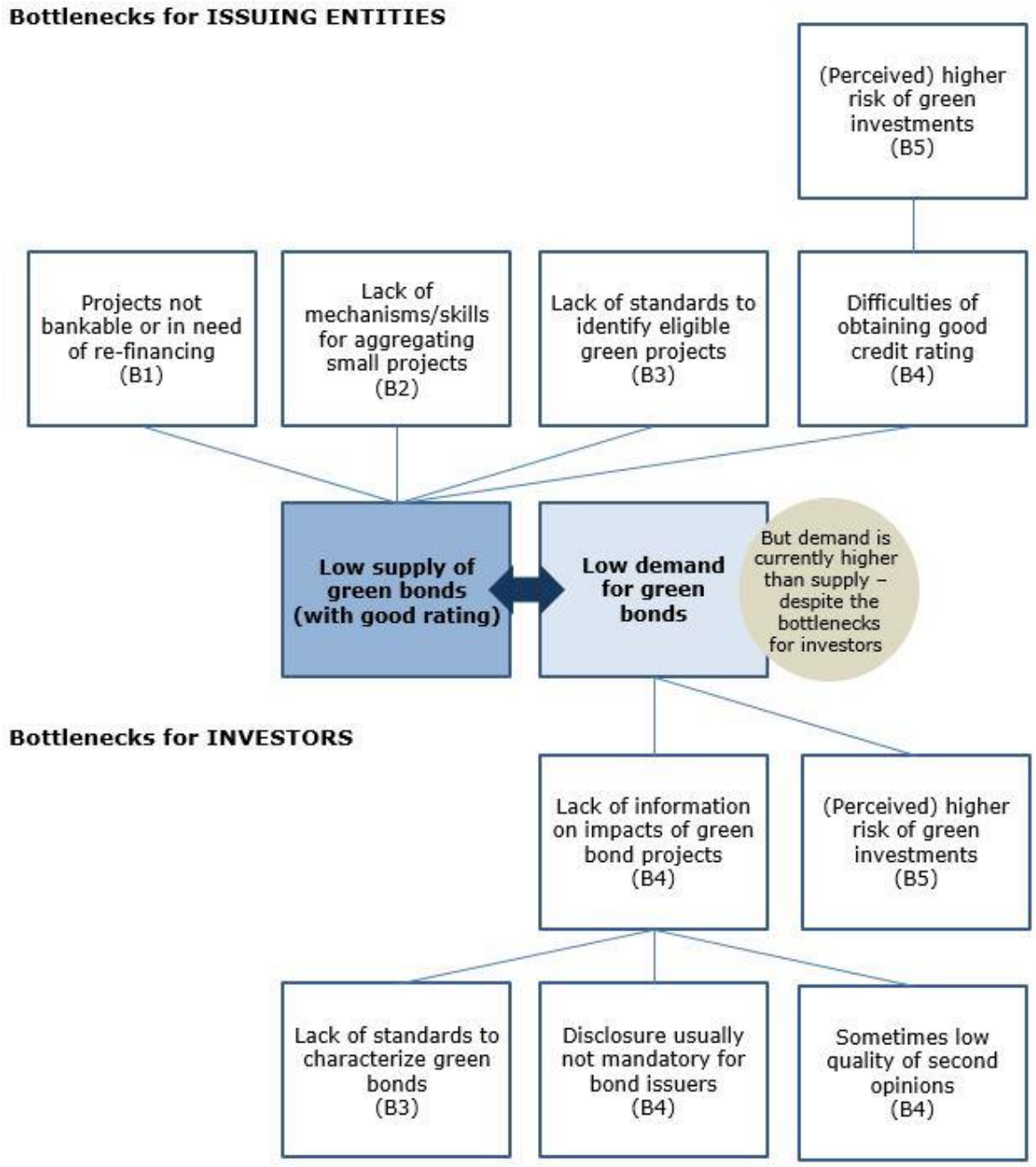
The green bond market faces a range of specific challenges and barriers to its further evolution and growth. Recent studies by the G20 Green Finance Study Group (2016)[21], OECD and Bloomberg (2016)[22], CBI (2015) and EC DG CLIMA (2015) list a variety of bottlenecks that apply in some way or another to most countries. These bottlenecks can be summarized as follows:

- Lack of green bonds and green project pipelines (B1)
- Lack of aggregation mechanisms for green projects (B2)
- Lack of green bonds definition and framework (B3)
- Lack of information and market knowledge (B4)
- Lack of clear risk profile of green investments (B5)

Figure 2-1 illustrates the interrelation between the different bottlenecks and the way they affect the issuing entities and investors. At present, the main challenge for the green bond market is the lack of supply of green bonds with good credit ratings. This is based on several underlying factors including: the lack of identified bankable projects that are in need of re-financing; the lack of aggregation mechanisms for small projects; the lack of universally agreed and comprehensive standards for green investments; and the difficulties for some issuers in obtaining good credit ratings for green bonds. On the demand-side, both information asymmetry and investors' risk aversion potentially lead to a lack of demand for green bonds. However, as was mentioned earlier, there is currently strong demand for green bonds, especially in the more developed bond markets. These bottlenecks are thus most relevant for countries where green bonds activity is still low.

[21] G20 Green Finance Study Group, G20 Green Finance Synthesis Report, 2016
[22] EC DG Clima, Shifting Private Finance towards Climate-Friendly Investments, 2015.

Figure 2-1 Interrelation between the different bottlenecks and the way they affect the issuing entities and investors



Source: Adelphi/COWI, 2016

Lack of green bonds and green project pipelines (B1)

While the demand for green bonds from investors is strong, the supply of such bonds is currently not sufficient. Bonds issued by renowned financial institutions such as KfW or EIB, are regularly oversubscribed by a factor of five to six. This also applies to green corporate bonds of large corporations[23] as well as regional governments, e.g. in France[24]. The main barrier in this context is the lack of projects to be (re)financed through green bonds. As bonds are primarily a refinancing instrument, sufficient up-

[23] Sustainalytics, What's all the buzz about green bonds, 2014
[24] Karin Wendt, Responsible Investment Banking, 2015

front financing in form of equity or debt needs to be available. In addition to a financing gap, there is also a lack of identified and well-prepared bankable green projects.

Governments on the national, regional and local level as well as the EU do not have a transparent project pipeline of, preferably, large projects with a positive environmental and climate impact, though steps in this direction were taken in connection with the preparation of the Juncker Plan in the autumn of 2014. Such a project pipeline would make the commitment of public actors to large-scale green investments visible and would provide a reliable planning horizon. It is the responsibility of public actors to define investment priorities in terms of sectors and projects for supporting the creation of projects to be financed through green bonds.

Although there is large demand for the limited number of green bonds, it is not clear whether this level of demand can be sustained if more green bonds are issued under the current parameters. Since national green bond markets, in particular, are still small and nascent in many countries, investors may refrain from investing in green bonds as they perceive them as being less liquid than other assets. Additionally, the bonds offered are often too small for large investors. Institutional investors require bonds to have a value of EUR 200 million or more in order to be able to invest in them.

This bottleneck is to be seen as a higher-level barrier that concerns the general attitude of policy makers to push a green transition of the economy comprising large investments in green public infrastructure.

Lack of aggregation mechanisms for green projects (B2)

As the bottleneck B1 has shown, not enough large green projects are available for financing through green bonds. In many countries, however, the number of small-sized green projects is large and growing. For example, investments in decentralized renewable energy or energy efficiency measures would be eligible for green bonds, but without aggregation the amounts of financing for individual projects are usually too small for the issuance of green bonds on their own.

The aggregation of loans that finance such investments, or the bundling of cash flows in asset-backed-securities, is a potential measure to address this situation. With the aggregation of these assets, the critical mass of assets eligible for investments by large investors can be reached.

The challenge here is that suitable aggregation mechanisms and models do not yet exist, that the projects and underlying contracts are not standardized, and that cash flows are sometimes unstable. Energy efficiency measures, for example, allow for cost savings through reduced energy use, but actual cash flows may vary with a number of factors such as weather or production levels. Moreover, aggregating cash flows in asset-backed securities (ABS) requires assessing the risk of the underlying project as well as the default risk of the source of the cash flow. This is difficult as financing institutions currently lack the ability to assess such risks in an adequate manner. If contracts underlying the cash flow (e.g. loan contracts of power purchase agreements) were standardized and more data on the reliability of cash flows collected, it would be easier for financing institutions to securitize cash flows of small green projects.

Lack of green bonds definition and framework (B3)

One of the biggest hurdles for the development of the global green bond market as well as the growth of regional and national green bond markets is the lack of a common green bonds definition and framework. The issue with the definition mainly concerns the questions what is ‘green’. Currently, the Green Bonds Principles and the Climate Bonds Standards are the main international voluntary frameworks used to label green bonds. No monitoring mechanism is in place to ensure compliance. On a national scale, China has developed green bonds standards and France has developed the

"Energy and Ecological Transition for Climate" label to promote green investments. A detailed discussion on green bonds frameworks is included in Chapter 3.

Companies, financial institutions and public issuers that are interested in issuing green bonds may find it hard to determine whether a certain asset is eligible to be labelled as green. This may prevent them from actually labelling a bond as green, as they face reputational risks if their interpretation of the "green" in green bonds is challenged – for example by environmental NGOs.

Most investors, on the other hand, are looking for issuers that demonstrate the environmental impacts of their green bonds. Investors with reasonable doubts that a bond actually fulfils the expected environmental requirements only have limited opportunities for legal enforcement of the green integrity of the bonds. A lack of penalties is in their view a lack of recourse. This might prevent them from investing in green bonds, especially if they had to pay a premium for the label "green". In the future, it may be relevant for investors to seek penalties if the bonds do not achieve the expected green impacts. Such penalty mechanisms do not exist to date and different types of mechanisms could be tested. Options for penalties include bond buy-back obligation in case of green default, loss of green ratings for this (and other) bonds issued by the entity, loss of potential tax benefits, etc. Issuers of course see this point as critical and argue that the risk of facing penalties when not fully complying with their stated environmental objectives may discourage them from issuing green bonds. This may reduce the supply of green bonds available to the market.

The issuance of green bonds also comes with additional transaction costs compared to general-purpose bonds, costs for issuers and sometimes also for investors. As there are no clear rules on the definition of 'green', issuers usually rely on external reviewers assuring the green bonds alignment with specific labelling frameworks. The costs for the external review render green bonds issuance in theory less attractive for some issuers – at least on a purely economic basis. If investors have doubts about the integrity of a certain 'green' bond, they may also contract an independent reviewer.

Lack of information and market knowledge (B4)

A main impediment to green bond market development, especially in less developed bond markets, is the limited knowledge of (potential) green bond market participants about green investments and green bonds. This bottleneck is closely linked with the previous barrier concerning a lack of definitions and standards.

Potential issuers lack the knowledge and understanding of what is required to issue a green bond. Assessing green investments and their respective environmental impacts is particularly challenging. As green investments and the associated business models are still new in many countries, issuers may face difficulties in obtaining good credit ratings. Such good ratings, however, are required for making bonds attractive to investors, especially large investors such as pension funds that have strict requirements regarding the quality of financial assets. Of course, green bond issuers need to have the appropriate financial standing to receive a good rating, yet rating agencies tend to grant good ratings to investments that have a long record of accomplishment in the market and organizations that have issued bonds before. This makes it rather difficult for new market participants with new business models to obtain adequate ratings and tap the bond market for financing. Ratings are granted by all of the large rating agencies (e.g. Fitch, S&P, Moody's).

Investors, on the other hand, face the problem that most bond issuers do not track or assess the actual impact of the projects that they are funding. Several interviewees confirm that it is currently not transparent how the proceeds of the bonds are being used and which assets are held by which investors. Requirements for reporting are lacking. Thus, it cannot be guaranteed that green bonds actually deliver the expected environmental and climate-related benefits. Making annual reports for investors and

issuers mandatory could significantly increase the information available. NGO representatives particularly stressed this and the lack of details on the envisaged use of proceeds.

NGO representatives that were interviewed for this study also mentioned that the quality of second opinions has not always been satisfactory. Many of them lack, for example, details on the human rights impacts of investments. As competition between service providers is growing, some experts are warning of a "race to the bottom" for developing the most favourable green bonds assessments. There is also an issue regarding the independence of some second opinion providers and potential conflicts of interest. Some of the second opinion providers sell their services for assessing green bonds and then rate the same companies. Although these second opinion providers claim that there are strict divisions between the teams offering these different services, some market actors feel that only a clear green bond standard, which is developed and financed by public actors, could alleviate this problem.

Lack of clear risk profile of green investments (B5)

Green investments typically include less mature technologies where the related risks and opportunities are more difficult to assess due to the lack of sufficient evidence on the performance. This means that rating agencies and institutional investors would assess the technology risk as being higher for emerging green investments than for investments in established sectors. A study by EC DG CLIMA (2015) on climate investments indicated that utility companies with a higher share of conventional energy sources in their energy mix received higher ratings than those with more renewable energy sources. At the same time, a report by Barclay's and US Credit Focus[25] shows investors are paying a premium for investing in green bonds, which suggests that they are perceived as being less risky or that a premium is attached to the green element.

The majority of green bonds currently issued are covered bonds, which are typically backed by the full balance sheet of the issuer, rather than being directly dependent on the performance of the green investments. This means that investors will primarily consider the credit quality of the issuer, rather than the credit risk profile of the underlying green investment. Green bonds issued by investment grade issuers that are financially stable and have a track record in the financing markets will tend to be viewed as having added benefits compared to non-green bonds from the same issuer (subject to comparable liquidity of the issues). However, green investments may also be undertaken by young companies without a strong credit profile and track record. This is because the shift to a green economy brings disruptions with it, which younger and smaller companies may respond to better than larger, established ones. Green bonds issued by non-investment grade issuers will tend to have a less clear risk profile, but potentially the green aspects of the investments could improve their access to markets.

Other options for green bond financing are project bonds (e.g. wind farms) and asset-backed securities (e.g. green property) where the risk is determined partly or fully by the cash flows from the underlying green projects. This segment is likely to be growing with more corporate issuers entering the green bond market.

Despite this somewhat unclear background on the risk-return profile of green investments and bonds, this report supports the position that some investments in green areas are riskier than investments in more conventional goods and services. This position is based on the fact that some of the technologies, financing instruments and actors in the emerging green bond market are less mature.

[25] Barclay's and US Credit Focus, The Cost of Being Green, 2015

From a societal perspective, the investments financed by green bonds are risk-mitigating measures, as they help in combating climate change and reducing other environmental risks for the economy. Yet, climate mitigation and adaptation effects only materialize in the long term, while many investors have a very short time horizon for investments. Often, long-term climatic trends are not figured into their investment calculation. Currently, no risk calculation approaches exist that combine an economy-wide long-term perspective with individual investment risk. Therefore, investments in proven fields such as, for example, the oil and gas industry seem less risky from a short-term perspective than green investments.

Some of the concerns around risk-return profiles of green bonds can be addressed by public measures – either by increasing returns through public incentives or by measures to reduce the risks associated with a bond.[26]

Increasing the returns of green investments through, for example, tax incentives is a possible public measure for boosting the green finance market in general. Yet, from the perspective of the investor, it creates another risk – the policy risk. This means that the return is only high as long as the policy is in place, or as long as its effects endure. Once policy priorities shift and public support is withdrawn, the return decreases if the root of the underlying risk has not been eliminated. This policy risk is taken into consideration by the investors and may make them reluctant to invest in green bonds. Even though other (i.e. non-green) investments are also often influenced by policies, investors may be more susceptible to policy change in the "new" green sectors than in conventional industries, especially as levels of subsidies for instance have been subject to sudden changes in many countries over the last few years.

Bottlenecks at the EU level

The role of the EU in supporting the growth of the green bond market is different from the role that national governments play given their authority over the different policy fields affecting green bond markets. This also means that the bottlenecks relevant at the EU level will differ from the national bottlenecks. Generally, there are not so much "bottlenecks" at the level of the EU, but rather opportunities and potential for support. The EU does not create specific barriers for green bonds, yet may not be implementing the full support potential for green bonds.

Bottlenecks at the national level

In this section, the general bottlenecks described above are ranked according to their relevance, per country. The key bottlenecks per country in Table 2-1 have been derived from the country case studies (Annex D). The ratings are based on desk research, interviews, the stakeholder meeting and the expertise of the authors. It should be noted that the ratings given to the different countries are indicative only.

[26] CBI, Improving risk return profile: increasing returns or reducing risks.

Table 2-1 Bottlenecks – overview by country

Country	Lack of green bonds and project pipelines (B1)	Lack of aggregation mechanisms (B2)	Lack of definitions and framework (B3)	Lack of information and market knowledge (B4)	Lack of clear risk profile (B5)
Bulgaria	High	High	High	High	High
France	Medium	High	Low	Low	Low
Germany	Medium	High	High	Low	Low
Italy	Medium	Medium	High	Medium	Medium
UK	Medium	High	High	Low	Low

Source: Adelphi/COWI, 2016

Lack of green bonds and green project pipelines (B1) is a challenge especially in the less developed market of Bulgaria. The other four EU member states all have green bonds on the market but there is still much room for growth.

The lack of aggregation mechanisms (B2) is relevant for all countries. Currently, no national aggregation or securitization exists in Bulgaria, France, Germany or the UK. In Italy, the Italian Viveracqua hydro bond was issued as an ABS.

There is generally a lack of national standards (B3) in all EU member states assessed in this study. Only France has a label based on the GBP and CBI taxonomy. The label is designed to be replicable on an EU scale.

Information and market knowledge (B4) on green bonds is advanced in France, Germany and the UK. There is somewhat less market knowledge on green bonds in the Italian market. In Bulgaria, there is a lot of potential for educating and training market actors, including policy makers.

A lack of a clear risk profile of green investments (B5) is especially high in countries with a lack of experiences with green bonds – above all Bulgaria. In Italy, market actors' understanding of the underlying risks of green investment could be improved. This bottleneck is less relevant for developed green bond markets such as France, Germany and the UK.

Bottlenecks per sector/eligible category

The key bottlenecks per sector in Table 2-2 have been derived from the country case studies. The ratings are based on desk research, interviews, the stakeholder meeting and the expertise of the authors. It should be noted that the ratings given to the different sectors are indicative.

Table 2-2 Bottlenecks – overview by sector

Sectors in line with GBP	Key bottlenecks assessment				
	Lack of green bonds and project pipelines (B1)	Lack of aggregation mechanisms (B2)	Lack of definitions and framework (B3)	Lack of information and market knowledge (B4)	Lack of clear risk profile (B5)
Renewable energy	Low	Low	Low	Low	Medium
Energy efficiency	Low	Medium	Low	Low	Medium
Pollution prevention and control	Medium	Low	High	Medium	Low
Sustainable management of living natural resources	High	High	Medium	High	Medium
Terrestrial and aquatic biodiversity conservation,	High	High	High	High	High
Clean transportation	Low	Medium	Low	Medium	Low
Sustainable water management (including clean and/or drinking water)	Medium	Low	Medium	Medium	Low
Climate Adaptation	High	High	High	High	High
Eco-efficient products, production technologies and processes	High	Medium	High	High	High

Source: Adelphi/COWI, 2016

The relevance of bottleneck B1 (lack of green bonds and green project pipelines) for the different sectors is assessed based on the current volume of green bonds issued by the respective sector. Most green bonds are issued in the renewable energy, energy efficiency and clean transport sectors. There are some issuances in the fields of sustainable waste management (as one field of pollution prevention and control) and sustainable water management. Issuance in the sectors of eco-efficiency, biodiversity and climate adaptation is low. A reason for the differences in volume of bonds issued may be the size of typical companies in the sector and differing cash-flow structures.

The lack of aggregation mechanisms (B2) is linked to the generation of stable cash flows. Cash flows can be generated through power purchase agreements for renewable energy and through utilities for water and waste management. It is already more difficult to create uniform cash flows for energy efficiency, eco-efficient products and processes and transport investments (although there have been aggregations in the energy efficiency sector). For biodiversity, sustainable land use and adaptation it is very difficult to generate cash flows that can be aggregated.

For the lack of definitions and frameworks (B3), we are drawing on the taxonomy provided by the CBI[27]. There are criteria in place for renewable energy (solar, wind, geothermal) and energy efficiency in buildings as well as transport. Criteria are under development for sustainable land use (nature-based assets) and water. Eco-efficient products and processes are, to a certain degree, covered by the CBI taxonomy (e.g. resource efficiency, recycled products and circular economy). However, standards have not (yet) been developed. Neither biodiversity nor climate change adaptation are

[27] CBI, Taxonomy

covered in the taxonomy (although flood defence is covered under the water criteria). For these latter sectors, definitions, baselines and guidelines (e.g. for reporting) need to be developed.

Lack of market knowledge (B4) is also based on the actual issuance of green bonds in the sectors. It is assumed that the more bonds are being issued, the better the knowledge of the market actors on how to issue, rate, and invest in green bonds.

The risk profile of green bonds (B5) according to sectors is assessed based on how "new" green technologies in the field are and to what extent new companies have entered the market. Clean transport (especially railways) as well as waste and water infrastructure are quite established as investment fields. Appropriate technologies are in use in different countries. Energy efficiency, renewable energy, and sustainable land use are somewhat established but still considered new by some market actors. Eco-efficiency, biodiversity conservation and climate change adaptation is still rather new to most actors and therefore comes with a higher risk.

Generally, it is sometimes difficult to separate the sectors as they are often interlinked (e.g. water and adaptation; waste and renewable energy). Moreover, some sectors (agriculture, adaptation, waste) are more dependent on local conditions than others are. Thus, it is difficult to design uniform standards.

The agricultural sector is not expected to be a big green bond issuance sector, unless more investments are made in carbon sequestration in soils. The forestry sector needs a clearer policy direction to become a larger source of green bonds. Current efforts to economically appraise the ecosystem services provided by forests, e.g. through emissions trading schemes, need to be continued and strengthened in the future to make the forestry sector more attractive for investors.

2.2 Public sector measures

This chapter introduces measures that public entities can potentially take for reducing the bottlenecks described above[28]. References to the respective bottlenecks are included in parentheses (e.g. B1, B2). The measures are grouped as "supply-side" (related to issuance), "demand-side" (investment) as well as "demand- and supply-side" measures. Table 2-3 gives an overview on the public measures that are included in the chapter. Detailed information on the measures can be found in the Policy Toolbox in the Annex C.

Please note that this chapter merely provides an overview and discussion of measures that public sector entities can *potentially* take. More in-depth analysis of individual country or sector contexts would be required in order to make concrete recommendations for the EU Commission or EU Member States.

[28] The description of measures builds to a large extent on the following sources: G20 Green Finance Study Group, CBI 2015, EC DG CLIMA 2015 and CBI, Policy areas supporting the growth of a green bond market, n.d.

Table 2-3 Summary of public measures for reducing green bond market bottlenecks

Measures	Key actors and governance level	Cost and benefits	Scale-up potential within the EU[29]	Global examples
DEMAND-SIDE MEASURES				
Public investment in green bonds *Relevant for: B5*	Public financing institutions, sovereign wealth funds and public pension funds	Administrative costs are low to *moderate*; Actual cost of implementation can be *significant*; Potentially *high impact* if there is a lack of demand from private actors.	The measure is *relevant* for the EU level, *less relevant* for developed green bond markets and *very relevant* for less developed green bond markets.	Norway's Sovereign Wealth Fund investment in green bonds; EIB's investment in the Italian Viverracqua hydro bond; The California State Teachers' Retirement System (CalSTRS) investment in green bonds issued by the World Bank.
SUPPLY-SIDE MEASURES				
Public issuance of green bonds *Relevant for: B1, B4, B5*	National governments, sub-national entities (regional or provincial governments, cities, municipalities and their utilities), national and international development banks, green banks	Administrative costs *vary* depending on familiarity of institutions with the issuance of bonds; The measure can have a *significant* leveraging effect.	The measure is *relevant* for the EU level and developed green bond market; it is *very relevant* for less developed green bond markets.	Green Municipal Bonds in the US; Issuance of green bond by French regional government of Ile de France; Issuance of green bond by the German public financing institution KfW.
Public sector support for aggregation and securitization *Relevant for: B2*	Public financial institutions as well as financial regulators	Administrative costs are *low to moderate*; Transaction costs can be *substantial*; The impact of the measure is potentially *very large*.	The measure is *relevant* for the EU level as well as Member States with a more developed green bond market.	Warehousing schemes: US Warehouse for Energy Efficiency Loans (WHEEL) programme; IADB's financial warehouse in Mexico for funding investments in energy efficiency. Standardized contracts: support for the standardization of lease and power purchase contracts by the United States Solar Access to Public Capital (SAPC) programme
Credit enhancement by public financing institutions *Relevant for: B4, B5*	Public financial institutions	Administrative costs as well as actual costs of this measure are *moderate to high*; The impact of the measures is *moderate*.	Credit enhancement measures are *relevant* for the EU level, for developed as well as less developed green bond markets.	European Investment Fund's credit enhancement operations for SMEs, including guarantees (wraps, bilateral guarantees, credit default swaps, etc.) on senior tranches.

[29]Options for scale-up potential are: the EU level, developed green bond markets and less developed green bond markets. With the EU level we refer to actions that can be taken by the EU institutions to foster growth of the green bond markets in the Member States. With developed green bond markets we refer to EU member states where green bonds have already been issued (e.g. Germany, France, the UK) and where national (public and private) initiatives exist on the further development of the green bond market. Less developed green bond market are such where no or very few green bonds issuance have occurred and where knowledge and capacities around green bonds are low (e.g. Bulgaria).

Measures	Key actors and governance level	Cost and benefits	Scale-up potential within the EU[29]	Global examples
SUPPLY- AND DEMAND-SIDE MEASURES				
Public facilitation of co-operation between green bond market actors *Relevant for: B3, B4*	All relevant national stake-holders, i.e. Ministries of Finance, capital markets authorities, rating agencies, public and private financial institutions, external re-viewers, municipalities and utility companies, etc.	Administrative costs are *low*; Impacts of the measure are potentially *high*.	The measure is *relevant* for the EU level as well as for developed and less devel-oped green bond markets.	National Green Bond Market Development Committee in Mexico; Green Infrastructure In-vestment Coalition; Green Cities Bonds Coalition
Tax incentives for green bonds *Relevant for: B1*	Ministries of Finance	Administrative costs are *mod-erate*; Actual cost can be *con-siderable*; impacts of tax incen-tives *vary* depending on the scope and extent of the tax.	The measure is *relevant* for developed and less devel-oped green bond markets.	US federal government's Clean Renewable En-ergy Bonds (CREBs) and Qualified Energy Con-servation Bonds (QECBs) programmes
Support for the stand-ardization of green bonds definition and framework *Relevant for: B3*	All relevant national and EU stakeholders, i.e. Ministries of Finance, capital markets authorities, rating agencies, public and private financial institutions, external re-viewers, municipalities and utility companies, etc.	Administrative costs are *mod-erate*; Impacts of the measure could potentially be *very high*.	The measure is *relevant* at the EU level and both devel-oped as well as less devel-oped markets.	China's central bank strategy on green bonds; France's "Energy and Ecological Transition for Climate" Label
Preferential treatment of green bonds in monetary regulation and central bank strategy Relevant for: B5	Financial regulators, Minis-tries of Finance and central banks	Administrative costs are *mod-erate*; Impacts of this measure could potentially be *very high*.	The measures are *relevant* at the EU level as well as in developed and less devel-oped green bond markets.	Chinese regulation on green bonds regarding preferential risk weighting and favourable treatment on the asset side

Source: Adelphi/COWI, 2016

Public investment in green bonds (M1)

Public investment in green bonds can reduce the first-mover risk and other risks perceived by the private investors (B5). It provides a signal that public actors consider these types of bonds to be reliable and trustworthy investments. Thus, private green bond investment is likely to increase.

Authorities can shift the preferences of public investors (e.g. development banks, sovereign wealth funds, public pension funds and specific green investment funds) from brown or conventional to green investments by prescribing green investment targets or by altering investment guidelines in a way that green bonds are favoured.

Public investment in green bonds is most relevant in less developed bond markets, as well as for new types of bonds. In such cases, this measure may stimulate demand for green bonds and support the development of green bond markets.

However, experts point to a number of challenges for changing the national investment priorities. Firstly, it needs to be considered that especially for pension funds it is of utmost importance that risk levels do not increase if funding priorities are shifted. Secondly, it needs to be made sure that targeted public investments do not turn into state aid for projects that would otherwise not be financially sustainable. Moreover, demand for green bonds usually exceeds their supply, particularly at the highest quality levels of green bonds where a liquid secondary market exists. Some experts therefore suggest that public investments in developed green bond markets should rather take the form of credit enhancement (see public measure M4).

Public issuance of green bonds (M2)

Demand for green bonds currently exceeds supply in both developed and less developed green bond markets (B1). At the same time, many investors are not yet familiar with green bonds as financial products (B4, B5). By issuing bonds, public entities can substantially increase the supply of green bonds on the market and demonstrate the functioning of these assets.

Public actors that can issue green bonds include the national government, subnational entities (e.g. regional or provincial governments, cities, municipalities and their utilities) as well as national and international development banks. Additionally, public green financial institutions may play a role in supplying green bonds in the future. In order to stimulate green bond issuance by these entities, authorities need to provide capacity building on how to issue green bonds. Besides, public entities should promote green bonds and raise awareness of their benefits in order to stimulate private issuers and investors to become engaged in the green bonds market.

As demand for green bonds currently exceeds supply, public issuance and promotion of green bonds is a very relevant measure for promoting green bond market development. Experts and stakeholders consulted for this study generally support this measure as it facilitates growth of the green bonds market while leaving the decision to buy such bonds or to issue additional bonds entirely to private market actors.

Public sector support for aggregation and securitization (M3)

Bonds typically have to have a size of above USD 200 million to be relevant for institutional investors. This is a big challenge for many small-scale projects that are often prevalent in green sectors. As aggregation mechanisms for green projects are usually lacking (B2), smaller loans or assets remain inaccessible to large investors. This results in high cost of capital for green projects. Stakeholders therefore suggested that public sector support for aggregation is required if small projects are to be financed through green bonds. It was also emphasised that financial institutions ought to play a crucial role as they are already the largest aggregators in the market.

Aggregation and securitization of loans allow for the creation of green bonds that meet the demands of large investors in terms of volume and diversification of risk portfolio. The most established aggregation instruments are asset-backed securities (ABS), covered bonds and yieldcos. This report only addresses ABS and covered bonds as these instruments can be most influenced by policy makers.

Authorities can support the aggregation of bonds through various measures:

- **Warehousing**: Warehousing describes the process of aggregating loans or cash flows of different types (yet sharing common characteristics) under a single entity (the financial warehouse). This aggregation enables the warehouse to package the loans or cash flows and issue them as ABS or bonds to investors. For a graphic illustration of a warehousing program supported by the public sector, see the US study in Annex D (Warehouse for Energy Efficiency Loans (WHEEL)).
- **Standardized contracts**: In the context of warehousing, the risks associated with aggregating a range of different contracts in a single pool, each with various unique terms and potentially without individual credit ratings, are too high for investors. Standardized contracts can facilitate the pooling of the associated cash flows, so that they could be securitized and sold in capital markets. Public actors could develop standardized contracts, regulate what standardization information has to be included in loan contracts or provide support for voluntary development of standard contracts. Public warehouses could have mandatory requirements for loan contracts.
- **Green covered bonds:** Legal provisions clearly define which types of assets are eligible to serve as collaterals for covered bonds. In some countries, the selection of asset classes restricts using green assets. Policy changes could allow green assets for covered bonds and thus stimulate the emergence of green covered bonds.

Aggregation and securitization is most relevant for those countries where a sufficient number of eligible projects are available.

Besides aggregation, public entities could also support issuance of smaller green bonds. In an attempt to increase access to finance for small- and medium-sized enterprises (SMEs), several countries (e.g. Italy, Germany) allow issuance of small or "mini bonds" by unlisted SMEs. Green mini bonds could complement larger green bonds, thereby increasing access to finance for smaller companies working in green sectors. However, as the recent default series in the mini bond sector has shown, small bonds can come with considerable risks for investors. Therefore, both issuers and investors need to implement sound risk management procedures[30].

Credit enhancement by public financing institutions (M4)

In early stages of the green bond market, many issuers face difficulties in achieving satisfactory ratings of their bonds, as there is generally a lot of uncertainty around new financial products (B4). Private investors, on the other hand, are reluctant to invest in bonds that do not meet their quality criteria (B5).

Public financial institutions can enhance the credit rating of bonds by absorbing some of the risks associated with the investments. This renders the bonds financially competitive and thus attractive for private investors.

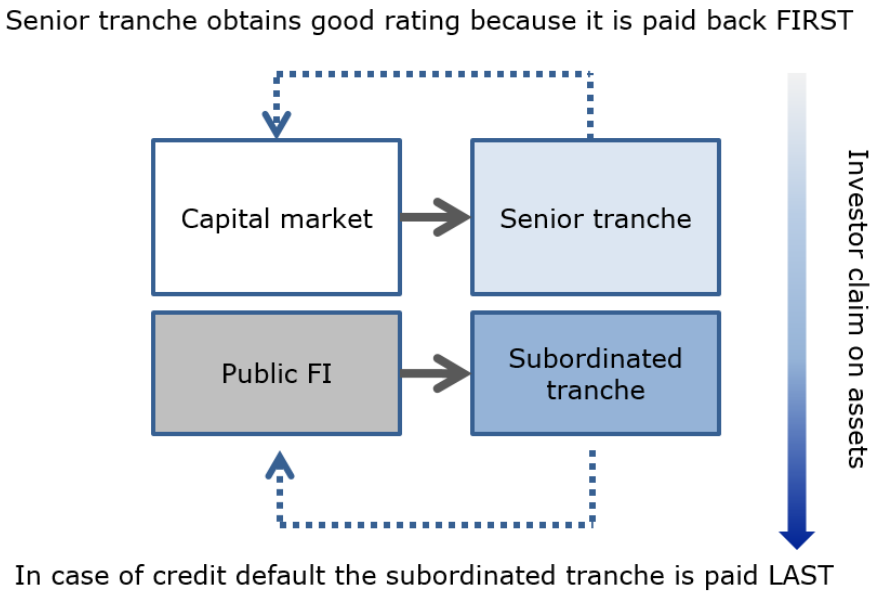
Several measures are available to enhance credit rating of green bonds:

[30] EIF, Institutional non-bank lending and the role of Debt Funds, 2014

- **Providing guarantees**: Public financial institutions can issue loan guarantees at the project finance stage or provide partial-risk or full guarantees at the bond issuance stage. This is also one of the suggestions of the G20 Climate Finance Study Group[31].
- **Purchasing subordinated debt or equity**: By obtaining the subordinated tranche of a bond, the public entity agrees to bear the first loss of capital, should any losses occur. As a result, the higher order or senior tranches receive a better rating and are thus more attractive for private investors (see Figure 2-2).

Figure 2-2 Credit enhancement through purchase of subordinate debt

By taking greater risks, publics FI's provide credit enhancement:



Source: Adelphi/COWI, 2016

- **Providing financial insurance**: Ratings of green bonds can be enhanced through financial insurances for the principal and interest of bonds. As many financial insurers have lost their ratings during the financial crisis, public financial institutions could potentially take up this role by offering insurance for green bonds.
- **Providing policy risk insurance:** Policy risk insurance schemes compensate investors if a policy upon which investments decisions were based (e.g. a feed-in-tariff) is reversed or revised.

Credit enhancement is particularly relevant for less developed bond markets where political and credit risks make green bonds less attractive to investors. However, stakeholders point out that it would also be beneficial to support green bond market players in adequately managing risks themselves. Relevant measures would include technical assistance or financial support for green bond assurance, rating, verification, disclosure and reporting.

Public facilitation of cooperation between green bond market actors (M5)

The lack of a definition and framework for green bonds (B3) as well as the lack of information and knowledge by market participants (B4) could be reduced through cooperation and learning among stakeholders at national and international levels. Building on experiences from other countries, and using proven approaches, may prevent

[31] G20. Climate Finance Study Group – Report to the Finance Ministers – 2015.

countries from repeating mistakes that others have already made. In addition, uncoordinated efforts also run the risk that different standards, protocols and procedures are developed which then lead to incompatible systems.

Some countries have advanced considerably in the development of their green bond market. Moreover, market-led initiatives (e.g. the Green Bonds Principles, GBP) have evolved to promote ambitious and transparent green bond growth. All stakeholders involved in this development process, including finance ministries, capital markets authorities, rating agencies, public and private financial institutions, investors, issuers and underwriters as well as verifiers and second opinion providers, should be encouraged to intensify cooperation.

Authorities can take up an active role in supporting cooperation and learning between stakeholders by:

- **Developing roadmaps or visions** for green bond market development that identify relevant stakeholders and outline coordination mechanisms;
- **Setting up national platforms** through which actors can jointly work on the development of the bond markets and use this platform to create topic-specific working groups to deal with technical details of the green bond market;
- **Financially and technically supporting international platforms** (e.g. GBP) that bring national and international actors together to work on international standards for a global green bonds regime.

Cooperation and learning should take place in and between all bond markets actors, including those active in developed, as well as less developed markets. The different stakeholders of green bond markets generally welcome this type of measure as it facilitates market growth and supports the voluntary nature of the international green bonds landscape. Moreover, it allows for a constructive dialogue with the official sector and helps build the capacities of (potential) green bond issuers and investors from countries with less developed green bond markets, thus stimulating the development of local green bond markets.

Tax incentives for green bonds (M6)

Governments can use taxes and other fiscal incentives (e.g. subsidies) in a variety of fields, including green bonds, to incentivize a particular behaviour. To support the development of the green bond market, governments can reduce taxes for investors and issuers of green bonds and/or levy taxes for brown or conventional bonds. Similarly, green bond issuance could be subsidized. All options will lower the costs for green bonds and thus make them more attractive for issuers and investors.

Taxes and subsidies could contribute to an increased supply of green bonds (if the issuer benefits from the incentive) as well as an increased demand (if the investor benefits from the incentive). As currently the supply of green bonds is too low (B1), incentives should specifically target bond issuers.

Authorities can use different types of fiscal measures to support the green bond market.

- **Tax-credit bonds** apply to bond investors who receive tax credits instead of interest payments. This means that issuers do not have to pay interest for their bonds.
- **Tax-exempt bonds** mean that investors do not have to pay income tax on their bonds' interest. Consequently, issuers can offer lower interest rates.
- **Direct subsidy bonds** are a direct financial government support to green bond markets. Bonds issuers receive a subsidy from the government to supplement their interest payments.

Tax incentives can be provided in countries with either developed or less developed bond markets. As taxes are national instruments, this measure cannot be implemented at the EU level.

Overall, it needs to be highlighted that changing tax and subsidy regimes in favour of green projects is highly contested by some experts. Such incentives could lead to "greenwashing" of conventional project or bonds, thus threatening to undermine the quality of the green bonds market. Additionally, tax incentives increase the policy risk inherent to green bonds, as their financial attractiveness depends on the willingness of the government to continue providing such incentives. Pricing negative externalities, including through effective carbon pricing, is generally understood as a more effective and legitimate measure to stimulate green finance.

Support for the standardization of green bonds definition and frameworks (M7)

One of the biggest hurdles for the development of the global green bond market as well as the growth of regional and national green bond markets is the lack of a common green bonds definition and framework (B3).

Investors require uniform standards in order to be certain that the green bonds proceeds will actually have the desired green impacts. Issuers, in turn, benefit from a clear standard by knowing what they need to do to issue a green bond and which of their assets are eligible for being included in a green bond.

Currently, the Green Bonds Principles and the Climate Bonds Standards are the main frameworks for labelling green bonds. There is a broad consensus in the market that policymakers should build on these frameworks when further refining definitions and standards.

There are several options to work towards a harmonized green bonds framework:

- **Using and sharing best practices:** Public financial institutions can support the development of green bonds standards by implementing best practices in their own green bonds issuance and by sharing their lessons learnt with suitable bodies and platforms that work on standardization of green bonds definitions.
- **Compliance and transparency**: Any public institution that issues or invests in green bonds could support the emergence of a clear green bonds framework by adhering to the rules stipulated in the current frameworks or by making transparent, which principles it follows.
- **Stimulating cooperation**: As described under M5, policy makers could initiate a cooperation process between stakeholders (e.g. public financial institutions, Ministries of Finance, financial regulators and municipalities that issue green bonds) for the development of standards on the national as well as the international level.
- **Accounting and disclosure**: Another option is to extend the accounting and disclosure requirements of green bonds to other non-green bonds. This would a) allow investors to see the environmental impact of their investments, b) allow the market to price in environmental benefits (or dis-benefits) and c) help ensure that the opportunities to improve environmental impact are maximized. It could also be considered to require disclosure of green indicators regarding bond issuances and investments i.e. what share of an issuance or investment portfolio is green. This would allow keeping track of market development and good-practice players.

Standardization of green bonds frameworks is crucial for both developed as well as less developed markets. In order to allow for cross-border trade of green bonds, voluntary standards are also relevant at a global level. However, overly detailed standards could increase the cost of new issuances for countries or issuers that are bound

to particular interpretation of green investments due to legal or other reasons. Standards should thus allow enough room for adaptation by potential green bond issuers.

Preferential treatment of green bonds in monetary regulation and central bank strategy (M8)

Despite the unclear risk profile of green investments (B5), there is some evidence that certain green asset classes (e.g. green mortgages) may comprise lower risks compared to conventional investments.[32] One of the underlying reasons for this notion is that the investments funded through the bonds' proceeds contribute to the sustainability of economic systems. If this is confirmed by further research, financial regulators (e.g. central banks) could adjust risk weightings for green bonds. Loans that are financed with the green bonds proceeds could be rated more favourably than conventional bonds.

Besides risk weighting, central banks have further options to incentivize the development of green bond markets. For example, they could provide cheaper liquidity to banks that engage in the green bond market in a certain form. They could also provide preferential treatment for green bonds as collateral if banks are seeking finance from central banks. Additionally, they could allow more favourable loan-deposit ratio for loans that are funded through green bonds.

Central banks themselves could invest in green bonds as part of their reserve management strategy. This would increase the demand for green bonds. Finally, central banks could include green bonds in their quantitative easing programmes. In these programmes, central banks purchase large amounts of bonds and securities.

These measures are relevant for developed and less developed green bond markets. Nevertheless, many experts consider preferential treatment of green bonds as highly controversial. Given that the objective of monetary regulation is to create financial stability, changes to such regulatory regimes could destabilize financial markets, especially in the absence of a clear risk profile of green bonds.

2.3 Good practices

The good-practice public sector measures presented in Table 2-4 have been identified for the five EU countries analysed in this study:

Table 2-4 Good-practice public sector – EU countries

Country	Good-practice public sector measures
Bulgaria	No information on good practice measures available
France	The **public label** (M7) "Energy and Ecological Transition for the Climate", developed by the French Ministry of Ecology, Sustainable Development and Energy in 2015, identifies investment funds contributing to the energy and ecological transition. The key objectives of the label are to 1) mobilize savings; 2) encourage the creation of new green investment funds; 3) provide strong assurance to end-investors; and 4) to be deployed on the European level.[33] **Public issuance** (M2) of two green bonds by Île-de-France regional government to finance a mix of climate friendly investments[34]
Germany	**Public issuance** (M2) of five green bonds (amounting to EUR 3.7 bn.) by KfW in 2015. Green bonds account for 6% of KfW's total funding (EUR 62.6 bn. in total).[35]

[32] IMT, Home Energy Efficiency and Mortgage Risks, 2013
[33] French Ministry Of Environment, Energy And The Sea, Energy and Ecological Transition for the Climate Label, Criteria Guidelines
[34] Climate Bonds Initiative, Île-de-France issues EUR600m, April 2014

Country	Good-practice public sector measures
	Support for the standardization of green bonds (M7) through the development of quality standards for green bonds (of German issuers) by KfW in cooperation with the Federal Ministry for the Environment (BMUB) in 2015.
Italy	**Public guarantees** (M4) for a tranche of SunPower's project bond issuance by the Italian Ministry of Economy and Finance (through the Italian Export Credit Agency "SACE) contributed to a better rating and lower interest rate of the bond financing for solar energy. [36]
UK	**Preferential risk weighting** (M8) for the UK Business Growth Fund (BGF) to support SMEs. The Financial Service Authority allowed preferential treatment in risk weightings to a pooled structure for SME lending. **Public facilitation of cooperation** (M5) through the UK Green Bond Market Development Committee that helps to consolidate existing market innovation and provides a platform for future growth.

Source: Adelphi/COWI, 2016

The good-practice public sector measures presented in Table 2-5 have been identified for the four non-EU countries analysed in this study:

[35] KfW, Green bonds – Made by KfW, March 2016
[36] SunPower, SunPower closes the Industry's First Solar Project Bonds, December 2010

Table 2-5 Good-practice public sector measures – Non-EU countries

Country	Good-practice public sector measures
China	**Support for the standardization** of green bonds (M7) through Green Financial Bond Guidelines, released by the People's Bank of China (December 2015).[37] The Green Bond Guidelines set out standards for the use of green bonds, including criteria for the management of proceeds and requirements on disclosure.[38] **Support for the standardization** of green bonds (M7) through a Green Bond Endorsed Project Catalogue, published by the People's Bank of China. It describes the type of projects that are eligible for green bonds and is based on Chinese environmental policies and international standards.[39] **Preferential treatment of green bonds** (M8) to promote the country's green bond market. Policies proposed by China's central bank include preferential risk weighting; exemption from loan-deposit ratio cap; and fast-track approval procedure for green bonds.
Mexico	**Public facilitation of cooperation** (M5) through the National Green Bond Market Development Committee, led by the Mexican Stock Exchange. The committee unites different types of public entities, which are committed towards climate friendly development (e.g. financial regulators, the Ministry of Finance and development banks).[40] **Support for aggregation/securitization** (M3) of loans in the energy sector through the Financial Warehouse, set up by IADB. Additionally, the Clean Technology Fund provides credit guarantees for the underlying loans. The $5.6 bn. Clean Technology Fund (CTF), is a funding window of the Climate Investment Fund (CIF). It is empowering transformation in middle income and developing countries by providing resources to scale up the demonstration, deployment, and transfer of low carbon technologies with a significant potential for long-term greenhouse gas emissions savings. The concept is now being replicated across Latin America with funding by the Green Climate Fund (GCF).
Norway	**Public investments** (M1) in green bonds through the "Government Pension Fund – Global" (since 2013/2014).
US	**Partial tax exemptions** (M6) for Clean Renewable Energy Bonds (CREBs) and Qualified Energy Conservation Bonds (QECBs). **Support for aggregation/securitization** (M3) of loans in the energy sector through the Warehouse for Energy Efficiency loans (WHEEL) program, established by the United States Energy Programs Consortium (EPC) and the National Association of State Energy Officials (NASEO).[41] In 2014, WHEEL held loans of around USD 20 million.[42] The first tranche of asset-backed securities was issued in 2014 with a total volume of almost USD 12.6 million.[43] See Figure D-1 (Annex D) for a graphic illustration of the WHEEL program. **Public issuance** (M2) of green municipal bonds**.** After a single USD 100 bn. green municipal bonds issuance in 2013, USD 2.5 bn. of green municipal bonds were issued in 2014 and an additional USD 1.3 bn. were issued in 2015.[44] **Public investment** (M1) into green bonds through the California State Teachers' Retirement System (CalSTRS) In 2015, CalSTRS held green bonds worth USD 264 million. Additionally, CalSTRS is also actively supporting the development of green bonds standards.[45] **Standardized lease and power purchase contracts** (M7) for the residential and commercial solar sectors, developed by the U.S. Solar Access to Public Capital (SAPC) working group. To date, various developers, law firms, financing platforms and program administrators have adopted the standardized contracts.[46]

Source: Adelphi/COWI, 2016

[37] IISD, Green Bonds, Green Boundaries: Building China's green financial system on a solid foundation, January 2016
[38] Environmental Leader, From Green Bonds to Green Boom: What China's New Green Bond Rules Mean for Sustainable Investment, January 2016
[39] World Resources Institute, With New Guidelines, China's Green Bond Market Poised to Take Off in the Year of the Monkey, 2016
[40] Environmental Finance, Mexico's Stock Exchange to launch green bond, 2015
[41] IMT, WHEEL'S up for home energy efficiency loans, July 2015
[42] Institutional Investor, WHEEL: Aligning Energy Efficiency and Securitization, May 2014
[43] Renew Financial, IFR. Citi sells first Green ABS bond of consumer loans, June 2015
[44] Green City Bonds, how to issue a Green Muni bond, n.d.
[45] Green Initiative Task Force, 2015 Annual Report, 2015
[46] NREL, NREL Activities to open capital market investment and bank lending for solar deployment, May 2015

3. ANALYSIS OF THE OPPORTUNITY IN DEVELOPING COMMON EU STANDARDS

Establishing and implementing standards for green bonds is likely to be critical for the development of a robust green bond market. Developing standards around 'what is green' is crucial for three main reasons:

1. To help investors monitor, and verify, the environmental effectiveness of their investments;
2. To reduce, or eliminate, resort to claims that bonds are 'green' when, in fact, they may have limited environmental merit; and
3. To help various types of issuers to support green bond issuance on the market that aligns with green growth policies.

The green bond market has been growing rapidly but continued confidence in the green credentials of green bonds is essential to maintain this growth. Trust in green labels, and ensuring transparency to the underlying assets, are crucial for this market to reach scale. However, investor capacity to assess green credentials is in many cases limited, especially for the small non-institutional investor. Therefore, credible guidelines and standards about what should or should not be considered a qualifying green investment, which are accepted by the market, can help guide investors towards bonds with sound environmental credentials when this is what they demand.

Green bond standards can provide common, evidence-based classification of what is green. This is an important driver for the growth of the green bond market by allowing a wide variety of issuers to enter the market.

In this context, this chapter analyses the opportunity for developing EU standards for green bonds. It considers the definition and scope of standards, and various components of them, and how to reduce some of the market bottlenecks (described in Chapter 2) by developing and implementing green bond standards. Finally, the chapter identifies possible key standardization measures for the EU and analyses the feasibility and potential impacts of these measures.

3.1 Existing standards and their key components

A green bond standard can be defined as a set of common criteria concerning eligibility, disclosure, transparency and impact reporting for green bonds. It entails various market-driven and publicly facilitated initiatives promoting either voluntary convergence towards, or mandated compliance with, generally accepted norms for issuing and managing green bonds.

At present, there are a number of market driven and national standardization initiatives in place. The Green Bonds Principles (GBP) and the Climate Bonds Standards (CBS) are two main frameworks being used for labelling green bonds. Currently, all bonds labelled as green are in line with the GBP and/or GBP-based frameworks, which makes the GBP the de facto market standard. On the other hand, the CBS, which integrate the GBP, provide more detailed sector specific eligibility criteria and have a certification mechanism. There are also other emerging standards mostly developed on a national scale, however with a lower market share. China has developed national green bonds standards. France has developed a public label for green investment funds. In India, the Securities and Exchange Board of India (SEBI) has released green bond requirements. In this context, brief descriptions of key market driven standardization initiatives are presented in Box 1 below.

Box 1 Market driven standardization initiatives

The **Green Bond Principles (GBP)** are voluntary process guidelines intended for broad use by the market that recommend transparency and disclosure, and promote integrity in the development of the green bond market. GBP are designed to provide the informational basis for the market to increase capital allocation to environmentally beneficial purposes without any single arbiter.

The **Climate Bonds Standards (CBS)** entail a certification mechanism for green bonds, provide green definitions and allow investors, issuers and intermediaries to better assess the environmental integrity of green and climate bonds. They are multi-sector standards covering, for example, solar and wind energy investments, low-carbon buildings, transport, water, agriculture and other sectors.

A **Harmonized Framework for Impact Reporting** on projects to which green bond proceeds have been allocated. The document outlines core principles and recommendations, in order to provide issuers with a reference as they develop their own reporting[47].

Moody's Green Bonds Assessment (GBA) provides forward-looking opinions of the (likely) relative effectiveness of the issuer's approach for managing, administering, allocating proceeds to and reporting on environmental projects financed by green bonds. It is an assessment process, which scores each bond issue on five key factors, weighted to reflect their relative importance, to arrive at a composite grade[48].

Rules and regulations published in China, France and India, have created precedents where the GBP/CBS serve, either explicitly or implicitly, as the basis for official recognition of green bonds. This promotes the compatibility of such national guidance or rules with the voluntary practices elaborated by market participants for the growing international green bond market. It also mitigates the risk of the multiplication of incompatible sets of national guidance and rules, though it also does not eliminate that possibility. Indeed, countries are at liberty to make certain requirements mandatory, if compliance with voluntary rules is not sufficient. Brief descriptions of such governmental initiatives to promote standards is summarized in Box 2 below.

[47] EIB, 2015. Green Bonds: Working Towards a Harmonized Framework for Impact Reporting
[48] Moody's, 2016, Green Bonds Assessment (GBA)

Box 2 Governmental initiatives to promote standards

France - a public label named "*Transition Energétique Climat"* excludes any support to fossil or nuclear energy and specifies positive investment areas that can be used by funds. The list of positive investment areas is based on the Climate Bonds Initiative Taxonomy and the GBP. Furthermore, *Article 173* of the *Energy and Green Growth Act* introduces mandatory environmental reporting for institutional investors (asset managers, insurance companies, pension and social security funds). The French green fund label is, perhaps, a highly relevant precedent in the European context.

China - *Green Financial Bond Guidelines* and *Green Bond Endorsed Project Catalogue* make a number of changes to the market including to: 1) Emphasize that the proceeds of green financial bonds can only be used for green assets and projects; the Green Bond Catalogue can be used for screening out green assets and projects. 2) Provide rules on the allocation of proceeds including ring fencing, earmarking and investments allowed before the allocation. 3) Require robust environmental information disclosure regarding assets/projects type, decision-making process including standard used, and environmental performance target, etc. 4) Encourage issuers to arrange an independent party to review or to certify the bond in terms of use of proceeds and environmental performance.

India - Securities and Exchange Board of India (SEBI) published *Official Green Bond Requirements,* which feature new requirements to cover the definition of green bonds, external review, tracking of proceeds, and disclosure. They follow the general architecture of the GBP, while turning some recommendations into requirements.

The following working groups are also relevant:

- **G20 Green Finance Study Group** identifies institutional and market barriers to green finance and, based on country experiences and best practices, analyses options on how to enhance the ability of the financial system to mobilize private green investment, thereby facilitating the green transformation of the global economy.
- **G20 Climate Finance Study Group** looks into 1) Improving the collaboration, dialogue and cooperation between climate funds; 2) Adaptation financing for developing countries; 3) Sharing experiences on public finance mobilization; 4) Promoting effective financial instruments and approaches to enhance climate finance and stimulate climate-friendly private investment, such as (i) Green bonds; (ii) Risk-sharing instruments; (iii) GHG emission pricing approaches.
- **Task Force on Climate-Related Financial Disclosures** (under the FSB) aims to develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to investors, lenders, insurers, and other stakeholders. The Task Force considers the physical, liability and transition risks associated with climate change and what constitutes effective financial disclosures across industries.
- **CERES** outlined in a "Statement of Investor Expectations" for bonds labelled green, that they "consider consistency in standards and procedures helpful to the development of a robust green bond market and view adherence to the GBP to be an essential step in this direction".[49]

In addition, the Commission is in the process of establishing an **expert group to develop a comprehensive European strategy on green finance**[50].

[49] Ceres, Investor Network on Climate Risk
[50] European Commission establishes an expert group to develop a comprehensive European strategy on sustainable finance

A green bond standard can include various components. Currently, there is no complete consensus in the market on what should be included within 'a standard'. The main components of some of the widely accepted existing standardization frameworks are presented below in Boxes 3, 4, 5 and 6.

Box 3 Components of Green Bond Principles

Use of proceeds categories;

- Renewable energy
- Energy efficiency
- Pollution prevention and control
- Sustainable management of living natural resources
- Terrestrial and aquatic biodiversity conservation,
- Clean transportation
- Sustainable water management (including clean and/or drinking water)
- Climate Adaptation
- Eco-efficient products, production technologies and processes

Process for Project Evaluation and Selection;

- how the projects fit within the eligible categories
- the related eligibility criteria;
- the environmental sustainability objectives.

Management of Proceeds;

- net proceeds of Green Bonds should be credited to a sub-account, moved to a sub portfolio
- balance of the tracked proceeds should be periodically adjusted
- make known to investors the intended types of temporary placement for the balance of unallocated proceeds.

Reporting (and external review).

- Issuers should make, and keep, readily available up to date information on the use of proceeds to be renewed annually until full allocation, and as necessary in the event of new developments
- Issuers use an external review to confirm the alignment of their Green Bonds with the key features of the GBP

Box 4 Components of Climate Bond Standards

Pre-Issuance requirements

1. Selection of projects and assets
2. Internal processes and controls
3. Reporting prior to issuance

Post-Issuance requirements

4. Nominated projects and assets
5. Use of proceeds
6. Non-contamination of proceeds
7. Confidentiality
8. Reporting

Eligible projects and assets

9. Climate Bond Taxonomy
10. Technical criteria

Requirements for specific bond types

11. Project holding
12. Settlement period
13. Earmarking

Certification

14. Pre-issuance
15. Post-issuance

Box 5 Components of Moody's Green Bond Assessment framework

Organization

1. Governance and organization structure appears to be effective
2. Policies and procedures enable rigorous review and none decision making processes
3. Qualified and experienced personnel
4. Explicit and comprehensive criteria for investment selection, including measurable impact results
5. External evaluations provided by third parties for decision-making.

Use of proceeds

6. Percentage of green bond proceeds invested in accordance with one or more categories that is enumerated under the Green Bond Principles.

Disclosure of the use of proceeds

7. Detailed description of green projects.
8. Differentiation between new investments versus or none refinancing.
9. Adequate funding to complete the project.
10. Quantitative measures for targeted results for each investment.
11. Detailed criteria on the method for calculating performance against targeted results

Management of Proceeds

12. Bond proceeds are segregated and separately tracked on an accounting basis
13. Application of proceeds is tracked by environmental category and project type
14. Robust process for reconciling planned investments against actual allocations
15. Clear eligibility rules for investment of cash balances
16. Audit by external organization or internal audit unit

On-going reporting and Disclosure

17. Initial reporting and disclosure after issuance provides detailed status update on investments.
18. Ongoing annual reporting is expected over the life of the bond.
19. Disclosures provide granular detail on the investments and their expected environmental impacts.
20. Detailed reporting provides a quantitative indication of the environmental impacts realized to date.
21. Reporting includes quantitative explanation of how the realized economic impacts compare to projections at the time the bonds were sold.

Box 6 Components of Harmonized Framework for Impact Reporting Principles

1. Report on both the use of green bond proceeds, and expected environmental impacts annually.
2. Define and disclose the period and process for including projects
3. Report the total signed amount and the amount of green bond proceeds allocated
4. Put in place a formal internal process for the allocation of proceeds linked to the issuers' lending and investment operations for Green Projects and to report on the allocation of proceeds.
5. Provide a list of projects to which green bond proceeds have been allocated, or report solely on a portfolio level.
6. The impact reporting approach can be: 1) project-by-project report or portfolio report based on project-by-project allocations, and 2) portfolio report based on portfolio allocations
7. The impact report should illustrate the expected environmental impact made possible as a result of projects to which green bond proceeds have been allocated.
8. Report the estimated lifetime results and/or project economic life (in years) to provide users with a basis for understanding the impact of the project over its lifetime.
9. In case the issuer samples ex-post verification of specific projects, it is recommended that the relevant results are included in the reporting
10. Report on a limited number of core indicators for projects included in green bond programs
11. In the absence of one single commonly-used standard for the calculation of GHG emissions reduced/avoided, issuers may follow their own methodologies while making these available to investors
12. Investors should be aware that comparing projects, sectors, or whole portfolios is difficult because general assumptions on inputs in calculations and the cost structures between countries may vary
13. Convert units reported for individual projects, based on a standard conversion factor to facilitate comparison and aggregation
14. Be transparent about projects with partial eligibility
15. In case the expected impacts of different project components (such as EE and RE components of the same project) may not be reported separately, issuers may attribute the results to each component based on its relative share in the related financing, disclosing the attribution approach
16. Be transparent on reporting all green bond-related cash flows in one currency and report on the projects to which green bond proceeds have been allocated.

In the context of harmonized impact reporting, IFC's experience within the renewable energy and energy efficiency sectors may be highly relevant. Box 7 provides an example, following the developed principles, recommendations, indicators and reporting templates in the harmonized impact-reporting framework.

Box 7 Harmonized impact reporting example related to renewable energy and energy efficiency

In 2015, IFC issued 18 Green Bonds in the cumulative amount of $352 million[51]. During the year, IFC committed to a total amount of $1.15 bn. across 38 new projects, including an additional commitment to a project from the previous year. Green bond disbursements during the fiscal year amounted to $956 million, of which $572.7 million was disbursed to the newly committed 38 projects and $383.3 million to prior commitments. IFC used a harmonized impact-reporting framework, which includes principles and recommendations, indicators and templates allowing comparisons. The total impacts are summarized below:

Climate loan committed (*USD m.*)	**Annual renewable energy produced (*MWh*)**	**Annual energy savings (*Kwh*)**	**Renewable energy capacity (*MW*)**	**Annual GHG emissions (*Tonnes of CO_2*)**
1,154.5	3,499,485	69,292,326	1,439	2,465,182

IFC tracks project results throughout the project cycle until project closure. Total GHG reductions reached almost 2.5 million tons of CO_2 that is equivalent of taking around 500,000 cars off the road or carbon sequestered by 2 million acres of U.S. forest in one year. Annual renewable energy generation of 3.5 million MWh is sufficient to supply over 300,000 U.S. homes with electricity. All impact measures are calculated on an ex ante basis.

Given the wide variety of components included in the various existing standardization initiatives (as listed above), the next section identifies a few key components that could be considered in the European context, to show promise as mechanisms that could be used to reduce (or overcome) the key green bond market bottlenecks detailed in Chapter 2.

3.2 Key bottlenecks due to the lack of common standards

The following key bottlenecks described in Chapter 2 could be reduced by various green bond standardization measures, namely:

- Lack of green bonds definition and framework (B3); and
- Lack of information and market knowledge on the part of green bond market participants (B4).

It is important to note that reducing these bottlenecks through developing a common green bond standard can also indirectly affect other identified bottlenecks, which in turn affect the green bond market demand and supply. For example, increasing transparency of impact reporting can provide better information regarding the risk profile of the green bond, and thus increase demand.

The following analysis focuses on how different standardization measures can be used to reduce the aforementioned green bond market bottlenecks

Lack of green bonds definition and framework (B3)

As discussed in Chapter 2, a main issue related to the lack of a clear definition of, and a framework for, green bonds is the question of what investments can be considered

[51] IFC Green Bond Impact Report FY2015

as 'green' for the purpose of issuing green bonds. Specifically, issuers of green bonds often face difficulty in determining the eligibility of a project, or a portfolio, to be considered for green financing. This sometimes prevents them from issuing bonds labelled as 'green' due to reputational risks, and this may be a brake on the supply of green bonds in the market.

Furthermore, the transaction costs to issuers for issuing green bonds tend to be higher compared to general-purpose bonds. Issuers currently rely on a limited number of existing external reviewers for ensuring that green bonds are aligned with specific labelling frameworks because of a lack of uniform green bond definition and framework.

Investors, on the other hand, might reasonably have expectations that when they are investing in green bonds, they are investing for environmental improvement. Because of a lack of reliable delineation of what qualifies as 'green', they may not be clear about the '*greenness*' of the bonds and may refrain from investing in them, which in turn reduces the overall market demand for green bonds.

Even with green bonds that have been subject to an external review, sometimes, it remains unclear to the investor whether the bond will comply with its stated objectives regarding use of proceeds and environmental impacts of investment. This is mainly because the external reviews undertaken by various second parties are not harmonized in evaluating and reporting certain aspects of the bond that the investors might be interested in understanding. It has to be noted that GBP has already taken steps to overcome this by publishing a template, which recommends the public disclosure of external reviews either in summary format through a recommended template and/or in its entirety[52].

These bottlenecks related to lack of green bonds definition and framework can be reduced (or even overcome) by various standardization measures. Firstly, a uniform green bonds project eligibility and selection criteria would underpin what type of projects could be financed using the proceeds of green bonds. It would also provide accurate signal to the potential investor on whether a particular green bond will fulfil his green investment requirements.

Secondly, these can also minimize the external review requirements of issuers, and reduce part of the additional transaction costs associated with green bonds compared to regular bonds, hence making bond issuance more attractive.

Finally, a standardized minimum requirement for external reviews and impact reporting for green bonds will ensure these review reports meets the transparency requirements of the investors and contain necessary information required by various types of investors for making informed investment decisions.

Lack of information and market knowledge by green bond market participants (B4)

One of the main concerns related to the lack of information for an investor is '*greenwashing*' and transparency. When undertaking an investment, the investor is not often clear about whether the proceeds from the green bond will be allocated toward eligible green projects and what the potential environmental impacts of the specified investment profile should be.

On the other hand, potential issuers often lack the knowledge and understanding of requirements to issue a green bond. Moreover, smaller companies undertaking a

[52] GBP 2016, External Review Form

green project might not be aware of green bonds as a form of financing or re-financing.

Problems related to lack of information by green bond investors and issuers can be reduced by developing standards on green bond project eligibility and selection criteria, tracking and management of proceeds, and pre- and post-issuance impact reporting framework. Other standardization measures, such as, pre- and post-issuance external reviews on environmental performance of green bonds, can work as an assurance mechanism and can be used to increase investors' confidence in green bonds.

3.3 Possible EU policy measures

Based on the above discussion on the definition of a green bond standard and bottlenecks related to standards, this section identifies key standardization measures that could potentially be considered in the spirit of developing a common green bond standard at the EU level. These measures are grouped into three key life-cycle stages of a green bond:

- Pre-issuance: Pre-issuance standardization measures focus on selection of eligible projects and assets, as well as requirements for an external review, certification, etc. The identified measures are:
  - Project Eligibility and Selection Criteria (S1)
  - Pre-issuance External Review (S2)

- Investment Decision: This relates to disclosure of the issuer's stated internal processes to track, and report on, use of proceeds (to enable informed investment decisions). The identified measure under this stage is:
  - Pre-issuance report (S3)

- Post-issuance: Post-issuance standardization measures focus on the actual use of proceeds, as well as reporting requirements for demonstrating their environmental impacts. The identified measures are:
  - Management of proceeds (S4)
  - Post-issuance External review (S5)
  - Periodic reporting (S6)

Project Eligibility and Selection Criteria (S1)

This standardization measure provides criteria on intended utilization of proceeds including the estimated share of financing vs. re-financing, as well as the processes to be used for evaluating and selecting eligible projects. Under this measure, the issuer of the green bond should outline:

- A process for determining how the projects fit within the eligible green projects categories; and
- The related eligibility criteria and associated environmental sustainability objectives (recognizing the potential for trade-offs across environmental impact categories).

Certain projects that fall within green bond categories may benefit the environment in important ways but also degrade it in others. In such cases, the investor may wish to exercise additional diligence when evaluating green bond offerings. One way of doing this might be to ensure that even where the principal objective of a bond issue is related to a specific environmental outcome, that the reporting requirements for projects are broader in scope than 'just' this one theme (see below).

Finally, if all or a proportion of the proceeds are or may be used for refinancing, the issuers should provide an estimate of the share of financing versus re-financing, and where appropriate, disclose which investments or project portfolios may be refinanced.

Pre-issuance External Review (S2)

This element of a standard would set out various requirements for the external review process of the issuance of green bonds. The most common form of external review is the '*second opinion*' provided by the specialized consultants and second opinion providers. Other forms of external reviews include assessment of the green bond by independent verifiers, certifiers, and rating agencies.

The pre-issuance external review can include the following components to help the investor make a sound investment decision:

- The criteria for selecting projects are in line with sound environmental analysis and consistent with relevant standards for eligible projects that are referenced;
- The selected eligible projects fall within the categories of investments commonly recognized to address the targeted environmental problem(s) based on information available from recognized sources: where there are potential 'side-effects' from projects, external reviewers could highlight these and suggest additional reporting requirements in terms of environmental performance;
- General sustainability credentials of the issuer: whether the issuer is linked to any of the common exclusions such as armaments, child labour, coal powered energy generation, etc.
- Issuers' have an appropriate governance structure with guidelines and systems in place to support the selection, monitoring and assessment of the projects;
- Issuers' have capacity to assess or measure and report on the impact of investment; and
- A standardized minimum requirement for reporting the required outputs of the external review process.

Given the complexity of assuring the use of proceeds for green bonds, additional levels of oversight concerning tracking of proceeds and selection of eligible green projects are likely to prove helpful to investors. Several financial auditors, and climate and environmental, social, governance (ESG) institutions have been participating as independent assurers in the green bond market. Financial auditors can provide support in tracking bond proceeds to stated eligible project categories and climate and ESG experts can support with selection of green projects and their expected environmental benefits This additional level of scrutiny can provide comfort to bond investors that additional outside due diligence has been conducted to the extent feasible. Also, to ensure transparency, the external review reports should be made publicly available.

Pre-issuance Report by the Issuer (S3)

In order to classify a bond as green bond, issuers could be required to provide investors with specific information prior to issuance. This could include:

- Categories of projects to which issuers intend to allocate the funds;
- A framework for deciding which projects should receive green bond funding;
- Criteria for assessing environmental benefits; and
- Environmental impacts the issuers expect their projects to generate.

Designated green projects should provide clear environmental benefits that can be described, assessed and quantified. This can take the form of projections of expected impacts, supporting environmental studies, internal research and third party assessments.

Although a pre-issuance report is provided for most of the issued green bonds, currently there are no standardized requirement of what should be reported as a minimum. A harmonized framework on minimum requirements for the pre-issuance report, reflecting the main characteristics of the green bond, will allow investors to compare this information between bonds issued by different issuers. Finally, the pre-issuance report should be made publicly available to ensure transparency.

Management of Proceeds by the Issuer (S4)

This measure provides details on the management process for tracking net proceeds from the issued green bond offering. Management of net proceeds may take a variety of forms, such as, a sub-portfolio; a separate bank account; or a sub-account. Under this measure, the issuer would need to disclose the following information:

- How proceeds will be transparently tracked and how this will be communicated to investors. Periodic audits should be undertaken for verifying such internal tracking methods and allocation of funds from proceeds.
- The intended types of temporary placement for the balance of unallocated proceeds.
- The percentage of bond proceeds being used for new project funding vs refinancing.
- Timeframe for allocating the green bond proceeds to eligible projects, appropriate to the maturity of the bond.

Post-issuance External Review (S5)

This standardization measure is broadly similar to *Pre-issuance External Review* (S2) described above. However, the post-issuance review would evaluate alignment of actual use of proceeds with the intended use of proceeds declared prior to issuance of the green bond. This measure would ensure transparency of management and the allocation of net green bond proceeds. The post-issuance external review can include:

- Verification of the internal tracking method;
- Allocation of funds from the green bond proceeds;
- Whether the project eligibility and selection criteria are met in the actual allocation of proceeds; and
- Verification of reported environmental impacts of projects funded by the green bond.

Periodic Reporting by the Issuer (S6)

This standardization measure concerns the periodic reporting after issuance of green bond. This can include the following:

- List of the projects to which Green Bond proceeds have been allocated, including allocated amount; and
- Performance of the green bond in terms of estimated impact (compared to projections at the time of issuance).

Issuers should provide annual updates on the use of green bond proceeds for eligible projects and reports of the estimated impact of projects supported by the green bond financing. The use of proceeds can be reported on a project-by-project or aggregate basis, preferably with a harmonized impact reporting approach.

Transparency is of particular value in communicating the expected impact of projects. Thus, reports should be publicly available and include expected results according to estimates developed when projects are in the design, construction and/or implementation phase.

Finally, to make such reporting easy for investors to understand, a simplified standard set of indicators concerning different types of environmental impacts could be developed under this standardization measure.

The next section analyses the feasibility and potential impacts of the above standardization measures.

3.4 Analysis of EU policy measures

Because of the lack of data on impacts of a standardization measure (and counterfactual scenario), it is difficult to evaluate, in quantitative terms, the impact of these measures on the size and liquidity of the green bond market. Thus, the following discussion focuses on qualitative analysis of the identified measures for the EU. Specifically the following aspects are examined and analysed for each measure:

- Potential impacts on market size and liquidity;
- Possible risks;
- Regulatory intensity[53];
- Recommended time-horizon;
- Assurance mechanisms[54] for the investors; and
- Stakeholders' perception (where available).

Project Eligibility and Selection Criteria (S1)

The standardization measure on project eligibility and project selection criteria should be beneficial for investors, especially the ones who are genuinely interested in investing in green projects, and could have a positive impact on the demand and liquidity in the green bond market. This is because, project eligibility and selection criteria based on clear and measurable environmental benefits of projects funded by green bonds will provide a common framework to the potential investor to identify whether a particular green bond will fulfil their green investment requirements.

On the supply side, a uniform green bond project eligibility and selection criteria would help the issuers (especially the new issuers) to determine what type of projects or portfolios could be financed using the proceeds of green bonds and the associated expected environmental benefits. However, a strict project eligibility and selection criteria can exclude certain sectors or certain types of projects to be financed by green bonds. Thus, it could have a negative impact on the supply of green bonds, at least in the short run. On the other hand, it could have a positive impact on the supply and

[53] Regulatory intensity refers to the degree of flexibility available within a standardization measure. Thus, a low intensity measure will provide high degree of flexibility within the relevant components of the standard (e.g. flexibility in eligibility criteria for issuing a green bond).
[54] To inform the investor regarding issuer's commitment to follow-through with the pre-issuance agreements for the green bonds (e.g. how green bond proceeds will be managed).

size of the green bond market in the long run, once this standard becomes a norm in the green bond market, and new projects are designed in accordance with the required eligibility and selection criteria.

Thus, the overall impact of this measure on the liquidity of the green bond market is likely to be positive, while the impact on market size is likely to be negative in the short run, with a potential to become positive in the long run.

The degree of regulation for this standardization measure should be kept high, as the main objective of the measure is to ensure that green bonds are financing genuinely green projects that meet the required eligibility and selection criteria. The recommended time-horizon for implementing this measure should be short-term as this measure will be the necessary first step towards a common framework for determining which projects should be financed by green bonds.

The relevant assurance mechanism under this measure is the issuers' commitment to undertake pre- and post-issuance external review to ensure that the net proceeds from green bonds are allocated to eligible projects and/or portfolios, and the estimated environmental impacts of funded projects are aligned with the expected impacts estimated prior to issuance.

This standardization measure was supported by a majority of stakeholders during the stakeholders' consultation in June 2016. It was also suggested that the EU could endorse one of the existing standards on project eligibility and selection criteria instead of developing a new standard. However, the eligibility and selection criteria under the existing market driven standardization initiatives do not cover many sectors and types of projects, and the eligibility and selection criteria for these need to be developed.

Pre-issuance External Review (S2)

Pre-issuance external reviews increase investor confidence in the green bond, and will likely lead to an increase in the demand for green bonds as a result. Moreover, if review reports are publicly available, it will ensure transparency of the review process and increase investor confidence further. It can also increase the investor base in the green bond market by attracting small non-institutional investors who otherwise do not have the necessary resources to undertake their own due-diligence. The GBP recommend an external review but do not mandate it. In addition, there are concerns regarding the quality of external reviews and the lack of a standard for them contribute to this.

On the other hand, more onerous requirements on the review process are likely to increase the associated transaction costs of issuing the green bond, and this could reduce the supply of green bonds, although the costs could be partly shifted to the investors in terms of a lower return (thereby negatively impacting on demand). Although the cost of external review might not be very high compared to the size of the green bond from large issuers, the impact could be more pronounced for the small and medium sized issuers whose green bonds might not receive an investment grade rating (at least a 'BBB') unless reviewed by an external party.

The overall impact of this measure on liquidity of the green bond market through increase in demand and investor base should be positive. However, the higher transaction cost associated with the external review process could affect the demand/supply and market size negatively. The negative impact on demand/supply and market size could be low given that some 60 percent[55] of the current green bonds undertake ex-

[55] Eurosif Green Bonds Policy Seminar, 2015

ternal review although there will be costs associated with reviewers adopting a new standard . In this context, it is worth noting that recent data referred to at the stakeholder meeting suggests an increase to 80% of green bonds having external reviews (second opinion or certification).

The degree of regulation for this standardization measure should be kept high in line with the regulatory intensity for selection and eligibility criteria, as the pre-issuance review will be the main mechanism for ensuring that the green bonds are aligned with the required project eligibility and selection criteria. Similarly, the recommended time-horizon for implementing this measure should also be short-term, in line with the recommended time horizon for the previous measure.

The assurance mechanism for this measure is that the review is undertaken by independent external party, and that transparency of the review process is maintained by making review reports publicly available, preferably in a harmonized manner (e.g. with common templates as developed by the GBP).

Most market stakeholders were supportive of pre-issuance external review as the most financially viable form of external review at present for the majority of the issuers.

Pre-issuance Report by the Issuer (S3)

Pre-issuance reporting is designed to provide a transparent account of the intended allocation of proceeds of green bonds, as well as the expected environmental impacts of projects that will be funded by the green bond. This would increase investors' confidence in the green bond and support demand. Moreover, standardized minimum requirements on information provided in the pre-issuance report would make it easier for the investors to compare between green bonds issued by different issuers.

However, more onerous reporting requirements for the pre-issuance report will increase the associated transaction costs of issuing green bonds, especially for the new issuers, and may have a negative impact on the supply of green bonds, or the returns the issuer is offering (which would impact negatively the demand).

The overall impact of this measure on liquidity of the green bond market should be positive through increasing in investors' confidence, and the demand for green bonds. On the other hand, the impact on green bond supply and market size could be negative if the cost of reporting is high.

The regulatory intensity for this standardization measure should be moderate to allow for flexibility in the reporting requirements to keep the reporting costs low. However, the recommended time-horizon for implementing this measure should also be short-term in line with the previous two measures, as this will be the main instrument for making informed investment decisions, and a necessary step towards developing and implementing a green bond standardization framework.

The assurance mechanism for this measure is the transparency of the reporting process that would come about by making pre-issuance report publicly available.

This measure was also supported by most stakeholders during the stakeholder consultation, with an emphasis on transparency and content of the reports.

Management of Proceeds by the Issuer (S4)

A standardization measure concerning management of proceeds could provide the investors with transparency in the process of allocating and tracking the net proceeds from the issued green bond offering, potentially increasing the demand and circulation for the issued green bonds. Moreover, periodic audits for verifying issuers' internal tracking methods and the allocation of funds from proceeds can increase the demand

and circulation further. Standardization of processes for management of proceeds can also benefit new issuers of green bonds, as they will not need to develop their own processes from scratch. This could increase the issuer base in the green bond market, resulting in further growth of the market.

On the other hand, standardization of management of proceeds can be restrictive for current, and large, issuers who may already have well-defined existing processes for managing proceeds, especially where the measure requires considerable changes to existing practice. This would have the potential to affect supply negatively. For this reason, such a measure should, as far as possible, reflect the types of process used by current and large issuers.

The overall impact of this measure on liquidity of the green bond market, through increasing demand and circulation for the issued green bonds, should be positive. However, the net effect of this measure on the supply of green bond and size of the market is ambiguous, as it would likely be of benefit to new issuers of green bonds, while potentially having a negative effect on the existing issuers.

The regulatory intensity for this standardization measure should allow flexibility in processes for management of proceeds, especially for the current large issuers with existing well-defined processes for managing green bond proceeds, and thus it should be at most moderate. The recommended time-horizon for implementing this measure is short-term as this could be developed easily based on existing processes and frameworks.

The assurance mechanism for this measure is the requirement for periodic audits that verify issuers' internal tracking methods, and the allocation of funds from proceeds. Moreover, the post-issuance external review (S5) and periodic reporting by the issuer (S6) on allocation and tracking of proceeds of the issued green bonds would provide further assurance to the investor.

Post-issuance External Review (S5)

Post-issuance external review will increase investors' confidence in the issued green bond, which will likely increase the demand and circulation of issued green bonds. Moreover, it could increase the credit rating of issued green bonds, which in turn can increase the investor base in the green bond market by attracting institutional investors (fund managers, pension funds, etc.).

However, stringent requirements on the post-issuance review process can increase the associated transaction cost of issuing green bonds, especially for the small and medium sized issuers, thus reducing the supply of green bonds.

The overall impact of this measure on liquidity of the green bond market should be positive through increasing demand and circulation of the issued green bonds, as well as the investor base. However, the impact on green bond supply and market size could be negative if the cost of external review is very high, especially for the small and medium sized issuers.

Similar to the regulatory intensity for the pre-issuance external review, this measure should also have a high regulatory intensity in line with the regulatory intensity for eligibility and selection criteria. This is because the post-issuance review is designed to ensure that the green bond proceeds are allocated in accordance with the project eligibility and selection criteria stated prior to issuance. The recommended time-horizon for implementing this measure is medium-term as post-issuance external review is not a common practice for the current green bond issuers and it might take a while for the market to adjust to this measure.

The assurance mechanism for this measure is similar to the pre-issuance review, that is, the review is undertaken by an independent external party, and that the review process is transparent (review reports are publicly available).

Among the different stakeholders, the investors were most keen on the implementation of post-issuance external review, suggesting that the absence of this might weaken investor appetite.

Periodic Reporting by the Issuer (S6)

Periodic reporting requirements will increase the transparency of actual allocation of green bond proceeds and associated performance of green bonds in terms of estimated environmental impacts of the funded projects. This, in turn, will increase investors' confidence in the issued green bond, which will likely increase the demand and circulation of those green bonds issued. Moreover, periodic reporting could also provide better information about the risk profile of the issued green bond, and will likely increase the demand and circulation further. Finally, harmonized minimum requirements on the information to be provided in the post-issuance report can reduce the reporting costs, and thus have a positive impact on the supply of green bonds.

However, it might be difficult and costly to estimate the expected impacts of large number of small projects funded by issued green bonds. This can increase the cost of reporting for green bonds that will fund a number of smaller projects (unless they are of a similar type), and thus result in a decrease in supply of these type of green bonds.

The overall impact of this measure on liquidity of the green bond market, through increase in demand and circulation of issued green bonds, should be positive. On the other hand, the net effect of this measure on the supply of green bond and size of the market is ambiguous, and will depend on whether this measure increases or decreases the cost of reporting.

As with the pre-issuance report, the regulatory intensity for this standardization measure should be moderate to allow for some flexibility in the requirements of impact reporting to keep the reporting costs low. The recommended time-horizon for implementing this measure is medium-term as creating a standardized reporting framework for many different sectors might be difficult to develop.

The assurance mechanism for this measure will be similar to the pre-issuance report, that is, the transparency of the reporting process by making the post-issuance periodic reports publicly available.

This measure was supported mostly by investors during the stakeholder consultation, with an emphasis on transparency and content of the periodic reports. However, some issuers expressed concern regarding the associated additional costs of periodic reporting.

Summary of possible EU Policy measures

Although, these measures were presented separately, essentially they are interlinked components of an overall standardization framework. So for each of these policy measures to be fully effective, it is suggested to introduce them together or in sequence to form a comprehensive EU green bond standard. For example, pre- and post-issuance external reviews act as the assurance mechanisms for the component on project eligibility and selection criteria. Thus, requirements on pre- and post-issuance external review are needed for introducing the standardization measure on project eligibility and selection criteria. The above analysis on key identified green bond standardization measures for EU is summarized in Table 3-1 below.

Table 3-1 Summary analysis of possible EU policy measures

Lifecycle Stage	Standardization Measures	Potential Impacts	Possible Risks	Overall Impact on Market Size and Liquidity	Regulatory Intensity	Recommended Time-horizon	Assurance Mechanism	Stakeholders' perception
Pre-issuance	Project eligibility and selection criteria	Increase in demand by signalling to investors whether a green bond fulfils specific investment requirements. Help issuers to determine eligible projects/portfolios and demonstrate associated environmental benefits	Decrease in market supply by excluding issuance in certain sectors or certain types of projects	Potential increase in market liquidity Possible decrease in market size in short-run, with potential increase in long-run	High	Short-term	Issuers' commitment to pre- and post-issuance review	EU can endorse existing standards
	Pre-issuance external review	Increase in demand through higher transparency and investors' confidence, and attracting non-institutional investors	Decrease in demand/supply by increasing cost of review and by lowering return	Potential increase in market liquidity Possible decrease in market size	High	Short-term	Review by independent external parties and publicly available	Most financially viable form of external review for the issuer
Investvestment Decision	Pre-issuance report	Increase in demand by increasing transparency of use of proceeds and expected environmental impacts; by making bonds from different issuers easy to compare	Decrease in demand/supply by increasing cost of reporting and by lowering return	Potential increase in market liquidity Possible decrease in market size	Moderate	Short-term	Reports are publicly available	Should focus on transparency and content of report
Post-issuance	Management of proceeds	Increase in demand through transparency of allocation and tracking of proceeds; and periodic audits for verifying tracking and allocation method Increase in supply by providing pre-defined proceed management processes for new issuers	Decrease in supply as existing issuer already have set processes for management of proceeds	Potential increase in market liquidity Ambiguous effect on market size	Moderate	Short-term	Periodic audits and reporting, Post-issuance external review	Not discussed
	Post-issuance external review	Increase in demand through higher transparency and investors' confidence and increase in investor base by increasing credit rating and thus attracting large institutional investors	Decrease in supply by increasing cost of review	Potential increase in market liquidity Possible decrease in market size	High	Medium-term	Review by independent external parties and publicly available	Supported mostly by investors
	Periodic reporting	Increase in demand by increasing transparency of allocation of proceeds and estimated environmental impacts; and by better informing investors regarding the risk-profile; Increase in supply by reducing cost through harmonization of reporting requirements	Decrease in supply by increasing reporting cost of estimated impacts for large number of small projects	Potential increase in market liquidity Ambiguous effect on market size	Moderate	Medium-term	Reports are publicly available	Should focus on transparency and content of report

Source: Eunomia/COWI, 2016

4. CONCLUSIONS

4.1 Green bond market development

Multilateral Development Banks initiated the development of the green bond market in 2007-2008. The market was initially dominated by small transactions. Significant market growth occurred in 2013 with the issuance of corporate and municipal green bonds. In 2015, the market continued growing and becoming more diverse in terms of geography, type of bonds, issuers, currency, credit ratings and projects financed. The main actors in the market can be categorized as issuers (entities with green projects needing funding or refunding), underwriters (financial institutions arranging the issuance of the green bonds), external reviewers (verifying the "greenness" of the underlying projects), intermediaries (such as stock exchanges), and investors (particularly those with a mandate to invest in green assets).

In 2015, the total volume of labelled green bonds issued reached USD 43 bn. and in 2016, total issuance reached USD 53.1 bn. by September 2016. In 2015, climate-aligned bond issuance was USD 538.1 bn.

Today, green bonds mainly finance projects within renewable energy (45.8% of the global issuance in 2015), energy efficiency (19.6%), low carbon transport (13.4%), sustainable water (9.3%), and waste & pollution (5.6%). The demand for green bonds has been growing exponentially with pension funds and insurance companies diversifying their investment portfolios and moving towards more responsible investing. In the light of the global commitment to shift to a low carbon economy, the green bond market is likely to continue to grow while attracting more diverse issuers and investors.

The EU green bond market is generally well developed due to its well-established existing finance infrastructure, the active involvement of EU based organizations and political support. However, there are significant differences in the green bond market development across EU Member States, caused mainly due to the differences in the national bond market development and policy frameworks. The EU green bond market is led by Multilateral Development Banks (such as EIB, EBRD), municipalities (e.g. Ile-de-France, Gothenburg) and corporations (e.g. utilities and producers of green solutions).

In the US the green bond market is largely driven by municipalities with two dominant themes: green property for universities and sustainable water projects. Several emerging market economies (China, India and Mexico) have demonstrated an increasing involvement and strong political commitment to growing their national green bond markets. In 2016, China is leading the country ranking globally with the highest amount of outstanding bonds. Both China and India developed national green bond standards based on the Green Bond Principles (GBP), whereas Mexico established a Green Bond Development Committee to facilitate national green bond market development.

4.2 Public sector role

In spite of its recent growth, the green bond market remains very small compared to the total bond market. The reason for this is that a range of bottlenecks hampers the further development of the green bond market. At present, the main bottleneck is the lack of supply of green bonds with good credit ratings. This is due to several factors including the lack of bankable projects that are in need of re-financing; the lack of aggregation mechanisms for small projects; the lack of universally agreed and comprehensive standards for "green" investments; and the general difficulties of issuers to obtain good credit ratings for green bonds. On the demand-side, both information asymmetry and investors' risk aversion potentially lead to a lack of demand for green bonds. However, especially the more developed market bond markets currently expe-

rience strong demand for green bonds. These bottlenecks are thus most relevant for countries where green bonds activity is still low.

Against this background, stakeholders have called for the public sector to play a larger role than hitherto and to support the development of the green bond market. Yet, there is no common agreement between stakeholder on the exact scope and extent of this role. In the overview table below, we have summarised *possible* key public sector measures, which could reduce the bottlenecks described above. It needs to be noted that some of the measures may have unintended consequences and should only be applied in specific contexts with clear boundary conditions (particularly M1, M4, M6 and M8).

Demand-side public sector measures
• Public investment in green bonds (M1)
Supply-side public sector measures
• Public issuance of green bonds (M2) • Public sector support for aggregation and securitization (M3) • Credit enhancement by public financing institutions (M4)
Demand and supply side public sector measures
• Public facilitation of cooperation between green bond market actors (M5) • Tax incentives for green bonds (M6) • Support for the standardization of green bonds definition and framework (M7) • Preferential treatment of green bonds in monetary regulation / central bank strategy (M8)

Some stakeholders consider the growth of the market to be driven mainly by private actors. They suggest this as an appropriate way forward with only a minor role for public sector interventions. Public sector involvement should be limited to facilitating market growth, e.g. in the form of issuances of green bonds by public actors or supporting capacity building among market actors. These stakeholders see regulatory measures by the public sector as something that will negatively affect the growth of the market by imposing additional costs. Fiscal measures such as tax benefits for green bonds may give the impression that green bonds need public support and this perception could render them less attractive to the larger institutional investor market.

In contrast to this, other stakeholders call for a more active public sector role. They argue that standards set by public actors could reduce the analytical burden for investors and allow easier benchmarking of green bonds across different sectors and issuers. The public sector is seen as having a role in creating high quality standards for green bonds to help ensure environmental benefits are achieved and add liquidity to the market. Many actors in favour of active market intervention by the public sector also call for fiscal incentives for the issuance of green bonds. In addition, they argue that investors should be required to have a certain minimum share of green investment in their portfolio to boost the demand for green bonds. Lastly, some actors also argue that financial credit enhancements, for example through multilateral financial institutions, could be a useful risk reduction tool for riskier types of projects that presently have difficulties accessing the market.

When assessing these measures it should be considered that market interventions by public actors always run the risk of unintended consequences. Public investment in green bonds, preferential treatment of green bonds in credit regulations, credit en-

hancement or fiscal incentives for green bonds could lead to an unjustified altering of risk profiles thereby threatening the financial stability of the participating market actors. Such far-reaching interventions should thus only be considered and implemented if they can be very well justified based on profound evidence.

Despite the lack of agreement on the role of the public sector, stakeholders generally support the issuance of green bonds by municipalities, regional governments and even national governments as it will help grow the market. Many experts also point out that in order to mobilize more capital for green projects (amongst others in the form of green bonds), reliable and stable policies are needed that help increase the benefits of environmentally and climate friendly behaviour while also increasing the cost of pollution and resource depletion. Such policy conditions will make green investments more attractive, thus helping to grow the green bond market.

Based on in-depth analyses of these potential public sector measures as well as on the input provided by experts and stakeholders, the study concludes that the following **EU interventions** are possible for the European context:

- Raise awareness of the benefits of green bonds (e.g. through a guide supporting the green bond market development targeted to national authorities)
- Lead, establish or join a coordination mechanism with the main market actors
- Collect, disseminate or maintain a list of planned green investments to support the development of a green project pipeline, and thus support the supply of green bonds (e.g. through requiring such list from each Member State)
- Require mandatory disclosure of green indicators regarding bond issuances and investments.

On a national level, **EU Member States** could take the following measures:

- Raise awareness on the benefits of green bonds, and thus increase supply
- Support capacity building and knowledge sharing
- Provide stronger support to local entities (e.g. municipalities) to issue green bonds
- Issue sovereign green bonds (as announced recently by France).

4.3 Opportunities in developing common EU standards

The Green Bonds Principles (GBP) and the Climate Bonds Standards (CBS) are key standard frameworks for labelling green bonds. On a national scale, France has developed a public label for green investment funds, which has the potential to be replicated in the European context. Furthermore, China has developed their own green bonds standards and the Securities and Exchange Board of India (SEBI) has released green bond requirements. All these national frameworks are building on the GBP and the CBS, which are widely accepted by the green bond market. Therefore, any policy/regulatory interventions regarding an upcoming common European Green Bond Standard should be built upon the experience of the GBP and the CBS.

Confidence in the green credentials of green bonds can accelerate the green bond market growth. In this context, a common European evidence-based classification of what is green could be beneficial. Credible guidelines and standards about what should or not be considered a qualifying green investment, which are accepted by the market, can help guide investors towards bonds with sound environmental credentials where this is what they seek.

Out of the five key bottlenecks identified as barriers to the further growth of the green bond market, the following two could be reduced by various green bond standardization measures:

- Lack of green bonds definition and framework (B3)
- Lack of information and market knowledge on the part of green bond market participants (B4)

Reducing these bottlenecks through developing a common European Green Bond Standard can also indirectly affect other identified bottlenecks, which in turn affect the green bond market demand and supply.

Six key standardization measures have been identified that could be considered as policy options for the EU. These measures are grouped into three key life-cycle stages of a green bond:

- Pre-issuance: Pre-issuance standardization measures focus on selection of eligible projects and assets, as well as requirements for external review, certification, etc. The identified measures are:
  - Project Eligibility and Selection Criteria (S1)
  - Pre-issuance External Review (S2)
- Investment Decision: This relates to disclosure of the issuer's stated internal processes to track, and report on, use of proceeds (so as to enable informed investment decisions by an investor). The identified measure under this stage is:
  - Pre-issuance report (S3)
- Post-issuance: Post-issuance standardization measures focus on the actual use of proceeds, as well as reporting requirements for demonstrating their environmental impacts. The identified measures are:
  - Management of proceeds (S4)
  - Post-issuance External review (S5)
  - Periodic reporting (S6)

Table 4-1 summarizes the main results of the policy measures analysis for the EU on developing a common European Green Bond Standard.

Table 4-1 Summary analysis of possible EU policy measures

Lifecycle Stage	Standardization Measures	Overall Impact on Market Size and Liquidity	Regulatory Intensity	Recommended Time-horizon
Pre-issuance	Project eligibility and selection criteria	Potential increase in market liquidity Possible decrease in market size in short-run, with potential increase in long-run	High	Short-term
	Pre-issuance external review	Potential increase in market liquidity Possible decrease in market size	High	Short-term
Investment De-	Pre-issuance report	Potential increase in market liquidity	Moderate	Short-term

cision		Possible decrease in market size		
Post-issuance	Management of proceeds	Potential increase in market liquidity Ambiguous effect on market size	Moderate	Short-term
	Post-issuance external review	Potential increase in market liquidity Possible decrease in market size	High	Medium-term
	Periodic report-ing	Potential increase in market liquidity Ambiguous effect on market size	Moderate	Medium-term

Source: Eunomia/COWI, 2016

Most of these measures will likely increase the demand and liquidity through increasing transparency and investors' confidence. These measures will also ensure that the proceeds from green bonds are used for funding genuinely *green* projects with clear environmental objectives.

Some measures could have a negative effect on the size of the green bond market, at least in the short-run, due to increased transaction costs associated with issuing green bonds within these measures. However, these measures could potentially increase the size of the market in the long-run, once the common EU green bond standard becomes the norm.

Most of these standardization measures can be implemented easily in the short-term by developing them based on existing practices. For other measures, it might take a while for the market to adjust to them, and thus should only be implemented in the medium-term.

Although, these standardization measures were presented as separate policy options for the EU, essentially they are interlinked components of an overall standardization framework. So for each of these policy options to be fully effective, all of them should be gradually introduced to form a comprehensive common European Green Bond Standard.

Based on in-depth analyses of the described measures and feedback from different stakeholder groups (see Annex B), the study concludes that the following **EU interventions** as regards to common standards are possible options in the European context:

- Support the emergence of a common European Green Bonds Standard based on the key suggested standardization measures and building on the existing market led initiatives such as the Green Bonds Principles and the Climate Bonds Standards.
- Encourage the Member States to learn from good practice elsewhere. For instance, France has developed a public label for green investment funds, with the potential to be replicated in the European context.
- Promote the different standardization measures with varying degrees of regulatory intensity to ensure alignment/compliance with the framework.

ANNEX A: GLOSSARY

Assurance Mechanism - to inform the investor regarding issuer's commitment to follow-through with the pre-issuance agreements for the green bonds (e.g. how green bond proceeds will be managed).

CERES - A working group of existing and potential green bond buyers, which outlined in a "Statement of Investor Expectations" for bonds labelled green that they "consider consistency in standards and procedures helpful to the development of a robust Green Bond market and view adherence to the Green Bond Principles to be an essential step in this direction".[56]

Climate Bond Standard initiated by the Climate Bonds Initiative, an investor-focused not-for-profit organisation - provides green definitions and certification to allow investors, issuers and intermediaries to better assess the environmental integrity of green and climate bonds. It's a multi-sector standard covering solar and wind energy investments, related manufacturing and grid, low-carbon buildings, with criteria for transport, water, agriculture and other sectors under development).

Conventional bond - a fixed income financial instrument for raising capital from investors through the debt capital market. Typically the bond issuer raises a fixed amount of capital from investors over a set period of time (the maturity) repaying the capital (the principal) when the bond matures and paying an agreed amount of interest (coupons) along the way. The bond has a fixed maturity date and a fixed coupon.

Currency – A key difference between equity and debt is that, unlike equity, institutions can issue bonds in many currencies. Indeed bond markets talk about the currency of issuance and not the country of issuance.

Coupon – the interest payment on a bond. This interest can be paid annually, semi-annually or even every three months, depending on the way the bond is structured. The size of the coupon gives an indication of the credit risk of the bond. The higher the coupon, the more risky the issuer, as an investor will require a higher interest rate to compensate them for the greater likelihood of the issuer defaulting.

Credit ratings - a rating of the likelihood of credit default (credit-worthiness) of an investment, used by most investors to assess the comparative risk of investment opportunities. Most ratings are provided an "independent" agency, usually one of the three major rating agencies, Moody's, Standard and Poor's (S&P) and Fitch. The three agencies all have similar rating categories. Some of the largest institutional investors (see below) do not use the ratings agencies but instead rely on their own internal risk assessment teams.

Credit risk - The risk that a bond will default on its payments

[56] Ceres, Investor Network on Climate Risk

G20 Climate Finance Study Group - looks into the following areas:1) Improving the collaboration, dialogue and cooperation between climate funds; 2) Adaptation financing for developing countries; 3) Sharing experiences on public finance mobilization; 4) Promoting effective financial instruments and approaches to enhance climate finance and stimulate climate-friendly private investment, such as (i) Green bonds; (ii) Risk-sharing instruments; (iii) GHG emission pricing approaches.

Green Bond Principles (GBP) are voluntary process guidelines intended for broad use by the market that recommend transparency and disclosure, and promote integrity in the development of the Green Bond market. They are intended to provide the informational basis for the market to increase capital allocation to environmentally beneficial purposes without any single authority or gatekeeper. As of June 2016, over 117 Green Bond issuers, underwriters and investors have become members of the Green Bond Principles (GBP) and in excess of 73 organisations are observers. Thus, GBP has already achieved a broad market acceptance as well as growing recognition. The GBP have four core components:

1. use of proceeds (which should be appropriately described in the legal documentation for the security and include designated green project categories);
2. process for project evaluation and selection (outlining the issuer's decision-making process in determining the eligibility of green projects);
3. management of proceeds (with the net proceeds of Green Bonds being credited to a sub-account, moved to a sub-portfolio or otherwise tracked by the issuer)
4. reporting (on the use of proceeds and the temporary investment of unallocated proceeds)

The GBP also recommend that issuers use external reviewers to confirm their alignment with the key features of Green Bonds.

Green bond - According to the voluntary Green Bond Principles (GBP), a green bond is a bond where the proceeds will be exclusively applied to finance or re-finance in part or in full new and/or existing eligible green projects. Green projects are projects that will promote progress on environmentally sustainable activities. The GBP recognize several categories of potential eligible projects such as renewable energy; energy efficiency; pollution prevention and control; sustainable management of living natural resources; terrestrial and aquatic biodiversity conservation; sustainable water management; climate change adaptation; eco efficient products, production technologies and processes. In terms of financial characteristics, a green bond is no different to a 'normal bond'.

Categorisation of the green bonds and examples	
Corporate bond – a 'use of proceeds' bond issued by a corporate entity	EDF (a French electric utility company) issued a corporate bond worth EUR 1.4 bn. to finance 13 renewable energy projects such as wind, solar, PV and biogas.
Project bond – a bond backed by single or multiple projects for which the investor has direct exposure to the risk of the project.	Solar Star Funding issued a EUR 285 million-project bond backed by 579MW solar projects in California.
Asset-backed security (ABS) – a bond collateralised by one or more specific projects usually providing recourse only to the assets	Hawaii State Department of Business, Economic Development and Tourism (DBEDT) issued a green ABS worth EUR 131 million backed by a Green Infrastructure Fee.
Covered bond – a bond collateralised by one or more specific projects usually providing primary recourse to the issuing entity, with secondary recourse to an underlying cover pool of assets.	Berlin HYP (German real estate and mortgage bank) issued a green bond worth EUR 500 million covered by Pfandbrief.
Supranational, sub-sovereign and agency (SSA) – a bond issued by international financial institutions like EIB or World Bank.	EIB was the largest single issuer of green bonds worth EUR 3.77 bn. in 2015.
Municipal bond - a bond issued by a municipal government, region or city.	Ile-de-France (a regional government of Paris) issued a municipal bond worth EUR 600 million to finance mix of green investments.
Financial sector bond – a type of corporate bond issued by a financial institution to specifically raise capital to finance 'on-balance sheet lending'.	Agricultural Bank of China issued EUR 880 million to finance environment-friendly projects.

Source: OECD Bloomberg, Green bonds, mobilising the debt capital markets for a low carbon transition

Harmonized Framework for Impact Reporting[57] - aims to work towards a harmonized framework for impact reporting on projects to which green bond proceeds have been allocated and provides suggested core indicators for energy efficiency and renewable energy projects. The document outlines "core principles and recommendations, in order to provide issuers with a reference as they develop their own reporting." It recommends core indicators for two sectors, energy efficiency and renewable energy, but does not at this point go beyond these two fields. The document also references reporting templates that issuers may use to adapt to their own circumstances. The framework includes 16 core principles and recommendations with a heavy emphasis on transparency, starting with a recommendation to disclose at least annually on the use of proceeds for fully and partially funded projects and expected environmental impacts, with reliance on at least a limited number of core indictors along with transparency around issuer methodologies for doing so. The document summarizes the conclusions of four of the multilateral development banks (MDBs) active in the green bond market – the African Development Bank (AfDB), the European Investment Bank (EIB), the International Finance Corporation (IFC), and the World Bank (IBRD).

Institutional Investors - includes insurance companies and pension funds, which tend to invest large amounts of money over a long time horizon with lower risk appetite

[57] EIB, 2015. Green Bonds: Working Towards a Harmonized Framework for Impact Reporting

Issuer – the issuer of the bond (i.e. borrower of the money) defines the credit risk of the bond. That is, the likelihood that the investor will be repaid their initial loan. For example, governments are generally considered to have a low credit risk, although this generally varies between rich countries and developing countries.

Liquidity - Market liquidity is an asset's ability to be sold without causing a significant movement in the price and with minimum loss of value. Money, or cash in hand (link is external), is the most liquid asset, and can be used immediately to perform economic actions like buying, selling, or paying debt, meeting immediate wants and needs.

Maturity – The date at which a bond is repaid. There are a number of subtleties around the maturity date, but most bonds have a single fixed date. The further in the future the maturity date (the "longer" the bond), the more risky the debt as there is more time for the issuer to get into trouble.

Moody's Green Bonds Assessment (GBA)[58] - assessment process which scores each bond issue on five key factors (along with their respective sub-factors), weighted to reflect their relative importance, to arrive at a composite grade. The five factors are: Organization (15%), Use of Proceeds (40%), Disclosure on the Use of Proceeds (10%), Management of Proceeds (15%) and Ongoing Reporting and Disclosure (20%). The sub-factors frame the evaluation of the key factor. For example, the "organization" factor includes the following sub-factors: (1) Environmental governance and organization structure appears to be effective. (2) Policies and procedures enable rigorous review and decision making processes. (3) Qualified and experienced personnel and/or reliance on qualified third parties. (4) Explicit and comprehensive criteria for investment selection, including measurable impact results. (5) External evaluations for decision making in line with project characteristics. The composite grade, in turn, informs an overall assessment that runs from 5 (Excellent) to 1 (Poor). After a GBA is initially assigned, it may be refreshed periodically, based on information provided in the issuer's subsequently issued annual reports.

MSCI Green Bond Index - provides an independently evaluated measure of the global green bond market, setting a standard for this growing new asset class.

Primary and Secondary Markets - The life of a bond has two phases, primary and secondary. The key stakeholders in the green bond market are important in both the primary market and the secondary market. The primary market is the part of the bond market that deals with issuing of new bonds. Once issued the bonds typically trade on a secondary market. The same underwriters who are involved in the issuance of a bond in the primary market are typically also market makers for the same bonds in the secondary market. The investor who buys a bond in the primary market is not necessarily the long-term holder of the bond. Bonds that were oversubscribed in the primary market will typically appreciate in value during the initial hours of trading in the secondary market, when investors who received less than planned or no allocation and who want to hold a long term position in the bond buy a position in the bond. The volume of green bond issuance during a given period is aggregated amounts of new green bonds issued through the primary market, whereas the outstanding amounts of bonds at a given time is the aggregated amount of outstanding bonds in the secondary market.

Refinancing - this is where a project or a business has already borrowed money but decides, or needs, to replace existing debt arrangements with new ones, similar to refinancing a mortgage. Reasons for refinancing include: more attractive terms be-

[58] Moody's, 2016, Green Bonds Assessment (GBA)

coming available in the market (perhaps as lenders become more familiar with the technology, meaning more money can be borrowed against the asset); or the duration of the loan facility, e.g. loans are often structured to become more expensive over time because of the increasing risk of changes to regulation or market conditions

Regulatory Intensity - refers to the degree of flexibility available within a standardization measure. Thus, a low intensity measure will provide high degree of flexibility within the relevant components of the standard (e.g. flexibility in eligibility criteria for issuing a green bond).

S&P Green Bond Index – index designed to track the global green bond market, which maintains standards in order to include only those bonds whose proceeds are used to finance environmentally friendly projects.

Task Force on Climate-Related Financial Disclosures under the FSB - will develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to investors, lenders, insurers, and other stakeholders. The Task Force will consider the physical, liability and transition risks associated with climate change and what constitutes effective financial disclosures across industries. The work and recommendations of the Task Force will help firms understand what financial markets want from disclosure in order to measure and respond to climate change risks, and encourage firms to align their disclosures with investors' needs.

Tranche - A piece or slice of a company's debt with specific characteristics in terms of seniority etc.

ANNEX B: STAKEHOLDERS FEEDBACK

This section presents a summary of observations derived from over 20 interviews with main market actors during the study.

Investor's observations:

- Investors are key to developing and driving the adoption of standards on reporting
- The majority of investors use indices to benchmark green bonds with vanilla bonds
- Key challenges include the cost, time and lack of reporting standards
- Investors are strongly supportive of external review
- The majority is presently supportive of a common voluntary EU standard. A common binding EU standard could be introduced once the market has reached a critical mass.
- Financial penalties for issuers that do not meet their stated environmental can be implemented
- Tax incentives and facilitation of administrative procedures could be key in supporting the development of the market on the supply side
- A possible global or EU-US standard that builds on existing initiatives and avoids overly detailed definitions that could increase costs and bureaucracy could be examined
- Endorsing the GBP guidance on transparency and disclosure summarised in the four pillars may be the first steps

Issuer's observations:

- Key challenges are that investors should consider not only the financial characteristics of a green bond, but more the use of the proceeds (benefits for green bond issuers should be greater)
- Other challenges are not having uniform regulation and assessment/review/audit procedures, and the effort needed to follow and track the use of proceeds on project-by-project basis. This effort is reflected in the final price of the bond.
- Supportive of external review as it provides credibility and accountability. Second opinion providers reduce uncertainty for investors.
- Supportive of green bond indices, as they raise the visibility of the market, increase transparency and enable new individuals to participate
- Supportive of a common voluntary EU standard
- A set of common criteria and standards will help to develop the green bond market. Yet, the standard should not be too rigid as it might be difficult to set criteria valid for all sectors/industries. A supervision of the green bonds issuance process by a certifier would be positive but a voluntary reporting system on green projects and related Key Performance Indicators (KPI) too.
- Some issuers do not believe that transparency requirements would facilitate the development of the green bond market. Companies should provide adequate disclosure about how they plan to manage, track and allocate proceeds and let investors evaluate their disclosure on a case-by-case basis
- Some issuers do not agree that including requirements for a harmonized impact reporting would facilitate development of the market as appropriate KPI are unique to each project

- A key opportunity for municipal issuers is the diversification and enlargement of their investor base through green bonds
- Binding EU standards could trigger tax incentives or other supportive public measures.

Underwriter's observations:

- Key challenges are how to scale the market, raise awareness, taxonomy, project pipelines and disclosure obligations
- Green bonds are a mainstream financial instrument providing for the best and quickest way to facilitate a transition to low carbon economy
- Supportive of external review
- Supportive of a common voluntary EU standard if it is based on the GBP
- Welcome the obligation for more disclosure of investment into low and high carbon assets
- Governments could incentivise the market to generate scale – giving an explicit incentive to firms to issue a green bond (e.g. tax incentivized model or an RWA-efficient model to provide direct subsidies like in the US muni market)
- Consider introducing a "bonds sustainability factor", which reduces the amount of capital required for green loans, relative to other loan categories (as the "SME supporting factor") within the CRR via Basel III

External reviewer's observations:

- Challenges are more standardization of definitions and methods for selecting investments /projects eligible for green bond financing, and for measurement, reporting and verification of impacts, and the maturity of bond markets in certain countries
- Better standards and guidelines for what is green are required to ensure the quality of green bonds and avoid 'green washing'
- Given the bottom-up, innovative and dynamic history and development of green bonds, policy makers/regulators should be careful not taking initiative that can reduce the potential of this instrument.
- Standards may be desirable for better quality of green bonds, yet it may not increase the size and liquidity of the market. As there are no standards at the moment, this actually encourages more actors to issue green bonds that they can interpret more freely.
- Labelling is important for discovery purposes, so investors can access these sorts of opportunities. Labelling adds liquidity to the market.
- Vision for 2050 is important to forecast the GB sector allocation

GBP Executive Committee observations:

- A challenge is to maintain the voluntary nature of the international GB market
- It is important to pursue a constructive dialogue with the official sector and the regulatory community
- Suggests improvements on the availability and standardization of information that facilitates the appropriate use of external reviews, which enables the scaling up of the international market

- Suggests support for the essential GBP guidance on transparency and disclosure as summarized in its 4 core components (use of proceeds, process for project evaluation and selection, management of proceeds, and reporting), as well as its recommendations on the use of external reviews

- Suggests the establishment of a broader coordination mechanism with the GBP Executive Committee

Other stakeholder's observations

- The key challenges are defining and measuring what is green, continued growth in investor demand and volume of issued green bonds, market liquidity, sufficient volume of environmental projects, continued credibility of market (disclosure transparency), consistency and harmonization of green bond issuance processes and project eligibility, stability and consistency of underlying policy frameworks for green investments.
- There is a difference between green bonds and greening the bond market. The latter may have a bigger effect and the EU could consider what it can do for the latter as well as the former. This may include things like requiring all bonds to report their environmental performance.
- Some stakeholders are strongly supportive of third-party certifiers and indices providers.
- For second opinion providers there is the danger for 'race to the bottom', which may result in a lower quality of the review.
- The majority of stakeholders support initiatives that are intended to foster disclosure and transparency that can improve comparability and analysis across sectors and geography
- No enforcement mechanism exists if the bonds fall short on delivering green benefits. There is a need to demonstrate tangible benefits (e.g. through pre-issuance certification; but also certified information throughout the lifetime is needed, and most importantly at the end of the issuance).
- Standards should be global as it is a global market - EU can play a convening role.
- A rating system for Green Bonds with more easy to digest information on the bonds is required because there are concerns about the quality of certain issuances.
- Requirements on reporting are lacking in the green bond market compared to the equity market. Tools for transparency could be annual reports and/or CSR reporting. Market players can only make informed decision if they have useful information.
- The promise of the green bond market is that, first, projects are financed which usually would not be financed, and second, that environmental projects have cheaper access to capital. Yet in practice, most projects financed would have found finance anyway. The financing conditions depend on the issuer.
- Many small-scale low carbon investments cannot access the bond markets and the institutional investors. Green securitisation is on option to overcome this barrier.

- Other potential barriers, where EU policy can have an impact are 1) complex structuring and valuation of ABS, 2) green lending, 3) standard contracts for low-carbon assets, 4) green warehousing by development banks, green banks or other public private partnerships, 5) credit enhancement of green; 6) demand-side: institutional investor demand for ABS generally.

ANNEX C: POLICY TOOLBOX

Table of content for policy toolbox

Demand-side measures

Public investment in green bonds (M1)

Measure name	**Public investment in green bonds**
Generic description of measure	Public actors can directly invest in green bonds using different kinds of public funding sources. Encouraging public funds to invest in green bonds can increase private green bond investment by reducing the first-mover risk and other risks perceived by the private investors. It provides a signal that public actors consider these types of bonds to be reliable and trustworthy investments. Shifting the preferences of public investors from brown or conventional to green investments usually requires a mandate from the policy level. If regulators have the authority to prescribe investment targets, they can alter the guidelines in a way that green bonds are favoured or that financial institutions must direct a certain amount of investment to green bonds. An example of how the policy level influences investment decisions is the decision by the German government to restrict investment support for coal-fired power plants through KfW.[59] However, it needs to be considered that especially for pension funds it is of utmost importance that risk levels do not increase if funding priorities are shifted. At the same time, it needs to be ensured that such public investment in green bonds does not become state aid for projects that would otherwise not be financially sustainable. The timeframe for the implementation of such a measure is **short-term to medium-term**. Once green bonds are issued, public institutions can buy them and thus create short-term demand for such products. If the investment in green bonds is not covered under the mandate of the respective public institutions, regulators need to adjust the funding guidelines and plans. This is only feasible in the mid-term.

[59] Bericht der Bundesregierung zur internationalen Kohlefinanzierung für den Wirtschaftsausschuss des Deutschen Bundestages

Measure name	Public investment in green bonds
Objective	It is the objective of this measure to increase the demand for green bonds and for public financial institutions to create trust in this asset class by serving as cornerstone investors in less developed green bond markets.
Key actors	The most relevant actors for public investment in green bonds are development banks, sovereign wealth funds and public pension funds. The latter two handle large amounts of money with the aim to generate returns. Development banks usually have policy-driven objectives for their investments. It is often easier for them to prioritise green investments over conventional ones if environmental and climate protection or related topics are part of their mandate. In addition to these types of actors, governments can set up specific green investment funds that specifically invest in green infrastructure.
Barriers addressed	The measure addresses a **barrier** that currently does not exist in most countries – the lack of demand for green bonds. On the contrary, demand in most cases exceeds the supply of green bonds. Investments in green bonds by public actors can therefore rather take the form of credit enhancement (a separate measure) by which the public actors invest in the junior tranches of bonds issued and thus take on higher risks than the private investors take. This again may be difficult for public investors such as pension funds, which by their mandate need to ensure low risk investments. Insufficient demand is mainly a problem in less developed bond markets as well as for new types of bonds with ratings in the lower end of the investment grade space (i.e. lower than single A). In these cases investments of public actors in green bonds as cornerstone investors may support green bond market development.
Relevant governance level	The measure is relevant for the EU level, less relevant for developed green bond markets and very relevant for less developed green bond markets.
Good practice examples	Norway's sovereign wealth fund has assets worth USD 882 bn. dollars, making it the largest in the world. In 2009, the fund chose not to engage in the green bond market, as the market for such bonds was considered immature. In 2013 and 2014, the green bond market grew rapidly and the fund started investing under its environmental mandate. In 2014, the fund saw the small size of the green bond market as a limitation to increase their investment in this area. Since then the green bond market has grown and become diversified, thus reducing the limitation cited by the fund[60]. The California State Teachers' Retirement System (CalSTRS), with a portfolio valued at USD 184 bn.[61], is the largest educator-only pension fund in the world. The World Bank has issued green bonds worth USD 50 million in response to demand from CalSTRS. Barclays was the sole lead manager for this transaction.[62] EIB's investment in the Italian Viveracqua hydro bond is an example of an innovative financing structure with a public financial institution as cornerstone investor. Mini-bonds are pooled by Italian utilities and used for an asset-backed securitization. EIB invested EUR 145 million in the hydro-bond to support the EUR 300 million-investment programme of 8 small municipalities in Veneto, Italy[63].

[60] CBI, Scaling up Green Bond Markets for Sustainable Development, 2015
[61] SRI, Sustainable Resource Investment | Briefing | November 2015
[62] The World Bank, World Bank issues USD 50 Million Fixed to Floating Rate Callable Green Bond due 2016, October 2014
[63] EIB, Viveracque Hydrobond, 2014

Measure name	Public investment in green bonds
Implementation steps	At the EU level, the investment of financial institutions such as EIB in green bonds may spur the issuance of such bonds from financial institutions and companies in less developed green bond markets. As the bonds issued in such countries may not yet be attractive for private investors, engagement by EU financial institutions would be important to create trust and arouse interest among private actors. Necessary actions to allow for public purchasing of green bonds include prescribing a certain minimum amount of investment in green bonds and, if necessary, providing policy makers/regulators with the mandate to make these investments. It should be ensured that investments are primarily directed at countries and green bonds where private sector demand is low. At the same time, it needs to be ensured that pension funds do not make compromises on the risks they take with their investments. In developed national green bond markets, green bonds are usually oversubscribed. This means that public actors do not need to invest in green bonds on a large scale. Actions in developed markets should be limited to such financial products that do not see sufficient demand from private investors. An option preferred to the direct investment in green bonds is credit enhancement (a separate measure in this toolbox). In less developed national green bond markets, investments by public actors may generate market pull for the creation of green bonds. In addition, it may help private investors to gain confidence in these investment opportunities. In case of less developed markets, public actors can directly invest in green bonds.
Costs and benefits of the measure	The administrative costs for investing in green bonds are considered **low** for public institutions that already have the mandate to take investment decisions in this field. If investment guidelines need to be revised and the mandate for investing in green bonds needs to be given to the institutions from the regulator, the costs are considered **moderate**. Yet such costs would only occur once. From the point where the revised guidelines are in place, the administrative costs would be low. Yet, the most important cost factor for investments are not the administrative costs but the actual cost of the investment. If an investment in green bonds is additional to the other investments made by the public actor, the full costs need to be accounted for. If investments in green bonds replace investments in other types of bonds or financial products, it needs to be assessed how the (expected) returns and the risks compare. This is in many cases very difficult, especially if longer maturities of green bonds are concerned. Investments of public actors could potentially have a high impact on a market if demand from private actors is lacking for such financial products. However, demand for green bonds is already high in most of the developed green bond markets. Additional investments by public actors would thus not have an impact. The revision of general investment guidelines of large investors such as pension funds could provide a signal to potential issuers that green bonds that meet the investment criteria will find buyers in the future. Thus, the inclusion of green bonds requirements in public actors' investment guidelines could have a medium-impact on the development of the green bond market. In less developed markets where buyers from the private sector are still reluctant to invest in green bonds, the impact of public actors could be medium to high, depending on how well the private sector follows suit.
Reference materials	CBI, Boosting demand. Mandates for domestic funds, quantitative easing, 2016 NBI, Buying green bonds a new way to finance environmental projects, April 2016

Supply-side measures

Public issuance of green bonds (M2)

Measure name	Public issuance of green bonds
Generic description of measure	There is far more demand for green bonds than there is supply of green bonds. With issuance through public entities, from national governments to public financial institutions and subnational entities, the supply of green bonds increases. Green bonds can be issued to demonstrate the functioning of these assets and to substantially increase the supply of bonds on the market. Relevant public actors are national governments, subnational entities such as regional or provincial governments, cities, municipalities and their utilities as well as national and international development banks. Public green banks are relatively new public financial institutions that may play a role in providing green bonds in the future. The public issuance of green bonds is a **short- / mid-term measure**. Public issuance of green bonds is required up to the point where the green bond market becomes more mature. A main goal of the involvement of the public sector in the issuance is the demonstration of this financial asset class. At the same time, public institutions can contribute to providing sufficient supply of green bonds in the mid-term. With governments and sub-national entities financing green public infrastructure, it can be expected that a substantial share of the green bonds will originate from public sources. This measure is generally supported by the stakeholders as it facilitates growth of the green bonds market while leaving the decision to buy such bonds or to issue additional bonds entirely to private market actors
Objective	It is the objective of this measure to increase the supply of green bonds for the market. An increased supply of green bonds will attract more investors whom, in turn, will also incentivise more private actors such as companies and banks to issue green bonds.
Key actors	National governments can issue government bonds to finance green investments, for example in clean energy or energy efficiency. However, no government has issued green government bonds yet. Cities, regions, provinces and public utilities can issue green bonds to finance investments in green public infrastructure. As a major share of global greenhouse gas emissions originates in cities and as the world's cities are expected to grow further, green bonds can be a means for cities to secure funding for green investments. Another option besides direct issuance of green bond through cities is the issuance of green bonds through municipal bond agencies that act on behalf of several municipalities or subnational actors. Development banks, both national and international, usually have high credit rankings and can therefore decrease the risk that investors are exposed to if they invest green bonds. In the future, dedicated green public banks may use green bonds to acquire capital.
Barriers addressed	This measure addresses several **barriers**. Green bonds are increasingly available on the market, yet the demand for green bonds still outweighs the supply (B1). For the green bond market to become more mature the supply of green bonds needs to be increased substantially. Public actors with a mandate and interest to foster green growth are therefore in a unique position to generate financing that they would be raising anyway in the form of green bonds. Many investors are not yet familiar with green bonds as financial products (B4, B5). By issuing green bonds, public financial institutions such as government banks, multilateral banks and municipalities (comprising cities, regions and provinces) can increase the trust in this relatively new asset class and create benchmarks. With their position in the financial system, they are often perceived as more trustworthy compared to pri-

Measure name	Public issuance of green bonds
	vate sector issuers.
Relevant governance level	The measure is relevant for the EU level and developed green bond market; it is very relevant for less developed green bond markets.
Good practice examples	The green muni bond market in the US that earmarks proceeds for green purposes has grown significantly in the last few years. After a single USD 100 million Green Muni Bond issuance in 2013, USD 2.5 bn. of Green Muni Bonds were issued in 2014 and an additional USD 1.3 bn. were issued in 2015. There is a consistent, strong investor demand for green muni bonds, which has the potential to attract competitively priced capital for low-carbon and climate-resilient infrastructure investments[64]. Île de France, a regional government in Paris, has issued two green bonds to finance a mix of climate friendly investments. The first bond was worth EUR 350 million and the second bond was EUR 600 million for 12 years and has a rating of AA/AA+[65]. The main issuer dominating the German green bond market is KfW, promotional bank of the Federal Republic of Germany. In July 2014, the bank introduced a green bond with a volume of EUR 1.5 bn. ("Green Bond – Made by KfW"), which was supported by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).[66] The proceeds of the bond were used for projects from the KfW loan program "Renewable Energies – Standard". This program primarily supports wind power and photovoltaic plants.[67] Five labelled green bonds amounting to 3.7 bn. euros where issued in 2015, thereof three new currencies (AUD, GBP and SEK).[68] Green bonds account for 6% of KfW's total funding (EUR 62.6 bn. in total).[69] No green sovereign bonds have been issued to date[70].

[64] Green City Bonds, how to issue a Green Muni bond, n.d.
[65] CBI, Île-de-France issues EUR600m, 2016
[66] BMUB, KfW promotes climate protection with purchase of green bonds, April 2015
[67] Deutsche Bank, Deutsche Bank strengthens the ‚Green Bonds' growth market, July 2014
[68] CBI, Update: Vive Paris!, November 2015
[69] KfW, Green bonds – Made by KfW, March 2016
[70] OECD, Green bonds, Mobilising the debt capital markets for a low-carbon transition - Policy Perspectives

Measure name	Public issuance of green bonds
Implementation steps	Continued action at the EU level, most specifically issuance of green bonds by the EIB, can signal to national public actors in the member states that the issue is relevant on the European level. The replication potential of the measure at the EU level is low. EIB has been a pioneer in issuing green bonds and already has experience in this area. EIB could increase the amount of green bonds issued. Actions would be specifically relevant for countries with no experience in green bonds. For more developed markets, the role of green bonds issued by European actors is less relevant. Potential actions at the EU level to support public issuance of green bonds include **capacity building of national entities on how to issue green bonds** and **credit enhancement through public financial institutions**. In the current market environment, all national markets benefit from the issuance of green bonds by public actors. In the more developed markets such as Germany and the UK, public issuance can accelerate the growth of the green bond market. Yet even without continuing current activities in this context the necessary foundation exists that would allow a privately driven development of the market. Relevant actions at the level of developed bond markets to support public issuance of green bonds also include capacity building of national entities on how to issue green bonds and credit enhancement through public financial institutions as well as the provision of **tax incentives for green bonds**. Issuance of green bonds by public institutions in countries with a less developed market is crucial. Here, the demonstration and trust-building effects of public green bonds issuance are required for kick starting the market development. Replication potential of the measure at the national level is high, especially in those countries that do not yet have a developed green bond market. Relevant actions at this level include credit enhancement through public financial institutions and **demonstration issuance of green bonds**.
Costs and benefits of the measure	The administrative costs of issuing green bonds are **low** for those financial institutions that are already familiar with the issuance of green bonds. Administrative costs are **moderate** for larger public institutions that are generally knowledgeable about bonds issuance but have not yet issued green bonds. Administrative cost may be higher for smaller public entities such as municipalities or public utilities that have thus far not issued bonds. In such cases, setting-up a municipal bonds agency may bring down administrative costs of bonds issuance for the municipalities involved. The issuance of green bonds through public actors especially in less developed markets is supposed to have a demonstration and therefore leveraging **impact**. With the entrance of public actors in green markets, private actors could follow suit and the overall market development could increase beyond the green bonds issued by the government. In more developed markets, public actors can increase the supply only if the issuance of bonds has a substantial weight compared to green bonds issued by private actors. In the mid-term, larger issuance by public sector can help the market to mature. Once the market reaches a certain size and the private sector plays a leading role, public issuance will no longer have significant impact on the market.
Reference materials	CBI, Strategic issuance. Cities, development banks, other public entities, 2016 Green City Bonds, how to issue a Green Muni bond, n.d.

Public sector support for aggregation and securitization (M3)

Measure name	Aggregation and securitization
Generic description of measure	Bonds typically have to have a size of above USD 200 million to be relevant for institutional investors. This is a big challenge for many small-scale projects that are often prevalent in green sectors such as renewable energy or energy efficiency. These smaller loans or assets remain inaccessible to large investors. Small projects thus usually have a rather high cost of capital. Aggregation and securitization of loans allow for the creation of green bonds that meet the demands of large investors in terms of volume and diversification of risk. The most established aggregation instruments are asset-backed securities (ABS), covered bonds and yieldcos. This report only addresses ABS and covered bonds as these instruments can be influenced by policy makers. Yieldcos will not be covered in this report. Yieldcos are listed companies with a stock of assets generating a stable cash flow, which is distributed to the shareholders as dividends. Policy on the EU and national levels could support the aggregation of bonds through various mechanisms. Particularly relevant are warehousing of loans by public actors, standardization of loan contracts and the clear legal definition of what assets are to be included under green covered bonds. The three types of interventions are explained in more detail below. **Warehousing** describes the process of aggregating loans of different types (yet sharing common characteristics) under a single entity (the financial warehouse). This aggregation of loans enables the warehouse to package the loans and issue them as ABS or bonds to investors. This type of securitization is usually not an option for individual banks as their loan portfolio is too small for issuing bonds. Therefore, the loans or assets of several banks can be collected in a financial warehouse. The warehouse usually takes the form of a Special Purpose Vehicle (SPV). The measure has an impact on the market in the **mid-term** as a sufficient number of loans needs to be aggregated before the first bond can be issued. A sufficient number of similar loans with a similar size needs to be available for the loans to be securitized. In addition, a financing institution needs to be willing to provide the up-front financing for the financial warehouse for purchasing the loans or assets. Lack of **standardised contracts** (for example for loans, renewable energy power purchase agreements and energy efficient equipment leases) is one of the main impediments for green industries in accessing capital markets. In the context of warehousing, the risks associated with aggregating a range of different contracts in a single pool, each with various unique terms and potentially without individual credit ratings, are too high for investors. Investors are typically interested in standardized contracts with predictable cash flows when investing in securitized bonds. Yet, the performance of contracts can be uncertain depending on the terms and conditions under which they were signed. Against this background, standardised contracts are expected to facilitate the pooling of the associated cash flows so that they could be securitized and made eligible to be sold in capital markets. Concrete actions of public sector actors to stimulate development of standardized contracts include the set-up and steering of working groups for voluntary development of standardized loan contracts or regulation on what information has to be included in loan contracts. Public warehouses could have mandatory requirements for loan contracts. Additionally, public sector actors could provide financing for the development of such loan contracts. In contrast to ABS, **covered bonds** are not secured by a pool of assets that have been sold to the SPV that issues the bond. Instead, the underlying assets remain on the balance sheet of the covered bond issuer. Legal provisions clearly define which types of assets are eligible to serve as collaterals for the covered bonds. The selection of asset classes restricts using green assets in some countries. Changes in policies could allow using green assets for covered bonds and thereby stimulate the emergence of green covered bonds.

Measure name	Aggregation and securitization
	The public measures to support aggregation and securitization are **medium-term** measures. Public actors need to familiarize themselves with the details and concepts behind these measures. All measures require developing some sort of standard or process, which cannot be implemented in the short-term.
Objective	It is the objective of this measure to make cash flows and small assets available to institutional investors. This would lower the cost of capital for small-scale green investments and thus increase the project pipeline.
Key actors	Key actors for developing and offering aggregation and securitization mechanisms are public financial institutions and financial regulators.
Barriers addressed	The measure addresses the barrier that large institutional investors who might have an interest in investing in green assets cannot access small green assets, as the investment sum is too small. By aggregating different small assets in bonds or securitising cash flows from green investments, they become accessible to large investors. This, in general, makes more funding available for small projects and at a lower cost.
Relevant governance level	The measure is relevant for the EU level as well as Member States with a more developed green bond market.
Good practice examples	The United States Energy Programs Consortium (EPC) and the National Association of State Energy Officials (NASEO) have established the **Warehouse for Energy Efficiency Loans (WHEEL)** programme in 2014.[71] With WHEEL, the access of state and local energy efficiency loan programmes to low cost, large-scale capital shall be supported. Such programmes are currently available through ReNew Financial in Florida, New York, Kentucky, Pennsylvania and Ohio.[72] The process of funding is as follows: Eligible energy efficiency projects obtain loans from the WHEEL lending partner banks. WHEEL purchases these loans from the lending partners using funds from senior lenders (Citi Bank and the Pennsylvania Treasury) and the Energy Efficiency Program. It pools the loans until a critical mass is reached and then securitizes and sells them to investors. Bonds sold will only amount to 80% of the total value of loans. This over-collateralization aims at giving the bonds a higher rating. The proceeds of selling the bonds are then used to pay off the senior lenders. As the borrowers pay back their loans, WHEEL uses loan repayments to also pay off the bonds. Finally, it pays off the Energy Efficiency Program. The first goal was to issue USD 50 million in asset-backed securities in the fall of 2014, but the actual issuance was lower.[73] The first tranche that was issued with a total volume of almost USD 12.6 million was bought by Calvert Investment Management (a social impact investor) and had a coupon of 3.5% and had a tenor of 2.3 years.[74] In 2014, WHEEL held loans in the vicinity of USD 20 million.[75] IADB has set-up a **financial warehouse** in Mexico for funding investments in energy efficiency. The warehouse operates as a Special Purpose Vehicle (SPV). The SPV makes a senior credit line of up to USD50 million available to three Energy Service Companies (ESCOS) in order to finance energy efficiency investments among SMEs. In a second phase, IADB will make available another USD 56 million to purchase the loans from the SPV, aggregate them and issue them as green bonds on the Mexican market. The Clean Technology Fund makes available another USD 19 million as a credit guarantee for the underlying loans.[76] Additional support is provided through

[71] IMT, WHEEL's Up For Home Energy Efficiency Loans, July 2015
[72] SeeAction, Accessing Secondary Markets as a Capital Source for Energy Efficiency Finance Programmes, February 2015
[73] IMT, WHEEL'S up for home energy efficiency loans, July 2015
[74] Renew Financial, IFR. Citi sells first Green ABS bond of consumer loans, June 2015
[75] Institutional Investor, WHEEL: Aligning Energy Efficiency and Securitization, May 2014
[76] IDB, IDB to support energy efficiency financing through the issuance of Green Bonds in Mexico, May 2015

Measure name	Aggregation and securitization
	non-reimbursable technical cooperation to develop capacity and knowledge for the assessment and identification of energy efficiency opportunities in accordance to the guidelines for energy efficiency projects. The project is now being replicated across Latin America with funding that has been made available by the Green Climate Fund (GCF) in November 2015. To address the issue of a lack of standardised lease and power purchase contracts the United States Solar Access to Public Capital (SAPC) working group has developed **standard residential lease and commercial power purchase agreement (PPA) contracts** available for use by solar developers, customers, and third-party finance providers.[77] This contributes to improving consumer transparency, reducing transaction costs in the contracting process and to facilitating the pooling of cash flows for the purpose of securitization. For residential contracts there are lease as well as power purchase agreements contracts available that apply to either an aggregated or disaggregated business model. The aggregated business model applies to vertically integrated developers and installers, whereas the disaggregated model is for developers who have a network of installation partners or third-party finance providers that are discrete entities[78]. The difference between the two is that vertically integrated or aggregated business models have the advantage that they can ensure a uniform quality across the whole PV life cycle[79]. Disaggregated business models face the risk that their suppliers do not provide the required quality. In addition, a residential loan agreement is currently under preparation. For commercial contracts, a standardised lease and a PPA contract are available. So far, developers, law firms, financing platforms and programme administrators have adopted the standardised contracts.[80] Besides developing standardised contracts, the SPAC working group has also developed the largest **public database of US PVB system performance (oSPARC).**[81] The databases assess system performance of over 3.800 PV systems. This will support investors, asset owners and other organizations in better assessing the expected performance and thus risk of the systems. Another element of the work of the SAPC is the development of **performance and credit data sets** to facilitate investor due diligence activities.[82] Furthermore, the working group has worked on topics relating to risks perception by rating agencies and the development of best-practice guidelines for PV system installation. In addition, the working group has published two **best practice guideline documents** - one on PV system installation and the other one on PV system operating and maintenance. They are intended to increase solar asset transparency for investors and rating agencies, provide an industry framework for quality management, and reduce transaction costs in the solar asset securitization process.[83] Finally, the SPAC working group developed a **mock portfolio of solar assets** that very closely resembled a bond aggregating individual solar PV asset deals.[84] The two hypothetical securities comprised a residential and a commercial solar portfolio. Five large rating agencies assessed these portfolios and provided feedback. A report summarizes the feedback and serves for future security issuers as well as rating agencies as a guide on what issues to consider and address.

[77] Energy.gov, Solar Access to Public Capital, n.d.
[78] NREL: Solar Securitization and the Solar Access to Public Capital (SAPC) Working Group, September 2014
[79] NREL, Best Practices in PV System Operations and Maintenance, March 2015
[80] NREL, NREL Activities to open capital market investment and bank lending for solar deployment, May 2015
[81] SUNSPEC, oSPARC Privacy Policy, 2015
[82] NREL, Best Practices in PV System Operations and Maintenance, March 2015
[83] NREL, SAPC Finalizes Two Best Practice Documents, May 2015
[84] NREL, the Solar Access to Public Capital (SAPC) Mock Securitization Project, December 2015

Measure name	Aggregation and securitization
Implementation steps	Under the heading of aggregation and securitization, three sub-measures are considered: warehousing; standardization of loan, lease and power purchase contracts; and the inclusion of green asset classes in covered bonds regulation. On the EU level, EIB and EBRD could engage in warehousing of green loans. This could serve as an example for national banks to follow. Standardised loan contracts would be relevant at the national level in both developed and less developed bond markets. The inclusion of green asset classes in covered bond frameworks is relevant in both developed and less developed bond markets. However, in less developed bond markets, covered bonds might not be regulated at all.
Costs and benefits of the measure	Administrative costs for aggregation and securitization is **low to moderate** for the three sub-measures. Warehousing of loans requires setting up an actual entity that bundles the loans. For this sub-measure, funding needs to be made available to purchase the loans. Although this bridge financing is recovered through the issuance of the bonds backed by the bundled loans it needs to be made available in the first place. The costs for standardization of loan, lease and power purchase contracts are low. Yet it usually requires coordination between a variety of stakeholders, which can take a rather long time. The costs for including new asset classes in the regulatory framework of covered bonds are low. Transaction costs are substantial. The impact of these measures is potentially very large. It would make an entire class of small assets available to the green bond market. Particularly because many energy efficiency and renewable energy projects are rather small, the aggregation and securitization of the same could significantly increase the supply of green bonds on the market.
Reference materials	CBI, Market development. Aggregation, securitization, covered bonds, 2016 CDC Climat and IDDRI: Mainstreaming Climate Change in the Financial Sector And Its Governance, Part II: Identifying Opportunity Windows, 2015

Credit enhancement by public financing institutions (M4)

Measure name	Credit enhancement by public financing institutions
Generic description of measure	Public actors can support the process of giving higher ratings to green bonds. In early stages of the green bond market, issuers of green bonds that did not fall under the still dominant category of "use of proceeds" bonds face difficulties in achieving high ratings of their bonds as there is generally a lot of uncertainty around new financial products. Private investors on the other hand are reluctant to invest in bonds that have low ratings. This hampers the development of the green bond market from the demand as well as the supply side. Public actors can enhance the credit rating of bonds through different measures. The measures aim at absorbing some of the risk through the public actor. This renders the bonds financially competitive and thus attractive for private investors. While credit enhancement involves some cost to the public sector, it can be more cost-effective than direct subsidies to achieve green infrastructure targets. Credit enhancement measures are particularly relevant for less developed bond markets where higher political and credit risks make green bonds less attractive to investors. The measures available for credit enhancement are providing guarantees; taking on subordinated debt or equity; providing insurance for default losses of bonds; and offering a policy risk insurance for losses resulting from a shift in policies. Regarding **guarantees,** public financial institutions have two options of influencing the market: they can issue loan guarantees at the project finance stage and they can provide partial-risk or full guarantees at the bond issuance stage. These insurances are often called "wrappers". With such a guarantee, the guarantor lends its credit rating to the bond. Partial-risk guarantees have the benefit that they have a leveraging effect compared to full guarantees. Liquidity guarantees are another form of guarantee that contributes to an extension of tenor of the bond. Investments by public financing institutions in **subordinate debt or equity** are another form of credit enhancement. This means that the public investors purchase a junior or mezzanine tranche of a bonds portfolio. Thereby, they accept the first set of losses, should any occur. These junior tranches have a lower credit rating. Because of this splitting of risk, the senior tranches receive a better rating and are thus more attractive for private investors. This structure is well known under the EIB/EC Risk Sharing Facility launched in 2007 and subsequent EIB/EC instruments launched to boost investments in the EU. Ratings of green bonds can be enhanced through **insurances**. Such insurances for the principal and interest of bonds were quite common before the financial crisis but then in many cases lost their high rating. This resulted in them not being able to provide these insurances anymore. Public financial institution could potentially take up this role to insure green bonds. Another option for credit enhancement that has hardly been applied in practice is a **policy risk insurance**. Investors and issuers always face the risk that a certain policy decision may affect the cash flow underlying a security and thus threatens a high rating of the bond. A policy risk insurance scheme will compensate investors if a policy based on which investments decisions were taken (e.g. a feed-in-tariff), is reversed. Such insurance should be set-up at the level where the risk emerges, namely at the level of policymaking. This would mean that public money is used to compensate investors if a policy was changed on which they had based an investment decision. The EIB external lending mandate covers policy risk at a general level.[85]

[85] EIB, External Lending Mandate – Climate Strategy, 2015.

Measure name	Credit enhancement by public financing institutions
	The measures could be implemented in the **short-term**. Public financial institutions usually have the capital available to engage in such actions (at least on a minor scale). The relevant schemes could be set up on rather short notice given that these instruments have been used also in other areas and sectors for a long period. However, policy risk insurances might only be implementable in the long-term, if at all. Credit enhancement through public entities should always be complemented by improvements in regulation and instruments for risk management by issuers and investors themselves (e.g. through credit reporting systems).
Objective	It is the objective of this measure to make more green bonds available for investments by private actors. Risk aversion of investors and especially institutional investors makes bonds with a low credit rating inaccessible. By providing credit enhancement public financial institutions can absorb some of the risk, which renders the rest of the asset tranche less risky and can thus be accessed by private investors. This increases the overall demand for green bonds.
Key actors	All of these measures are mostly relevant for public financial institutions. They would need to receive the mandate from the policy level to engage in these actions but implementation would rest with them.
Barriers addressed	The measure addresses the barrier that bonds with a rating below investment grade cannot be accessed by most investors. This reduces overall demand for green bonds. By absorbing some of the risk, public actors can improve the rating of the tranche available for private investors.
Relevant governance level	Credit enhancement measures are relevant for the EU level, for developed as well as less developed green bond markets.
Good practice examples	The European Investment Fund (EIF) has credit enhancement operations in place that aim to enhance access to finance for small and medium sized enterprises (SMEs). The credit enhancement operations include guarantees such as wraps, bilateral guarantees, credit default swaps, etc. on senior tranches of risk. The guarantees have typically a minimum rating equivalent to BB/Ba2.[86] The Project Bond Initiative (PBI)[87], a joint endeavour by the European Investment Bank (EIB) and the European Commission, aims to attract private funding for large-scale infrastructure projects in the European transport, energy and ICT sectors. By providing partial credit enhancement (loans or contingent credit lines for subordinated debt) for project bonds, it improves the credit quality of senior debt tranches and reduces investors' financial risk. The Project Bond initiative was initiated as an answer to the lack of both public and private long-term financing that had resulted from the financial and debt crises (2008 onwards). Since then, market conditions have improved considerably. Low interest rates and increasing competition among senior debt providers increasingly challenge the competitiveness of PBI-supported projects bonds. An evaluation of the PBI pilot phase (2012-2015) shows that the initiative was crucial to obtain debt financing for one of the seven projects supported during this period. The other projects could have been financed with bank debt but decided to use credit enhancement in order to obtain capital market financing at more favourable terms. The evaluators conclude that PBI's credit enhancement mechanism should be targeted towards more specific projects (i.e. with more risk for the investors) to remain relevant in the future.

[86] EIF, Credit enhancement, 2016
[87] Ernst & Young, Ad-hoc Audit of the pilot phase of the Europe 2020 Project Bond Initiative, 2015; European Commission, The pilot phase of the Europe 2020 Project Bond Initiative, n.d.; European Investment Bank, An outline guide to Project Bonds Credit Enhancement and the Project Bond Initiative,2012

Measure name	Credit enhancement by public financing institutions
Implementation steps	EU financial institutions and initiatives have experience with credit enhancement mechanisms especially for SME funding and infrastructure and could apply them to foster bond market development. The same holds true for many national public financial institutions that are using credit enhancement mechanisms for achieving other policy purposes. Most relevant credit enhancement mechanisms are guarantees and investment into subordinate debt and equity. Public institutions do not necessarily have to serve as monoline insurance companies, as there are still some private actors in this field. Moreover, the insurance company requires broad expertise in the particular field for which it provides insurance. It cannot be expected that a public financial institution that usually has a broader mandate accomplish this. Policy risk insurance would have to be set up at the EU level for those decisions that are mandated by the EU and at the national level for this decision that are under full authority of the states. Public actors can increase the use of credit enhancement mechanisms by integrating preference for green bonds in existing credit enhancement schemes, establishing dedicated green bonds credit enhancement schemes and exploring the concept of policy risk insurance schemes.
Costs and benefits of the measure	Administrative costs of these measures would be **moderate to high**. Providing guarantees and investing in subordinate debt would entail moderate costs if the institutions already have some experience with these sorts of instruments. Providing insurance or even setting up a policy risk insurance scheme would probably come at high costs, as public financial institutions do not have experience with these types of instruments. World Bank Group provides these risk guarantees in developing markets. The actual costs of these measures can be considered **moderate to high**. Much of the actual costs depend on how well public financial institutions would be able to assess the risk of the underlying assets in terms of their default risk – this concerns specifically the measures guarantees and insurance. The cost of investment in subordinate debt or equity would – as for the direct investment of public financial institutions in green bonds – depend on whether these funds are diverted from somewhere else or are made available only for this purpose. If the former applies, the risk and returns of the old and new investment have to be compared to come to a conclusion about the actual costs. If the latter applies, all costs need to be attributed to this intervention. The costs of a policy risk insurance cannot be assessed, as there is no experience with this measure. Yet, the costs could potentially be rather high depending on the extent of policy support that is withdrawn. The impact of the measures can be considered moderate. Especially in less developed green bond markets where market participants are unfamiliar with the financial products, guarantees and investments in subordinate tranches can have a large impact in building trust among actors.
Reference materials	CBI, Improving risk-return profile. Increasing returns or reducing risks, 2016 Mendelssohn, Michael et al.: Credit Enhancements and Capital Markets to Fund Solar Deployment: Leveraging Public Funds to Open Private Sector Investment, 2015, NREL Technical Report

Supply- and demand-side measures

Public facilitation of cooperation between green bond market actors (M5)

Measure name	Public facilitation of cooperation between green bond market actors
Generic description of measure	The global green bond market has now somewhat matured at a global level. Yet although some countries have advanced quite a bit in the development of its green bond markets, there is still the potential for a strong growth in many countries. Since a lot of action is happening simultaneously, there is the risk (from a global perspective) that resources are not used in the most efficient way. Learning and cooperation are important measures to make sure that the green bond markets develop in an efficient and sustainable way. Building on experiences from other countries and using proven approaches may prevent countries to repeat mistakes that others have already made. In addition, uncoordinated efforts also run the risk that different standards, protocols and procedures are developed which then lead to incompatible systems. Learning and cooperation can take place on an international level between those countries that have advanced more than others; and it can take place between actors at national levels. Besides the coordination of activities, actions can comprise capacity building and facilitation of exchange. Such learning and cooperation can be facilitated by public actors, in particular if it is in their interest and mandate to foster the growth of the green bond market. Actions that can be taken by public institutions to support learning and cooperation comprise, on the national level, setting a clear roadmap or vision how the green bond market is expected to develop. By making transparent where policymakers want the green bond market to go, market actors have more certainty about the likely development of the bond market; this will bring down risks for green investment and make actors more likely to participate in the market. Moreover, national public entities can establish a platform on which relevant actors can jointly work on the development of the bond markets, and use this platform to create topic-specific working groups to deal with technical details of the green bond market. On the international level, a platform should be established that brings relevant national actors and international actors together to work on international standards for a global green bonds regime. Ideally, such a platform is attached to an already existing initiative. As the GBP are the most prominent platform, they would be the natural anchor point for an even more inclusive dialogue process on establishing a common green bonds framework. The timeframe of the measure is **mid- to long-term**. The coordination of such action requires to bring all actors on board and to embark on a clearly defined path on where the green bond market is supposed to develop. The effects of such coordinative efforts will in many cases only become visible with time.
Objective	It is the objective of this measure to facilitate the cooperation the cooperation between different actors to establish a common framework for the green bond market.
Key actors	At the national level, actors involved in cooperation should include all relevant stakeholders, i.e. Ministries of Finance, capital markets authorities, rating agencies, public and private financial institutions, verifiers and second opinion providers, municipalities and utility companies, etc.
Barriers addressed	The barrier addressed through the measure is that an uncoordinated market comes with transaction costs to all market participants. By coordinating activities, educating market participants and coming up with a common framework for green bonds, these transaction costs can be reduced.
Relevant governance level	The measure is relevant for the EU level as well as for developed and less developed green bond markets.

Measure name	Public facilitation of cooperation between green bond market actors
Good practice examples	**National Green Bond Market Development Committees:** One example of cooperation in this sector are the Green Bond Market Development Committees that have emerged in several countries, such as China[88], India[89], Brazil, Mexico, etc.[90] These organs are structures at the domestic level, between different types of public entities which are committed to climate friendly development. The committees require a champion with in the government, who can take the green bond markets forward. **Green Infrastructure Investment Coalition**[91]**:** The coalition formed by Climate Bonds initiative, PRI, UNEP Inquiry and International Cooperative Mutual Insurers Federation (ICMIF). The aim of the Coalition is to bring together investors, governments and development banks to help enhance the flow of institutional investor capital to green infrastructure investments around the world. The primary activity of the Coalition is to hold roundtables to find out about and discuss government green investment plans. **Green Cities Bonds Coalition:** This coalition aims to build cities' capacity through an education programme that includes toolkits such as how-to-issue guides, strategic support through development banks, sharing of best practices between cities' treasuries and investor engagement activities. In 2015, a US Green City Bond Coalition was established by Climate Bonds Initiative, C40, NRDC, CDP, Ceres and As you Sow[92]. A Scandinavian Coalition is also in the process of being established; Coalitions for Europe, Latin America, Africa, India, China and Asia-Pacific are in the pipeline[93].
Implementation steps	At the EU level and in developed markets, more actors will be involved in the cooperation mechanisms. In less developed markets, only the players most interested in developing the bond market will participate. As the market matures, more actors will be concerned by the decisions of any type of cooperation mechanisms. Thus, more actors will likely participate in these mechanisms. Actions at any level require a few strong actors that have the will, resources and standing to establish a cooperation mechanism. Usually it requires a public institution such as a Ministry of Finance or Capital Markets Authority that has a well-developed profile to convince other actors that it is worthwhile to participate in such a cooperation round.
Costs and benefits of the measure	Administrative costs of cooperation between actors at the national and international levels are **low**. Per organisation, a small number of staff members have to participate in regular meetings and share the results in the organization. Cooperation between different stakeholders can significantly spur the development of national as well as international green bond markets by preventing the emergence of incompatible standards and procedures, and ensuring that good and best practices are disseminated. It is hardly possible to quantify the positive effects of cooperation but it is certain that the benefits outweigh the costs by far.
Reference materials	Green Infrastructure Investment Coalition

[88] IISD, Greening China's Bond market, 2015
[89] CEEW, Greening India's Financial Market: How Green Bonds Can Drive Clean Energy Deployment, 2016
[90] CBI, So what's next? How to grow green bond markets around the world, n.d.
[91] Green Infrastructure Investment Coalition
[92] CBI, US Green City Bonds Coalition
[93] CBI, Scaling up Green Bond Markets for Sustainable Development, 2015

Tax incentives for green bonds (M6)

Measure name	Tax incentives for green bonds
Generic description of measure	Governments can use tax incentives in a variety of fields, including green bonds, to incentivize a particular behaviour. For example, governments can reduce taxes for actions that are desired or levy additional taxes for undesirable behaviour. Authorities can use different types of taxes to support the green bond market. **Tax-credit bonds** apply to bond investors who receive tax credits instead of interest payments. This means that issuers do not have to pay interest for their bonds. **Tax-exempt bonds** mean that investors do not have to pay income tax on their bonds' interest. This means that issuers can offer lower interest rates. Tax exemptions and tax credits for investors usually only apply to investors that reside in the jurisdiction of the particular government. This supports the growth of a more localized market. Reductions in preferential withholding tax for green bonds can be a means to attract foreign investors into a market. **Direct subsidy bonds**, in turn, are not a tax but still a direct financial government support to green bond markets. Bonds issuers receive a direct subsidy from the government to supplement their interest payments. Tax incentives for green bonds can be implemented in the **short-term**. Financial regulators have a lot of experience with tax incentives for financial products. Tax-exemptions, tax credits and interest subsidies are often applied in other contexts as well, especially infrastructure finance. They would just need to be adapted for the green bond market. It needs to be highlighted that changing tax and subsidy regimes in favour of green projects is highly contested. Such incentives could lead to "greenwashing" of conventional project or bonds, thus actually threatening to undermine the quality of the green bonds market. Additionally, tax incentives increase the policy risk inherent to green bonds, as their financial attractiveness depends on the willingness of the government to continue providing such incentives. Pricing negative externalities is thus generally understood as more effective and legitimate measure to stimulate green finance.
Objective	To support the development of the green bond market, governments can reduce taxes for investors and issuers of green bonds and/or levy taxes for brown or conventional bonds. Both will lower the costs for green bonds and thus make them more attractive for both actors. Taxes can contribute to an increased supply of green bonds (if the issuer benefits from tax incentive) as well as an increased demand (if the investor benefits from the tax incentive).
Key actors	Tax incentives are provided by the Ministries of Finance. They are targeted at either the issuer or the investor of a bond.
Barriers addressed	The measure does not specifically address a barrier but provides additional incentives for the issuance of and investment in green bonds.
Relevant governance level	The measure is relevant for developed and less developed green bond markets. It is not relevant for the EU level.
Good practice examples	The US has offered tax incentives to bonds financing clean energy through the US federal government's Clean Renewable Energy Bonds (CREBs) and Qualified Energy Conservation Bonds (QECBs). While the former are tax-credit bonds, the latter are direct subsidy bonds. In both cases, proceeds from issuing the bonds need to be used for "qualified conservation purposes" such as renewable energy, energy efficiency and certain mass transpor-

Measure name	Tax incentives for green bonds
	tation projects. In Brazil, tax-free bonds can be issued for large infrastructure investments and wind farm developers[94].
Implementation steps	At the EU level, no tax incentives can be granted. However, the EU can use its convening power to work towards the harmonization of tax regimes on green bonds in the EU member states. Especially for tax incentives for investors, a harmonized approach should be established to prevent a competition among member states for investments in green bonds that would disadvantage some of the countries. At the national level, tax incentives are especially relevant for less developed green bond markets where issuance of green bonds needs to be increased and investors need to be incentivized to invest in green bonds. Actions at the national level using tax incentives to support the development of the green bond market include the extension of existing tax incentives schemes to also cover green bonds and create new tax incentive schemes to apply to green bonds. Given that tax incentives for green bonds are in place, they need to be harmonized on a regional scale. Here, the EU could play a coordinating role.
Costs and benefits of the measure	In terms of administrative costs, tax incentives are **moderate**. General tax collection procedures exist in every country, yet in order to introduce a new tax processes for tax calculation and collection need to be established. This one-time cost is complemented by the annual process to file and collect the taxes. Very relevant for this measure are the actual costs that arise. Tax breaks for investors always need to be financed through other fiscal measures, which may not be politically acceptable. Depending on the extent of the measure, the costs of tax incentives can be considerable, especially if no upper limit and timeframe are defined. The impact of tax incentives depends on the scope and extent of the measure. The more funds are made available by the financial authorities, the higher the impact will be. Therefore, political will and commitment to use resource for the development of the green bond market are decisive factors. However, tax incentives can only be effective if the general framework conditions are conducive to green bonds as well. Therefore, tax incentives should only serve as complementary measures.
Reference materials	CBI, Tax incentives for issuers and investors, 2016

[94] Tarrago, Rosa, Project Bonds: a Financing Opportunity for the Further Deployment of Wind Energy in Brazil, 2015

Support for the standardization of green bonds definition and frameworks (M7)

Measure name	Support for the standardization of green bonds definition and frameworks
Generic description of measure	Currently the Green Bonds Principles and the Climate Bonds Standards are the main frameworks for labelling green bonds. On a national scale, China has developed green bonds standards. France has developed a public label for green investment funds. In India, the Securities and Exchange Board of India (SEBI) has released green bond requirements[95]. Uniform standards are important for investors, as they guarantee that the green bonds proceeds will lead to the desired green benefits. Issuers benefit from a clear standard by knowing what they need to do to issue a green bond and which of their assets are eligible for being included in a green bond. The current practice of paying for verifiers and second party opinions increases the transaction costs of green bonds and makes them less attractive compared to conventional bonds. If a clear green bonds framework were in place, issuers and investors would know what is required for and included in the bonds. Transaction costs could thus be partly reduced. Any public institution that issues or invests in green bonds could support the emergence of a clear green bonds framework by adhering to the rules stipulated in the current frameworks or by making transparent which principles it follows. Moreover, they could implement best practices in their own green bonds issuance and share lessons learnt with suitable bodies and platforms that work on standardization of green bonds definitions. Another option to work towards a more harmonized green bonds framework is to extend the accounting and disclosure requirements of green bonds to other non-green bonds. This concerns the use of proceed as well as general environmental and climate indicators. International public financial institutions should also support the development of country-specific green bonds standards in contexts where a broader international definition does not meet the requirements of green investments in the respective countries (e.g. air pollution in emerging economies and developing countries). The development of a green bonds standard framework is a measure that can only be implemented in the **mid- to long-term**. It involves collecting further experiences and coordinating a multitude of actors on national levels as well as globally. In order to allow for cross-border trade of green bonds, voluntary standards are also relevant at a global level. However, overly detailed standards could increase the cost of new issuances for countries or issuers that are bound to particular interpretation of green investments to legal or other reasons. Standards should thus allow enough room for adaptation by potential green bonds issuers.
Objective	The objective of creating harmonized standards of green bond definitions and frameworks is to reduce transaction costs, thereby increasing demand for as well as supply of green bonds.
Key actors	Actions to work towards a harmonized green bonds framework can be taken by any public actor with ties to green bonds. Most relevant are public financial institutions, Ministries of Finance, financial regulators and municipalities (that issue green bonds).
Barriers addressed	There is thus far no uniform definition of green bonds. This creates transaction costs for ensuring the environmental integrity of issued bonds, for understanding the requirements for issuing a bond, etc. By creating green bond standards and a harmonized framework, these costs can be significantly reduced.
Relevant gov-	For the implementation of these measures, actions can be taken at the EU

[95] Kidney, Sean, India's securities' regulator finalizes official green bond listing requirements, 2016.

ernance level	level as well as the national level. A standardization of green bonds frameworks is relevant for both developed as well as less developed markets.
Good practice examples	For example, official **guidelines for green bonds** have now been developed by a group led by the central bank, People's Bank of China (PBoC)[96]. The green bond definitions are built on the domestic definitions for green credit, set out by the China Banking Regulatory Commission (CBRC), in 2013. Compared to green credit guidelines, the green bond guidelines contain a wider range of sectors, including climate change adaptation. The green bond guidelines also offer detailed technical criteria within each sector. Under the CBRC's green definition for green credit, there was RMB 5.72trn of outstanding green loans, which given an indication of the immense and immediate potential for green bonds. The **public label "Energy and Ecological Transition for the Climate"**, developed by the French Ministry of Ecology, Sustainable Development and Energy in 2015, identifies investment funds contributing to the energy and ecological transition. The key objectives of the label are 1) to mobilize more savings; 2) to encourage the creation of new green investment funds; 3) to provide strong assurance to end-investors; and 4) to be deployed on the European level.[97]
Implementation steps	Actions to be taken comprise the application of existing green bonds frameworks and sharing of experiences and approaches. Additionally, relevant policy makers could initiate a cooperation process for the development of standards on the national as well as the international level.
Costs and benefits of the measure	Administrative costs for the development of a green bonds framework will be moderate. The coordination between actors on national as well as international level would require resources. More relevant, however, would be an extension of reporting and disclosure requirements for non-green bonds. The impact of the development of a standardization of a green bonds definition would be large. This would create certainty for issuers and investors on the conditions, costs and benefits of green bonds. It would significantly lower the costs for third party verification and second opinion. Although it is likely that in addition to a global standard there will still be regionally differentiated frameworks, a general trend of harmonization will contribute to the growth of the green bond markets at all levels.
Reference materials	CBI, Supporting standards, 2016

[96] IISD, Roadmap for China: Scaling up Green Bond market issuance, April 2016; WRI, With New Guidelines, China's Green Bond Market Poised to Take Off in the Year of the Monkey, 2016

[97] FRENCH MINISTRY OF ENVIRONMENT, ENERGY AND THE SEA, Energy and Ecological Transition for the Climate Label

Preferential treatment of green bonds in monetary regulation and central bank strategy (M8)

Measure name	Preferential treatment of green bonds in monetary regulation and central bank strategy
Generic description of measure	Financial regulators and central banks can boost demand for green bonds by allowing for preferential treatment of green bonds in monetary regulation and central bank strategy. However, not many countries have adapted or introduced regulation to reflect the external benefits of green bonds. Financial regulators can affect the attractiveness of green bonds to investors by readjusting green bonds' risk weighting for banks. There is some evidence that green investments in a certain asset class (e.g. green mortgages) comprise lower risks compared to conventional investments. If this notion is confirmed through further research, financial regulators could adjust risk weightings for green bonds accordingly. Additionally, the long-term climate and environmental benefits could be reflected in the risk weighting, thereby increasing the risk of conventional bonds as they often contribute to an aggravation of climate and environmental risks (e.g. in the oil and coal industry). Risk weighting adjustment can be achieved in different ways. On the one hand, loans that are financed with the green bonds proceeds could be rated more favourably than conventional bonds. On the other hand, green bonds could be considered less risky when held by an investor. The former option would provide incentives for the issuance of green bonds, the latter would stimulate demand for green bonds. Additionally, a more favourable loan-deposit ratio could be offered to banks for loans that are funded through green bonds. This is part of the Chinese approach to green bonds. The Chinese authorities are also granting faster approval to green bonds compared to regular bonds (as the public approval of bonds is still required). Moreover, central banks could provide cheaper liquidity to banks that engage in the green bond market in a certain form. They could also provide preferential treatment for green bonds as collaterals if banks are seeking finance from central banks. Central banks themselves could invest in green bonds as part of their reserve management strategy. This would increase the demand for green bonds. Finally, central banks could include green bonds in their quantitative easing programmes. In these programmes, central banks purchase large amounts of bonds and securities. When central banks take influence on the development of the green bond markets it must be ensured that they do not lose their main aims, i.e. financial stability, out of sight, or create market distortions. Thus far, few central banks have engaged in any activities related to green bonds. China's central bank is the only one that has issued dedicated green bonds guidelines[98]. Other central banks have, however, been active in the field of green finance generally. The measures can be implemented in the **mid-term**. Many experts consider preferential treatment of green bonds as highly controversial. Given that the objective of monetary regulation is to create financial stability, changes to such regulatory regimes could destabilize financial markets, at least in the absence of a clear risk profile of green bonds.
Objective	It is the objective of this measure to reduce the risk weighting of green bonds. This renders them more attractive for issuers as well as investors and thereby increases demand for as well as supply of green bonds. Including green bonds in quantitative easing strategies of central banks could substantially increase demand for green bonds.
Key actors	Financial regulators, Ministries of Finance and central banks could imple-

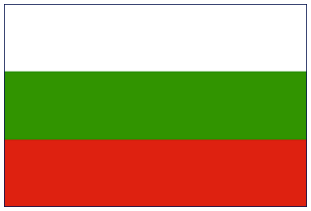
[98] IISD, Greening China's Financial System, 2015

Measure name	Preferential treatment of green bonds in monetary regulation and central bank strategy
	ment these measures.
Barriers addressed	The barrier addressed by this measure is the lack of green bonds and underlying projects. By giving green bonds or the underlying loans a better risk weight, issuance of green bonds (and loans) becomes more attractive as well as the investment in green bonds. Demand from the central bank for green bonds further increase incentives to issue green bonds.
Relevant governance level	The measures are relevant at the EU level as well as in developed and less developed green bond markets.
Good practice examples	In China, following supportive policies for green bonds are proposed by the central bank of China: Preferential risk weighting (if the green bond finances green loans, then these loans can get favourable risk weighting – this will incentivize issuance; green bonds can get favourable treatment on the asset side, once held by investors – this will increase investors' demand); Exemption from loan-deposit ratio cap for loans funded by green bonds; Fast-track approval procedure for green bonds.
Implementation steps	The central bank related measures can be implemented by the European Central Bank (ECB). National central banks in the EU do not have the authority to implement these measures independently of the ECB. The adjustment of risk weightings and capital charges is also regulated on the EU level through the Basel III and the Solvency II framework. On the global level, provisions targeting insurers will be made in a future Insurance Capital Standard. Specific green bonds targets could be enacted on the national level by financial regulators as well. This would require that a comprehensive regulatory framework for bonds be already in place and would be more suited for developed bond markets. Concrete actions that public actors could take include gaining a better understanding on the effects of central bank involvement in green bonds purchases and on how the adjustment of risk weightings and capital charges would change issuance of investments in green bonds. Based on the results of such research, actions could be taken to implement green bonds purchasing programmes or adjustments of risk weightings and capital charges.
Costs and benefits of the measure	The administrative costs of such measures would be **moderate**. Central banks and financial authorities are already engaged in the activities that are suggested for this measure. This means that the measures could be easily integrated in the existing strategies. Yet, the exact calibration of the measures requires a very good understanding of the market and modelling of the effects. Gaining this understanding before implementing these measures would require some resources. Once experiences from a first implementation of the measures have been collected, the administrative costs of these measures would be low. Impacts of these measures could potentially be very high. Especially central banks with their ability to channel money into the economy by purchasing green bonds could be a nearly infinite source of demand. Additionally, insurers have large amounts of finance that they need to invest. Nevertheless, policy makers need to consider that there is currently a shortage of supply of green bonds and not of demand. Of course, additional demand from public actors could stimulate additional green bonds issuance but policy makers should ensure that measures supporting additional demand go in hand with measure supporting additional supply.
Reference materials	European Commission, New EU Rules to promote investments in infrastructure projects, September 2015

ANNEX D: COUNTRY STUDIES

EU Countries

Bulgaria



Overview of the Bulgarian bond market development with relevance for green bonds.

Bulgaria's bond market sector development in line with GBP 2016 eligible categories		**Key Issuers**			
		Development Banks	**Banks and IFs**	**Municipalities**	**Corporates**
Renewable energy	25-50%	X			
Energy efficiency	25-50%	X		X	
Pollution prevention and control	25-50%	X			
Sustainable management of living natural resources	no data				
Terrestrial and aquatic biodiversity conservation,	no data				
Clean transportation	no data				
Sustainable water management (including clean and/or drinking water)	no data				
Climate Adaptation	no data				
Eco-efficient products, production technologies and processes	no data				

1. Market development and functioning

Key milestones

2001	The first mortgage bond issue was listed on BSE-Sofia issued by Bulgarian American Credit Bank AD.
2002	Varna Municipality issued the first municipal bonds for financing energy efficient modernization of the city's street lighting system.
2009	A finance contract was signed between BDB and EIB in the amount of EUR 25 million for financing investment projects of Bulgarian SMEs and priority projects in the fields of infrastructure, energy, environmental protection and other priority investments within the scope of EIB's Innovation 2010 initiative.
	The Bulgarian Development Bank issued two unlabelled green bonds in the area of renewable energy and municipal solid waste.
2010	A credit line has been signed between Nordic Investment Bank and BDB for the amount of EUR 20 million. The funds are intended for the financing of investment projects with participation of NIB member states, projects related to renewable energy sources or to environmental protection.
2015	KfW officially confirmed its interest in financing the Bulgarian Development Bank with a loan amount of EUR 100 million for the National Energy Efficiency Program.

Presently, in Bulgaria, there is no evidence for bonds labelled as green, but there are existing examples of bonds with proceeds used to finance green bonds eligible categories as categorised in the GBP. For instance, in 2002, the Municipality of Varna issued the first municipal bond for financing energy efficient modernisation of the city's street lighting system.[99] The municipal bond was disbursed under private channels and the invitation to purchase it was sent out to approximately 50 potential investors. The bond was sold within less than 24 hours.

Another example of unlabelled green bonds were two bonds amounting to 40 000 000 EUR issued by the Bulgarian Development Bank in 2010. The funds from the bond were used for financing new and refinancing existing infrastructure projects in the fields of energy generation from renewable energy sources and processing of municipal solid waste[100,101]. The major investors in the bonds were Allianz Bulgaria, Pension Fund "Suglasie", Pension Fund "Doverie" and CKB Sila[102]

The Bulgarian Ministry of Finance, together with the Bulgarian National Bank (BNB) plays an important role in the domestic market by regulating the terms and conditions for government bonds. Trading in government bonds is mediated by primary dealers (banks and investment intermediaries) with the right to acquire government bonds directly at auctions organized by the BNB. [103]

According to Cbonds Global, in Bulgaria the size of the corporate bond markets, relative to the size of the government bonds, is small. Generally, best effort method[104] is preferred during offerings, rather than firm underwriting. Government bonds are not currently traded at the Bulgarian Stock Exchange-Sofia. Two government bonds were

[99] Energy Cities, EU, New Forms of Financing Municipal Sustainable Energy Projects, 2006
[100] Bulgarian Development Bank, Bond Issuance, December 2010
[101] Bulgarian Development Bank, Bond Issuance, May 2010
[102] Bulgarian Development Bank, Bond Investors
[103] Financial Cbond Information, Bulgarian Bonds
[104] Best efforts is an agreement in which an underwriter promises to make a full-fledged attempt to sell as much of an initial public offering as possible to the public. Best effort methods are used mainly for securities with higher risk or in less-than-ideal market conditions.

listed at the Exchange until June 2008, but there was no trading in them. Corporate bonds can be traded both at the Exchange and Over-the-counter (OTC). The following types of corporate bonds are available at the Bulgarian Stock Exchange-Sofia: debentures; convertible bonds; mortgage bonds; floating and fixed rate bonds; callable and puttable bonds.

In 2016, the outstanding bonds in Bulgaria are:

- Corporate bonds: 14 outstanding worth BGN 132 648 580 and 52 issues outstanding worth EUR 1 629 367 800;
- Municipal bonds: 2 outstanding worth EUR 31 564 590; and
- Sovereign bonds: 16 outstanding worth BGN 4 839 462 310 and 12 outstanding worth EUR 6 584 086 610 and 2 outstanding worth USD 264 743 060.

2. Main actors

The Bulgarian Development Bank (BDB) is a financial institution 99.9%-owned by the Bulgarian state. It is the successor of Encouragement Bank established in 1999. Its focus is to support small and medium-sized enterprises. It is the only Bulgarian bank to provide financing via other credit institutions as well as direct financing. Its international partners include EIB, Nordic Investment Bank, KfW, China Development Bank, CitiBank and others.[105]

The Bulgarian Stock Exchange-Sofia's main strategic goal is to establish and maintain an efficient capital market in Bulgaria and to strengthen its public acknowledgment as a source of funding for the local business and an essential tool in the Bulgarian economy.

The Bulgarian Industrial Capital Association[106] (BICA) is an organization of employers in Bulgaria. BICA is working actively to sustainable development, high standards of corporate governance and corporate social responsibility for improving the quality of Services of general interest to promote competition and investment in Bulgarian industry. BICA has a network of regional chambers in 92 municipalities.

Pension Insurance Company Saglasie AD manages tree pension funds worth over 1 bn. Bulgarian levs.

Furthermore, the primary dealers of governmental securities in 2016 according to the Ministry of Finance[107] are: Allianz Bank Bulgaria, DSK Bank, United Bulgarian Bank, First Investment Bank, Raiffeisen Bank Bulgaria, Cibank, CitiBank Europe (Bulgarian Branch), Societe Generale Expressbank, Unicredit Bulbank, Central Cooperative Bank and Eurobank Bulgaria. Moreover, the InvestBulgaria Agency (IBA) has published a list of the major corporate investors in Bulgaria.[108]

3. Classification by sector

Presently, the bonds are classified as corporate, municipal and sovereign.

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[105] Bulgarian Development Bank, International Partners
[106] Bulgarian Industrial Capital Association
[107] List of the primary dealers of government securities for the period 01 January – 31 December 2016
[108] Invest Bulgaria Agency

4. Use and development of standards

Presently, there is no evidence of the use of green bond standards in Bulgaria. Worth noting is that the Bulgarian Industrial Capital Association (BICA) states in the EU Capital Markets Union Survey 2015, that standardization could improve liquidity in the corporate bond markets, and regulatory measures make sense. There are no specific suggestions, but BICA also outlines that the regulatory measures should be discussed and agreed with all the stakeholders and while standardization could be achieved by the market itself it will be a slow and difficult process.

As regards municipal bonds issuance, the Public Offering of Securities Act[109] provides the legislative framework.

5. Identified best-practice public sector measures

Presently, no existing public sector measures are identified which promote green bonds in Bulgaria. The Bulgarian Industrial Capital Association (BICA) suggests in the EU Capital Markets Union Survey 2015, that it is necessary to launch information campaigns to widely promote green investments and to disseminate best practices in this regard, including in close cooperation and by using the networks of the business and investors associations.

6. Identified key bottlenecks

The key bottlenecks in Bulgaria are the lack of awareness on the benefits of green bonds and existing international practices. There is also a lack of domestic investors prioritizing green assets.

According to an assessment of the energy efficient retrofitting of street lighting municipal bond issued in the city of Varna, the following bottlenecks could be summarised[110]:

- Municipal bonds issuance requires a long and expensive preparatory work (obtaining the credit rating, working out an investment memorandum for the emission, waiting for the endorsement by the State Commission on Securities, selection of an intermediary investment broker), with a relatively precise estimation of the expected outcome.
- There is a major risk related to the sale of the municipal bonds in a case the subscription would have been unsuccessful in implementing the conditions envisaged in the memorandum. For example, if at least EUR 2 million have to be collected within one month after closure of the subscription, any collected amounts must be paid back to the subscribers, together with the due interests charged by the bank.
- In case the issue has proved to be unsuccessful, the municipality would have incurred significant losses, since all the preparation costs of the issue and payment of the due subscription interests would be credited from the municipal account.

[109] Law on Public Offering of Securities, Bulgaria
[110] Energy Cities, EU, New Forms of Financing Municipal Sustainable Energy Projects, 2006

France

Overview of French green bond market development.

French green bond market sector development in line with GBP 2016 eligible categories		Key Issuers			
		Development Banks	Banks and IFs	Municipalities	Corporates
Renewable energy	>50%	X	X	X	X
Energy efficiency	5-25%	X		X	X
Pollution prevention and control	<5%				
Sustainable management of living natural resources	<5%	X			
Terrestrial and aquatic biodiversity conservation,	<5%			X	
Clean transportation	<5%	X		X	
Sustainable water management (including clean and/or drinking water)	<5%				X
Climate Adaptation	<5%				
Eco-efficient products, production technologies and processes	<5%				

1. Market development and functioning

Key Milestones

2008	Nord-Pas de Calais region issued the first municipal green bond in 2008.
2012	Ile-de-France Region issued its inaugural environmentally and socially responsible bond.
2013	France´s development bank AFD issued its inaugural green bond of EUR 1 bn.. EDF launched its first corporate green bond with a total amount of EUR 1.4 bn..
2014	Credit Agricole bank participated in the drafting committee of the Green Bond Principles, which were published in January 2014. ENGIE issued a green bond of EUR 2.5 bn.. The utility company was the world's largest corporate issuer of green bonds in 2014.
2015	Paprec issued the first ever labelled green bond in the waste and pollution sector. Campaign by Friends of the Earth (France) and BankTrack calls for French banks to commit publicly to excluding all sectors involved with coal, from its extraction to its combustion. Crédit Agricole has already stated that it will "no longer finance coal mining projects or operators in this sector".[111] A legal obligation for asset owners to report on environmental and social concerns was adopted. City of Paris issued a EUR 300 million green bond for renewable, low-carbon transport, energy efficiency and climate adaptation. Schneider Electric´s inaugural bond was issued. BDPC issued its inaugural bond with a volume of EUR 300 million. Launch of the "Energy and Ecological Transition for Climate" (EET4C) label and Article 173

Since February 2001, Agence France Trésor has been responsible for handling public debt and treasury management. The Ministry of the Economy, Finance and Foreign Trade created it. In France, standardization government securities include three categories: Obligations assimilables du Tresor (OATs, or fungible Treasury bonds), Bons du Trésor à intérêts annuels (BTANs or negotiable fixed-rate medium-term Treasury notes with annual interest), and Bons du Trésor à taux fixe et à intérêts précomptés (BTFs or negotiable fixed-rate discount Treasury bills).[112]

Within the French bond market, corporations, utilities, commercial banks and municipalities / regions are the main actors. Private sector bonds dominate the French bond market. However, in terms of outstanding amounts, government bonds make up a larger proportion, accounting for between 60% and 70% of the total in September 2015.[113]

[111] Novethic, Climate: Investors Take Action, November 2015
[112] CBonds, France: bonds, 2015
[113] AMF, Study of liquidity in French bond markets, November 2015

France is the third largest green bond market after China and the US as of July 2015, considering both labelled and climate-aligned bonds, with roughly 9% of total global issuance (similar to the UK).[114]

In July 2015, Article 173 of France's Energy and Ecology Transition Act (TEE) was adopted. This article requires French institutional investors to measure their carbon footprint and report on environmental and social criteria.

In December 2015, the French Ministry of Ecology, Sustainable Development and Energy (MEDDE) joined the Climate Bonds Initiative Partnership Programme[115]. Moreover, it established the "Energy and Ecological Transition for Climate" (EET4C) label in support of the law on Energy Transition for Green Growth. An SRI label for funds that comply with ESG (environment, social and governance) criteria was launched in January 2016[116].

2. Main actors

Regions / Municipal bonds

Ile-de-France Region: Ile-de-France Region issued its inaugural environmentally and socially responsible bond in March 2012. The bond's subscription rate reached 175% (EUR 620 million). The issuance was underwritten by Crédit Agricole CIB and BNP Paribas CIB[117]. For the Ile-de-France Region, the annual reporting is done internally and is not audited. A second green municipal bond with an amount of EUR 600 million was issued in April 2014. Book runners were Crédit Agricole CIB, HSBC France and Natixis. Proceeds of the bond will be used for renewable energy and energy efficiency projects such as construction and renovation of buildings, including high schools, public transport, energy efficient buildings for accommodation for vulnerable people and the elderly, and for social housing as well as support to small and medium-sized companies integrating corporate social responsibility initiatives. The project selection criteria were validated by Vigeo, and projects have to meet 11 criteria in the areas of climate change, ecological transition, spatial planning, economic and sustainable land development and the fight against inequality.[118] Île-de-France was the world's largest municipal issuer of green bonds in 2014.[119]

City of Paris: City of Paris issued an inaugural EUR 300 million green bond for renewable energy, low-carbon transport, energy efficiency and climate adaptation projects in November 2015. Joint lead managers were Credit Agricole CIB, HSBC, and Société Générale. Vigeo prepared a review for this bond. Paris has committed that funds will be used to finance current or future projects, rather than to refinance completed projects. The City commits to report annually on the allocation of proceeds and ESG performance of selected projects. It has selected key indicators per project type to report on climate impacts and ESG performance.[120]

[114] Climate Bonds Initiative, Bonds and Climate Change, 2015
[115] CBI, French Ministry of Ecology, Sustainable Development & Energy becomes Climate Bonds Partner, 2015
[116] Novethic, Sri: The French Government Creates Official Labels For Financial Products, 2016
[117] CDC Research, Financing the transition to a green economy: their word is their (green) bond?, 2012
[118] Credit Agricole, May 2014- New Green Bond Issue for the Region ILE-DE-FRANCE, 2014
[119] KPMG, Gearing up for green bonds, 2015
[120] CBI, Update: Vive Paris!, November 2015

Nord-Pas de Calais region: Nord-Pas de Calais region issued its inaugural green bond in 2008, followed by a second green bond in September 2012. The EUR 80 million bond (2012) was managed by Credit Agricole. The issue was twice oversubscribed (orders exceeded 150 million euros). The funds were to be be allocated to three sectors: transport & infrastructure (70%), energy (20%) and biodiversity (10%).[121]

Banks

Agence Francaise de Développement (French Development Agency, AFD): In September 2013, the French development bank AFD issued its inaugural green bond of EUR 1 bn.. The bond was underwritten by Bank of America Merrill Lynch, BNP Paribas, Credit Agricole CIB and HSBC. Proceeds are used to finance projects in the fields of renewable energy, energy efficiency, urban transport, forestry and agriculture projects. An eligibility framework for project selection was developed in collaboration with Vigéo.[122]

Credit Agricole: Crédit Agricole CIB is the Corporate and Investment Banking arm of the Crédit Agricole group and has contributed to major transactions for issuers including ENGIE, Ile-de-France region, World Bank, IFC, EIB and EDF.[123] Underwriting nearly 50 deals, CACIB accounted for USD 3.79 bn. of green bond issuances in 2015. It showed significant progress towards the end of the year, as over half of its annual deals (USD 2 bn.) were generated in the fourth quarter. Besides being the sole manager for two of its own green bond issuances, Crédit Agricole CIB was also involved in various big issuances such as green bond from EDF, KfW, Nafin, NRW Bank and ING in 2015.[124]

Alongside Bank of America Merrill Lynch, Citi and JP Morgan Chase, Crédit Agricole CIB was responsible for drafting the Green Bond Principles.[125]

BDPC: In December 2015, BDPC, France´s second largest bank, issued its inaugural bond with a volume of EUR 300 million. The bond was oversubscribed at the total of EUR 1.2 bn.. Natixis Energeco, BPCE´s subsidiary, is the only underwriter for this issue. Proceeds are allocated to renewable energy projects in the country and include wind, solar PV, hydro and biomass. Vigeo conducted an ex-ante review. Furthermore, annual third-party verification on allocated proceeds and compliance of projects with selection criteria will be provided.[126]

Utilities and corporate bonds

Électricité de France (EDF): EDF is the main French electricity company. Its business activities include generation, transmission, distribution, trading, power sales and energy services. In 2014, generated turnover amounted to EUR 72.9 bn., supplying energy and services to around 37.8 million customers.[127] In November 2013, EDF launched its first corporate green bond with a total amount of EUR 1.4 bn.. The issue was twice oversubscribed. The selected projects had to comply with eligibility criteria established by the rating agency Vigeo. Criteria included human rights and governance aspects in the countries in which the projects are located; environmental impacts of the projects; promotion of health and safety within the projects; promotion of respon-

[121] CBI, New EUR80m 12yr French enviro bond 90% over-subscribed, September 2012
[122] CBI, AFD goes BIG with first climate bond and gets investor diversification, September 2014
[123] Credit Agricole, Sustainable Banking, 2016
[124] CBI, Credit Agricole CIB tops Q4 green bond underwriters table, January 2016
[125] Credit Agricole: Global Debts Markets and Debt Capital Markets, May 2015
[126] CBI, Mkt updates, December 2015
[127] EDF, EDF raises US$1.25 bn. in largest ever US Dollar denominated Green Bond from a corporate issuer, 2015

sible relationships with suppliers; and involvement of territory's stakeholders.[128] Use of funds was annually disclosed by EDF and verified by Deloitte & Associates.[129] At the end of May 2015, EDF completed the full allocation of the 1.4 bn. raised through the Green Bond issued in November 2013. Another green bond with a total amount of USD 1.25 bn. was issued in October 2015. The proceeds of the bond issue are allocated to renewable energy projects. Similar to EDF´s inaugural green bond in 2013, the project selection process was accompanied by Vigeo, while Deloitte & Associates verified the allocation of funds. USD 500 million were allocated to the construction of three wind projects in the United States at the end of December 2015.

Schneider Electric: Schneider Electric, a French multinational corporation, specializes in electricity distribution and automation management and that produces installation components for energy management. In October 2015, Schneider Electric issued its inaugural bond in partnership with AXA Investment Managers, Mirova and Neuflize OBC Investissements. The bonds had a volume of EUR 200 million[130]. In December 2015, the company issued its second climate bond, as private placement. Credit Agricole CIB and Natixis are lead managers of both issuances. Vigeo prepared a second review of the alignment with Green Bond Principles. Proceeds of this bond will be allocated to Schneider's R&D program in developing new technologies in the area of energy efficiency, connection of renewable energy solutions to grid, low-greenhouse gases content, and low resource intensity.

ENGIE, formerly called GDF Suez, is the second largest electricity producer in France. Its areas of operations include four key sectors: independent power production, liquefied natural gas, renewable energy and energy efficiency services. The group is active in France, central Europe, Latin America, Asia, the Middle East, the United Kingdom and Australia.[131]

In May 2014, ENGIE issued a green bond of EUR 2.5 bn. in two tranches (6-year tranche of EUR 1.2 bn. with a 1.375% annual coupon, and a 12-year tranche of EUR 1.3 bn. with a 2.375% annual coupon). The utility company was the world's largest corporate issuer of green bonds in 2014.[132] The bond was three times oversubscribed. Proceeds of the bond issue are used to finance the group´s renewable energy projects including wind farms and hydroelectric plants as well as energy efficiency projects such as remote smart metering and the construction of integrated district heating networks powered by low-emission biomass plants.[133] ENGIE - in collaboration with the rating agency Vigeo - set ten environmental and social eligibility criteria in the areas of environmental protection, contribution to development and well-being of local communities, compliance with ethical principles and fairness to suppliers and subcontractors, human resources management and the quality of governance in the projects financed. Allocation of funds to the projects will be specifically traceable and verified by a statutory auditor[134]

Paprec: Paprec, a leading French recycling and waste management company, issued the first ever labelled green bond in the waste and pollution sector in March 2015. The bond had a volume of EUR 480 million and was split across two tranches: EUR 295 million with a maturity of seven years and a fixed semi-annual coupon of 5.25% (B+) and EUR 185 million with a maturity of eight years and a semi-annual coupon of

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[128] EDF, Annual Financial report 2014, 2014
[129] EDF, Successful launch of EDF's first Green Bond, 2013
[130] Schneider Electric, Schneider Electric successfully launches its first climate bond with AXA IM, Mirova and Neuflize OBC Investissements, 2015
[131] Engie, GDF suez becomes Engie, 2015
[132] KPMG, Gearing up for green bonds, 2015
[133] Engie, GDF Suez successfully issues the largest Green Bond to date, 2014
[134] Credit Agricole, Credit Agricole CIB works with GDF Suez to structure and issue the largest green bond ever, 2014

7.35% (B-). Credit Suisse and BNP Paribas were the two underwriters of the bond. Proceeds will be allocated to refinance investment in recycling assets (machinery) and acquisitions of recycling companies. Vigeo provided a second opinion (adherence with best practice guidelines and ESG assessment of Paprec) and developed eligibility criteria for project selection. Proceed allocation is not audited.[135]

SNCF: In 2015, SNCF issued a USD 11.0 bn. climate-aligned bond.[136]

3. Classification by sector

Renewable energy related bonds dominate the French climate-aligned bond market. Utilities are among the main issuers of green bonds in France and against this background, a major amount of proceeds are allocated to utilities´ renewable energy projects such as wind, solar, PV, hydro and biomass.

Proceeds of municipal bonds are commonly used for energy efficiency projects like construction and renovation of buildings as well as low-carbon transport and infrastructure.

A small share of proceeds in the French bond market is allocated to biodiversity and agriculture projects as well as forestry.

The allocation of proceeds to finance R&D projects and new technologies in the area of energy efficiency and the connection of renewable energy solutions to the grid, as well as to finance recycling projects is a specific characteristic of the French market.

4. Use and development of standards

All issuers described above are supportive of the Green Bond Principles. Furthermore, Ile-de-France region, EDF, ENGIE and Crédit Agricole CIB are members of the Green Bond Principles.

Vigeo is the main actor in certifying compliance with the Green Bond Principles and developing eligibility criteria for the selection of projects to which green bond proceeds will be allocated. Some issuers (such as EDF) provide verification of the allocation of funds by Deloitte and Associates or other auditors.

French green bond actors are active in developing and enhancing standards on national as well as international level. Crédit Agricole CIB was involved in the development of the Green Bond Principles and AFD participates in an informal working group to outline a harmonized framework for impact reporting on projects to which green bond principles have been allocated[137].

On the national level, the MEDDE joined the Climate Bonds Initiative Partnership Programme and launched the "Energy and Ecological Transition for Climate" (EET4C) label in December 2015.

[135] CBI, Wkly blog: 1st recycling #GreenBond from France's Paprec, March 2015
[136] CBI, Bonds and Climate Change, 2015
[137] AFDB, Green Bonds working towards a harmonized framework for Impact reporting, 2015

5. Identified best-practice public sector measures

The **Ministry of Ecology, Sustainable Development and Energy (MEDDE)** has developed a **public quality label for green investment funds**. The label, called "Energy and Ecological Transition for Climate" (EET4C), was officially launched at the COP21 in December 2015. Some of its key objectives are to incentivize funds to finance green activities in line with climate change objectives; to encourage the creation of new green investment funds; and to provide strong assurance to end-investors[138]. Amongst other things, it defines what is 'green' based on the GBP and the CBI taxonomy. As of June 2016, EET4C-labelled funds had reached almost EUR 1 bn.[139]. MEDDE is expected to focus its activities on green categorisation, labels and market guidance for green investment funds. Its efforts in this regard were reinforced with MEDDE joining the Climate Bonds Initiative Partnership Programme in December 2015[140]. Meanwhile, the French Government passed an Energy and Green Growth Act into law which aims to reduce final energy consumption by 50% in 2050 compared to 2012 and to reduce fossil fuel consumption by 30% in 2030 compared to 2012. In addition, Article 173 of this law introduces mandatory environmental reporting for institutional investors (asset managers, insurance companies, pension and social security funds).

With respect to **public issuance of green bonds**, the bond issuance by the **Île-de-France regional government** can be considered a best-practice public sector measure. Since 2012, the government has issued two green bonds to finance a mix of climate friendly investments. The first bond was worth EUR 350 million and the second bond was EUR 600 million for 12 years and had a rating of AA/AA+. Proceeds of the bonds will be used for renewable energy and energy efficiency projects such as construction and renovation of buildings, public transport, energy efficient buildings for accommodation for vulnerable people and the elderly, as well as to support small and medium-sized companies integrating corporate social responsibility initiatives. In 2014, Île-de-France was the world's largest municipal issuer of green bonds.

6. Identified key bottlenecks

The following bottlenecks were identified by an analysis of statements given by prominent financial institutions in the context of the Capital Markets Union EU survey 2015[141]. It should be noted that these bottlenecks represent the view of a selected range of stakeholders, including the ones interviewed during the study.

Survey participants mentioned that impact measurement of projects financed by the proceeds of green bonds is not standardized. This bottleneck is closely linked to a lack of traceability of funds. Enhanced transparency on the allocation of funds, ESG risks and in reporting in order to reduce "greenwashing" is stated to be a requirement for further development of the French green bond market. However, since the survey was taken in 2015, France has introduced the Energy and Ecological Transition for Climate" (EET4C) label as well as an SRI label in order to increase the transparency of green funds.

Concerning political support for incentivizing green investments there is no consensus between the participants of the Capital Markets Union EU survey 2015. While some mentioned that a market-led approach is necessary, others stated that tax incentives for both issuers and investors should be adopted. Issuing green bonds incurs a fixed

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[138] Edme, Robin, New French climate legislation and relevance for Swiss asset managers, March 2016
[139] Robin Edme, Ministry of Ecology, Sustainable Development and Energy (France)
[140] CBI, French Ministry of Ecology, Sustainable Development & Energy becomes Climate Bonds Partner, 2015
[141] EUSurvey, Published results-capital markets union, 2016

cost and reporting burden that is not associated with conventional bond issuance and may therefore hamper market development of green bonds. A "green premium" could motivate ESG issuers on higher levels of integrity and detailed reporting.

Furthermore, it was suggested to encourage the development of an ESG-related return on investment. This would mean that more energy savings in a project would lead to a higher return of investment for the investor.

Germany

Overview of German green bond market development.

German green bond market sector development in line with GBP 2016 eligible categories		Key Issuers			
		Development Banks	Banks and IFs	Municipalities	Corporates
Renewable energy	>50%	X	X		X
Energy efficiency	25-50%	X	X		
Pollution prevention and control	<5%				
Sustainable management of living natural resources	<5%				
Terrestrial and aquatic biodiversity conservation,	<5%				
Clean transportation	<5%				
Sustainable water management (including clean and/or drinking water)	<5%		X		
Climate Adaptation	<5%				
Eco-efficient products, production technologies and processes	<5%				

1. Market development and functioning

Key milestones

2013	MBB Clean Energy AG issued a bond with a volume of EUR 72 million to finance existing wind and solar power plants. The bond was listed on the Frankfurt Stock Exchange. The first green bond in Germany with a volume of EUR 50 million was issued by Landwirtschaftliche Rentenbank. NRW Bank issued its first green bond with a volume of EUR 250 million. The bond was underwritten by Crédit Agricole CIB and DZ Bank.
2014	NRW bank issued its second green bond with a volume of EUR 500 million. The bond was underwritten by DZ Bank and HSBC. KfW issued its first green bond with a volume of EUR 1.5 bn., the largest Green Bond ever at the time of issuance in this segment. Crédit Agricole, Deutsche Bank and SEB jointly acted as lead managers of the transaction.
2015	KfW issued five labelled green bonds, amounting to EUR 3.7 bn. NRW Bank issued another EUR 500 million green bond. The bond was underwritten by Credit Agricole CIB and HSBC. The first labelled green covered bond with a volume of EUR 500 million was issued by real estate and mortgage bank BerlinHyp.
2016	Insolvency of German Pellets, one of the largest issuers of SME bonds that was producing biomass-based fuel products

The Federal Republic of Germany Finance Agency is the central service provider for the Federal Republic of Germany's borrowing and debt management. The market for German Government securities is widely regarded as liquid and clearly structured. Divided into money market and capital market instruments, German Government securities offer original maturities ranging from three months to 30 years.

The size of the corporate bond market, relative to the size of the government bond market, is fairly large in Germany. According to Cbonds Global, 9.502 corporate bonds, 222 government bonds and 883 municipal bonds structured the German bond market in February 2016.[142]

Germany has shown significant growth in green bond market size during the last years. German-registered green bond issuance amounted to USD 5.6 bn. in 2015, accounting for one third of the USD 18.4 bn. issued within Europe in 2015 in total.[143] The public (national promotional) bank KfW is the main issuer of green bonds in the German market. The German second-opinion provider Oekom research is one of the few rating agencies in the market.

A special characteristic of the German green bond market is the issuance of the first covered green bond by BerlinHyp in 2015. Similar to a traditional mortgage "Pfandbrief", the covered green bond is intended to finance mortgage-backed real estate.

[142] CBonds, General information on bond market-Germany, 2015
[143] CBI, 2015 Green Bond Market Roundup, 2015

These properties have either a green building certificate or an appropriate energy efficiency certificate from internationally recognized certification bodies.[144]

A recent setback for the corporate bond market was the insolvency of the company German Pellets, one of the largest issuers of SME bonds[145]. As the bond proceeds were used for investments in biomass fuel products, the bonds can also be considered unlabelled green SME bonds. The withdrawal of this renewable energy forerunner from the bond market is an example, which might negatively affect investors' perception of the risks related to green bonds.

2. Main actors

The German green bond market is characterised by a few governmental actors as well as corporate banks and regional financial institutions. The four main issuers are KfW, Landwirtschaftliche Rentenbank, NRW Bank, and BerlinHyp.

Banks

KfW is the main issuer dominating the German green bond market.[146]

In July 2014, the bank introduced a green bond with a volume of EUR 1.5 bn. ("Green Bond – Made by KfW"). The proceeds of the bond were used for projects from the KfW loan program "Renewable Energies – Standard" to finance wind power and photovoltaic plants. Investors included the leading Dutch pension fund APG, the insurance companies Zürich, Aegon and Munich Re as well as the German asset manager Union Investment. Guarantor of green bonds issued by KfW is the Federal Republic of Germany.

In 2015, KfW issued five labelled green bonds amounting to EUR 3.7 bn..[147] Green bonds account for 6% of KfW's total funding (EUR 62.6 bn. in total).[148]

Landwirtschaftliche Rentenbank issued the first green bond in Germany in 2013. The Renewable Energy Bonds had a volume of EUR 50 million in 2013, which decreased to 15 million in 2014.[149] Rentenbank is a public law institution and provides refinancing to banks with the European Union involved in financing agriculture and rural areas.

NRW Bank, a state owned development bank issued its first green bond with a volume of EUR 250 million in 2013. This bond was one of the first labelled green bonds in the German market. The second green bond of NRW Bank with a size of 500 million euros was issued in 2014. Sustainable added value of this bond was verified by an independent institute (oekom research AG). Proceeds were allocated to both refinancing of loans as well as financing new projects mainly to fund energy efficiency (low carbon buildings), renewable energy infrastructure and river restoration. In 2015, NRW Bank issued another EUR 500 million green bond. For this bond an additional impact assessment on sustainability effects of funded projects was conducted by Wuppertal Institute for Climate, Environment and Energy, an independent research institute, in 2015.[150]

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[144] Berlin Hyp, The Green Pfandbrief of Berlin Hyp- a sustainable investment, n.d.
[145] Energy Transition, Low oil prices hit German pellet giant, 2016
[146] KfW, Structure and Mission of KfW, January 2016
[147] CBI, Update: Vive Paris!, November 2015
[148] KfW, Invest in the everlasting Green Bonds, March 2016
[149] Rentenbank, Annual Report 2014, 2014
[150] NRW.Bank, NRW.BANK-Green Bond Programme, 2015

BerlinHyp issued the first labelled green covered bond with an issue size of 500 million euros in the global market in 2015. Significant oversubscription was registered since the order book reached a final size of EUR 2 bn. BerlinHyp is a real estate and mortgage bank, which specializes in large-volume real estate financing for professional investors and housing societies. The green covered bond finances mortgage-backed real estate properties, which have been certified as green building or have an appropriate energy efficiency certificate from internationally recognized third party. Sustainability standards have been developed in cooperation with an independent verifier (oekom research).

Deutsche Bank, Germany´s leading bank with a focus on commercial and investment banking, retail banking, transaction banking and asset and wealth management products and services, invested an amount of EUR 200 million in green bonds issued by the World Bank and served as an underwriter of KfW´s "Green Bond – Made by KfW". Additionally, Deutsche Bank was one of the lead managers for the European Investment Bank's Climate Awareness Bond issued in 2014. It also invested in Transport for London´s inaugural green bond.

Commerzbank AG and ***Landesbank Baden-Württemberg (LBBW)*** are also important German underwriters.

Utilities, private companies

In 2013, two energy companies were active on the maturing German green corporate bond market.

MBB Clean Energy **AG** issued a bond with a volume of EUR 72 million with proceeds being invested in existing wind and solar power plants. The bond was listed on the Frankfurt Stock Exchange.

PNE Wind AG issued a EUR 100 million corporate bond, which could be labelled as green due to the company´s exclusive activities in wind power[151].

Rating Agencies

Oekom research provides second party opinions for green bond issuers as well as a sustainability bond rating for investors. Second party opinion provided by Oekom includes a review of the issuers' selection criteria for projects which are financed by green bonds, verification of alignment with the Green Bond Principles, the development of a verification framework, verification of fund allocation and an assessment of the issuer´s sustainability performance.

The sustainability bond rating is based on the issuer´s evaluations, transparency and external assurance as well as a detailed ESG analysis of the bond by oekom research. The rating is not publicly available.[152] Oekom research has provided second party opinions for the main actors in the German green bond market, including KfW, NRW Bank and BerlinHyp.

Additional to second party opinions, impact assessments of the projects financed by green bonds (issued by NRW Bank and KfW) have been conducted by independent research institutes.

[151] PNE Wind, PNE Wind Ag Has Topped-Up Its Corporate Bond Issue To EUR 100.0 Million, 2013
[152] oekom research, oekom green bond services, n.d.

Wuppertal Institute for Climate, Environment and Energy has collected data on the impact of projects financed by green bond proceeds from NRW Bank. Wuppertal Institute´s analysis is not made transparent (public).

The non-profit **Center for Solar Energy and Hydrogen Research Baden Württemberg** (ZWS) conducted an evaluation on KfW's funding of renewable energy projects. However, the analysis that is publicly available relates to several financing instruments aiming at fostering renewable energies. KfW itself made data available in form of an "impact tracking" which shows CO2 savings resulting from the bonds.

3. Classification by sector

Proceeds of green bonds issued by ***KfW*** are mainly used to finance projects in the fields of renewable energy and energy efficiency. In particular, these projects include photovoltaic equipment and joint projects which combine the generation of electricity with energy storage and/or load management, on-shore wind power plants and repowering measures, hydro-electric power stations as well as equipment for the generation and use of biogas. Projects in the fields of fossil fuels or nuclear power are excluded from financing. Apart from renewable energy and energy efficiency, proceeds are used to finance projects regarding environmental friendly transportation, was industry and (waste-) water management as well as biodiversity measures.

In 2015, 90% of proceeds were used for financing wind energy, 8% were used for solar energy projects, less than 1% were used for biogas/ -mass and 2% were used to finance other projects. A major share of projects is located in Germany (79%). Additionally geographical distribution includes projects located in France (12%), Finland (4%), Italy (2%) and other countries (3%)[153].

Landwirtschaftliche Rentenbank invested the bond´s proceeds in renewable energy generation. 40% of its 65 million volume of green bond proceeds were used for biogas plants and biomass heating plants, 27% were used for photovoltaics and 33% were invested in windpower.

Using its 2014 green bond, ***NRW Bank*** supported the implementation of water and energy projects. Proceeds were mainly used for water projects (81%) such as river restoration, maintenance of fresh water supply and improvement of river flood management as well as for energy projects (19%) like efficiency facility programs and electric mobility promotion programs.

In 2015, the focus shifted towards investments into energy efficiency in buildings (new buildings and energy renovations) (40%) as well as wind power projects (30%). A small share of proceeds was used for renaturation of watercourses and wastewater drainage and treatment (19%), cogeneration of power plants (9%) and energy and resource efficiency in small and medium-sized enterprises (2%)[154].

Berlin Hyp used the issue proceeds for future financing of green buildings in Germany, France, Great Britain, the Netherlands and Poland. A major share of proceeds is allocated to office and commercial properties (74%), a minor share is allocated to retail objectives (24%) and management and social properties (2%).

4. Use and development of standards

[153] KfW, Invest in the everlasting. Green Bonds – Made by KfW, 2016
[154] Oekom research, Verification of the Sustainability Quality of the Green Bond 2015 issued by NRW.BANK, 2015

Deutsche Bank, one of the lead managers of the "Green Bonds – Made by KfW" was involved in the development of the Green Bond Principles in cooperation with twelve international financial institutes. Other signatories to the principles include Bank of America, Citigroup, Crédit Agricole CIB, JPMorgan Chase, BNP Paribas, Daiwa, Goldman Sachs, HSBC, Mizuho, Morgan Stanley, Rabobank and SEB.

KfW and the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) developed minimum requirement for the quality of green bonds in 2015. Quality standards include transparency of projects to be financed and the use of funds, detailed and regular reports on the financed projects and provision of external experts' opinion. Following the further development of the market, KfW and the BMUB are planning to gradually raise minimum requirements for the German green bond market. Additionally, KfW announced plans to support the establishment of sophisticated green bond by the implementation of market initiatives and discussions with third parties.[155]

5. Identified best-practice public sector measures

Germany's development bank **KfW** is the country's main **public issuer** of green bonds. In July 2014 the bank introduced a green bond with a volume of EUR 1.5 bn. ("Green Bond – Made by KfW"), which was supported by the BMUB. The proceeds of the bond were used for projects from the KfW loan programme "Renewable Energies – Standard". This programme primarily supports wind power and photovoltaic plants.[156] Five labelled green bonds amounting to EUR 3.7 bn. where issued in 2015, thereof three new currencies (AUD, GBP and SEK).[157] Green bonds account for 6% of KfW's total funding (EUR 62.6 bn. in total).[158]

Also, **KfW** is contributing to the development of **quality standards** for green bond issuers. Jointly with the BMUB, the bank developed quality standards for green bonds of German issuers in 2015. Specifically, the standards include transparency of projects to be financed and the use of funds, detailed and regular reports on the financed projects and provision of external experts' opinion. As the German green bond market develops, KfW and BMUB are expected to gradually raise their standards' requirements.

6. Identified key bottlenecks

The following bottlenecks were identified by an analysis of statements given by prominent financial institutions in the context of the Capital Markets Union EU survey 2015. It should be noted that these bottlenecks represent the view of a selected range of stakeholders.

A bottleneck within the German green bond market relates to a lack of political support and public intervention to incentivize investments. With regard to pension funds, no fiscal subsidy on social responsible pension saving like in the Netherlands exist and no guidelines for public or governmental pension funds are approved like it is the case in Norway. ESG aspects are not incorporated in investment guidelines of pension vehicles or public authorities until now.

Tax advantages were cited as an effective tool to strengthen the German green bond market. On the other hand, according to respondents in the Capital Markets Union EU

[155] BMUB, KfW promotes climate protection with purchase of green bonds, April 2015
[156] Deutsche Bank, Deutsche Bank strengthens the 'Green Bonds' growth market, July 2014
[157] CBI, Update: Vive Paris !, November 2015
[158] KfW, Green bonds – Made by KfW, March 2016

survey 2015, incentives for further investment may lead to a misallocation of capital within the German financial market.

German financial institutions cited a lack of standardization of green bond contracts as well as an absent universal definition of sustainable green investment on national as well as international level as one of the main obstacles for a growing green bond market. KfW and the BMUB reacted on the lack of standardization, transparent and accountable ESG investment by developing quality standards for green bonds of German issuers in 2015.

On the other hand, according to respondents, the market is not sufficiently mature and so any additional regulation would risk further development.

Italy

Overview of Italian green bond market development.

Italian green bond market sector development in line with GBP 2016 eligible categories		Key Issuers			
		Development Banks	Banks and IFs	Municipalities	Corporates
Renewable energy	>50%	X	X		X
Energy efficiency	25-50%	X	X		
Pollution prevention and control	<5%				
Sustainable management of living natural resources	<5%				
Terrestrial and aquatic biodiversity conservation	<5%				
Clean transportation	<5%				
Sustainable water management (including clean and/or drinking water)	<5%		X		
Climate Adaptation	<5%				
Eco-efficient products, production technologies and processes	<5%				

1. Market development and functioning

Key milestones

2007	UniCredit acted as Joint Lead Manager in the European Investment Bank's Green Bond, the first bond of its kind to come to market.[159]
2010	SunPower issues Italy´s first project bond to finance photovoltaic facilities.
2014	Hera issued its first EUR 500 million green bond. Innovatec, an Italian energy-efficiency and energy services company, issued a EUR 15 million bond. UniCredit joins the "Climate Bonds Partner" programme.
2015	Metro 5 issued a EUR 150 MM unlabelled climate project bond in order to finance the extension of metro 5 line. In 2015, the World Bank issued a Green Growth Bond for Italian retail investors that closed at USD 83.54 million.

The Italian Ministry of the Economy and Finance issues five different types of Government bonds that are held by both individual investors and institutional investors. Those types include short-term BOT bonds, (Buoni Ordinari del Tesoro), zero coupon bonds CTZs (Certificati del Tesoro Zero Coupon), Treasury Bonds BTPs (Buoni del Tesoro Poliennali), Index-linked BTPs and Treasury Certificates CCT (Certificati di Credito del Tesoro).[160]

In terms of bond issuance activity of selected European countries, Italy ranks third after France and Germany, with an issuance of 76 bonds in 2014. Traditionally, bonds have been used to finance infrastructure projects in Italy, as for instance the construction of the country's "autostradas".[161] The number of issuances in Italy experienced particularly strong development between 2011 and 2014, where the number of new issuances increased by a factor of four.

Italy's markets for corporate bonds have significantly expanded since 2012 and the number of corporate issuers nearly quadrupled to 66 in 2014. In Italy, a relatively large number of bonds with small volumes was issued in 2014, with volumes under EUR 25 million; two out of five corporate bonds (41%) are attributable to the mini bond segment. Concurrently, the proportion of issues above EUR 1 bn. (4%) was lower than in other European countries.[162]

The green bond market is still in a very early stage of development. In 2010, the successful bond issuance for SunPower's Montalto di Castro solar PV park was the world's first publicly-rated bond issue for a solar project[163]. A key milestone was the issuance of the first green-labelled corporate bond by the utility company HERA in 2014. In terms of investment, the issuance of a Green Growth Bond for Italian retail investors (Italy is the largest retail investment market in Europe[164]) was also a milestone. In the

[159] UniCredit, Environmental Commitment, June 2015
[160] afme, Types of Bonds, 2016
[161] CBI, Fund the rapid transition, n.d.
[162] Creditreform, Corporate Bonds in Europe 2005-2014, June 2015
[163] Della Croce, R., C. Kaminker and F. Stewart (OECD), The Role of Pension Funds in Financing Green Growth Initiatives, 2011
[164] BANCA IMI, "The Italian case study: the largest retail bond market in Europe", 2014

Italian MOT market, the largest retail bond market place, seven green bonds were listed in September 2015, including six by EIB and one by IBRD [165].

Besides these labelled green bonds activities, there have been bonds issuances, especially by companies, that can be considered as unlabelled green bonds. In 2015, the Viveracqua was issued with a total volume of EUR 150 million[166]. The Viveracqua consortium consists of eight small- and medium-sized water utilities that issued minibonds, which were subscribed by a SPV. These so called Viveracqua Hydrobonds served as collateral for an asset-backed securitization. The majority of the bonds (EUR 148.5 million) were purchased by the EIB. The Viveracqua Hydrobond is credit enhanced through two loss-absorbing mechanisms for a total of EUR 30m or 20% of the deal size. Most recently, a financial intermediary, the Foresight Group, has suggested the establishment of an Italian Green Bond Fund. The fund would seek to provide innovative debt financing in the form of mini bonds to smaller renewable energy projects in Italy. The proposal is currently under appraisal[167].

In 2015, the World Bank issued a Green Growth Bond for Italian retail investors that closed at USD 83.54 million.[168]

2. Main actors

Corporations / Utilities

SunPower Corp. is an Italian solar panel producer, which was founded in 1985. Its headquarters are located in San Jose, California and the corporation has offices in North America, Europe, Australia and Asia. In December 2010, SunPower Corp. issued the EUR 195.2 million solar bond "Andromeda". The lead managers for the bonds were BNP Paribas, London Branch and Société Générale (Corporation & Investment Banking). In order to finance the construction of two photovoltaic facilities in Italy, two project loans were initially taken out; these were repaid using the proceeds from the issue of the bond tranches. Tranche A benefits from a loan guarantee by the Italian Export Credit Agency (SACE, an insurance and financial group controlled by Italy's Ministry of Economy and Finance), the B tranche was subscribed to in full by the EIB.[169] Proceeds were used for the development and construction of the company´s 44-megawatt Montalto di Castro solar park in Italy. The bond was the world's first publicly rated bond issue for a solar project and Italy's first rated bond.[170]

Hera is an Italian energy, water and environmental services utility. The utility issued its first EUR 500 million green bond in July 2014. It was three times oversubscribed. Lead managers were Banca IMI, BNP Paribas, Barclays, Crédit Agricole CIB, Deutsche Bank, Mediobanca, Banca di Credito Finanziario and UniCredit. [171] Proceeds are used to finance or refinance projects in the fields of climate mitigation (renewable energy, energy efficiency), improvement in air quality (by reducing emissions into the atmosphere of the Group's waste-to-energy plants), increasing the availability of clean water and increasing sustainable waste management.[172]

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[165] London Stock Exchange, Green Bonds on London Stock Exchange, 2015
[166] EIB, Info 1/2015, 2015
[167] EIB, Italian Green Bond Fund, 2016
[168] World Bank, World Bank's Green Growth Bond 07/2023 for Italian Retail Investors closes at USD 83.54 Million, 2015
[169] Löffler, Karsten; Ruiz, Simone; Liesch, Thomas, Climate Bonds, July 2013
[170] SunPower, SunPower closes the Industry's First Solar Project Bonds, December 2010
[171] CBI, Italian utility Hera issues EUR 500m, BBB, 10 yr green bond, July 2014
[172] Gruppo HERA, Hera launches the first Italian green bond, July 2014

Hera announced the establishment internal tracking systems to monitor the allocation of the proceeds, which will be reviewed by DNV-GL. DNV-GL certified that the Hera Green Bond is aligned with the Green Bond Principles.[173]

Enna Energia issued Italy´s first green bond. In 2016, Enna Energie received a Green Bond Certificate for having issued the country's first green bond.[174]

Innovatec is an Italian energy-efficiency and energy services company that issued a 15 million euro bond in October 2014. JCI is lead manager of this bond. Innovatec has not provided a second party opinion on the green criteria of the bond, or details around disclosure and reporting.

Metro5 issued a EUR 150 million unlabelled climate project bond in order to finance the extension of metro 5 line in June 2015. Revenues were allocated to the project under a public private partnership agreement with the Municipality of Milan.[175]

Bank (underwriter)

UniCredit is an Italian commercial bank operating in 17 countries with 144.000 employees, and an international network that includes 50 markets. UniCredit is a partner of the Green Bond Principles and acts as underwriter of several green bond issuances. In 2007, UniCredit acted as Joint Lead Manager in the European Investment Bank's Green Bond, the first bond of its kind to come to market.[176] In 2014, UniCredit lead managed three of the five European utility companies that entered the green bond market in benchmark-sized transactions.[177] In December 2014, the bank became an official "Climate Bonds Partner" [178].

3. Classification by sector

Utilities are the main issuers of green bonds in Italy and proceeds are mainly allocated to climate mitigation projects.

SunPower issued the first climate-related project bond where debt servicing is directly linked to the performance of the underlying assets. In the case of the SunPower / Andromeda bond, two project loans were initially taken out in order to finance the construction of two PV facilities in Italy. These were repaid using the proceed from the issue of the bond tranches.

Metro5 issued an unlabelled project bond in order to finance the extension of a metro line.

Aside from photovoltaic productions, proceeds are allocated to complementary climate mitigation projects like district heating, reduction of emissions to the atmosphere, projects aiming to increase the availability of clean water and sustainable waste management.

[173] HERA Group, Green Bond Presentation, June 2014
[174] CBI, Green Bond Awards, 2016
[175] CBI, Weekly blog: MS $500m inaugural GB ups ante with a rare US 2nd opinion, June 2015
[176] UniCredit, Environmental Commitment, 2015
[177] Unicreditgroup, 2014 Integrated Report, 2014
[178] CBI, UniCredit, the largest corporate lender in Europe, becomes a Climate Bonds Partner, 2014

4. Use and development of standards

Hera is the only issuer identified whose bonds are aligned with the Green Bond Principles and certified by DNV GL. On the international level, UniCredit is a member of the Green Bond Principles.[179]

DNV GL provides second party opinions on use of proceeds, process for project evaluation and selection, management of proceeds as well as reporting. The certification is aligned with the Green Bond Principles.[180]

No national initiative in standard setting for green bonds could be identified.

5. Identified best-practice public sector measures

Italy's public sector makes efforts to promote the development of a green bond market. While these support measures might not be considered "best practice" in international comparison, they nonetheless illustrate the public sector's ambition to strengthen the national green bond market.

For instance, the **Ministry of Economy and Finance** (through SACE) acted as **loan guarantee** for a tranche of SunPower's project bond issuance. Thanks to this engagement the bond had a better rating and a lower interest rate. Proceeds of the bond were used for the development and construction of a 44-megawatt solar park. This transaction was the world's first publicly rated bond issue for a solar project.

Furthermore, in 2012, the Italian Government created the Minibond market (**Extra-MOT Pro**) for SMEs to issue debt instruments. The issuers are SMEs with audited financial statements and a sponsor (typically a local bank). Minibonds are sold solely to qualified investors. Partial guarantees for unsecured mini bonds are provided by the Italian Government-owned SACE (for minibonds issued to finance an internationalization project) and by the public Central Fund of Guarantee (Fondo Centrale di Garanzia)[181]. Mini bonds for SMEs could serve as an example for similar small-sized green bonds.

6. Identified key bottlenecks

The following bottlenecks were identified by an analysis of statements given by prominent financial institutions in the context of the Capital Markets Union EU survey 2015. It should be noted that these bottlenecks represent the view of a selected range of stakeholders.

A major bottleneck is a lack of common standards and reporting. It was stated that especially for carbon disclosure, comprehensive standards are lacking and a de-facto standard for reporting emerged through vendors such as Bloomberg or Thomson Financial. Given that the majority of proceeds of Italian green bonds are allocated to (climate change) mitigation projects, this seems to be a bottleneck within the Italian green bond market.

Another point that was mentioned is a lack of information for investors. It was stated that the prejudice with regard to the correlation between profitability and ethics is still persistent. Although empirical evidence shows that ESG investments do not underperform, investors are not aware of this.

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[179] ICMA, Membership, 2016
[180] UniCredit, Green Bonds: The Chartbook, April 2015
[181] OECD, Unlocking SME finance through market-based debt: Securitisation, private placements and bonds, 2014

United Kingdom

Overview of UK green bond market development.

UK green bond market sector development in line with GBP 2016 eligible categories		Key Issuers			
		Development Banks	Banks and IFs	Municipalities	Corporates
Renewable energy	25-50%	X			X
Energy efficiency	5-25%	X			X
Pollution prevention and control	<5%				X
Sustainable management of living natural resources	<5%				
Terrestrial and aquatic biodiversity conservation,	<5%				
Clean transportation	>50%		X	X	X
Sustainable water management (including clean and/or drinking water)	<5%				
Climate Adaptation	<5%				
Eco-efficient products, production technologies and processes	<5%				

1. Market development and functioning

Key milestones

2009	First green bond listed by World Bank on London Stock Exchange's markets
2014	The International Finance Corporation (IFC) issues the first Renminbi-denominated green bond, raising RMB 500 million. This set the precedent as the first green bond issued by a multilateral institution in the offshore Chinese markets. LSEG joins UN's Sustainable Stock Exchanges (SSE) initiative
2015	Transport for London lists its debut green bond, raising £400 million, to improve sustainability of London transport network. IFC issues the first offshore Indian Rupee denominated green bond, raising INR 3.15 bn. Agricultural Bank of China lists a USD1bn triple tranche, dual currency green bond, the largest green issue on London Stock Exchange's markets. London Stock Exchange becomes an Observer to the internationally recognized Green Bond Principles guidelines
2016	LSEG joined the Green Infrastructure Investment Coalition (GIIC), which was launched at COP21 by alliance of global investors, development banks, financial sector associations & NGOs. Its aim is to support the financing of a rapid transition to a low. LSEG also joined the City of London's Green Finance Initiative run in partnership with HMT and the Department of Energy and Climate Change. It also joined the Climate Bonds Initiative Partnership Program

The total outstanding UK-registered green bond issuance reached USD 57.1 bn. in July 2015[182]. The UK is the third largest green bond market after China and the US as of July 2015, considering both labelled and climate-aligned bonds, with roughly 9% of total global issuance. Most UK registered green bonds have been issued in GBP, but issuance of bonds in other currencies has been increasing since 2011, with 21% of outstanding issuance in non-GBP currencies.

Transport-related bonds (notably rail) continue to dominate the UK green bond market – with inclusion based on superior environmental performance compared with road and air transport. In addition, an increasing number of clean energy-related bonds have been issued in recent years. A notable green energy refinancing example is Gwynt y Mor OFTO Plc's USD 325 million issuance for an offshore wind power transmission link, developed with EIB project bond credit enhancement. In May 2015, Transport for London issued a GBP 400 million green bond, a notable issuance from a quasi-public entity.[183]

[182] CBI (2015) Bonds and Climate Change: The State of the Market in 2015. July 2015.

2. Main actors

National

The London Stock Exchange (LSE) welcomed over 27 green bonds to its markets denominated in six different currencies, which have raised more than USD 5.18 bn. equivalent.[184] In 2015, 12 green bonds were listed on LSE, which translated to a 14.5% market share of total green bond (in total, 1,900+ bonds were issued on London Stock Exchange's debt markets in 2015, raising more than USD 414bn. equivalent, in 25 different currencies). The OFIS market structure offers dedicated trading segments for 'green' bonds. LSE has a range of dedicated 'green bond' segments, offering a flexible range of market models, covering both Regulated Market (RM) and MTF segments, comprising retail and wholesale, and offering the choice of trade reporting, end-of-day and continuous quoting.

Green Investment Bank (GIB) helps mobilise GBP 10bn of capital into UK green Infrastructure and has partnered with almost 100 co-investors. GIB developed a Handbook[185], setting out practical tools to assess, monitor and report the green impact of every investment. In 2014, the GIB announced to invest GBP 26m, alongside GBP 48m debt to be raised from the bond market, guaranteed by HM Treasury[186]. It has the following "green purposes" - reducing greenhouse gas emissions; advancing efficiency in the use of natural resources; protecting or enhancing the natural environment and biodiversity; and promoting environmental sustainability. Projects requiring funding from the bank must meet the five purposes.

Transport for London (TfL), a UK government owned corporation issued GBP denominated (GBP 400million) Green bonds to finance transportation projects. Joint lead managers are Deutsche Bank and the Bank of America Merrill Lynch (BoAML) with a Third Party opinion provided by DNV GL. Proceeds will support the objectives of TfL's corporate environmental framework, which includes reducing air pollution in the city, improving natural resource management and preparing for potential climate change effects. (24 Apr 2015)

Shanks Group, a UK waste to product company used EUR 100 million Green Bond issuance to tap into retail investor liquidity and finance sustainable infrastructure. Lead managers are BNP Paribas, KBC Bank (16 Jun 2015)

Unilever PLC, issued a GBP 250 million "green sustainability" bond linked to projects that improve the energy and water efficiency of the company's internal operations, where the threshold for each project to be included is that it must reduce CO_2 emissions or water use by 50% if a new project, or 30% if a retrofit, against a 2008 company baseline. Worth noting is that according to MSCI the bond does not meet the publicly stated index criteria[187]. This bond caused some controversy.

[184] Green Bonds on London Stock Exchange
[185] Green Investment Handbook
[186] Green Investment Bank, Speyside green energy project
[187] Unilever's green bond, (Environmental Finance, 2015)

International

HSBC has committed USD 1 bn. to a green bond portfolio which will invest in high quality liquid assets[188]. The bonds will be aligned with the Green Bond Principles and will be used to fund projects in sectors such as renewable energy, energy efficiency, clean transportation and climate change adaption as well as SME financing in sectors such public transport, education and healthcare.[189] HSBC has been one of the leaders at the forefront of sustainable financing for a number of years, and as one of the top three leading global underwriters of Green Bonds, is playing a pivotal role in the market's overall development.

Climate Bonds Initiative is an investor-focused not-for-profit working with 1) Market tracking & Demonstration projects, which includes reporting on the Climate Bond developments and sizing of the Climate Bonds universe; 2) Developing trusted standards and a labelling scheme for bonds; 3) Providing policy models and advice to catalyse the debt capital markets.[190]

3. Classification by sector

They majority of the key stakeholders in the UK green bond market, including CBI, HSBC and the London Stock Exchange, classify the green bonds in accordance with the GBP. [191,192] The Green Investment Bank has developed its own framework and invests in offshore wind, energy efficiency, waste and bioenergy and onshore renewables (but has not yet issued green bonds). In addition, GIB has established sector specific advisor roles, for which they have developed scopes of works regarding: 1) waste projects (a life cycle assessment scope of works which is represented in Green Impact Reporting Criteria); 2) for biomass projects; and 3) for energy efficiency projects.

4. Use and development of standards

According to the Capital Markets Union EU survey and interviews executed for this study[193]:

HSBC is supportive of voluntary guidelines as the GBP and not supportive of common EU standards, as the market still needs to grow and mature, and the introduction of overly burdensome regional standards could hamper the development. HSBC could support the introduction of common regional standards if public authorities chose to use incentive structures and increase risk capacity to scale up the green bond market. Any regional standards though should be based on ICMA GBP. In addition, HSBC sees Moody's decision to commence assessment of green bonds as a positive development. The international recognition of Moody's and their Green Bond Assessment should help facilitate greater standardization and more issuance.

[188] HSBC Commits USD 1 Bn. To Green Bond
[189] HSBC Green Bond Reports
[190] CBI website
[191] HSBC Green Bond Framework, 2015
[192] London Stock Exchange, Green Bonds Listing Process
[193] Capital Markets Union EU survey

LSE Group is suggesting improving the current system of third party verification. FTSE International Ltd (part of the LSE Group) is currently developing a self-reporting tool for issuers, so that investors can ultimately decide and the market can determine the best way to verify the green credentials of bonds.

5. Identified best-practice public sector measures

The following public measures have already been implemented in the UK:

1. A UK Green Bond Market Development Committee helps to consolidate existing market innovation and provides a platform for future growth
2. London's Green Finance Initiative works on strengthening London's position as climate finance capital
3. The City of London launched an initiative to make London the world leader in Green Finance . This is to use the City's convening power and relationship with industry to find practical ways to support the market. A model for this was a similar initiative to support the development of London's Renminbi markets which led to huge successes such as a growth in trade volumes of 600% since 2011, a government issued RMB bond, and the sale of more than USD 1 bn. dual currency bonds in London by the Agricultural Bank of China by 2015.
4. Developing a priority list for issuance of strategic green projects by a National Agency
5. Encouraging strategic green bond issuance from public entities (e.g. staged privatisation of GIB by 2020, which would allow a greater number of green infrastructure sectors)
6. The UK Business Growth Fund is one example, where the Financial Service Authority allowed preferential treatment in risk weightings to a pooled structure for SME lending
7. Yield Cos as an aggregation tool within the renewable energy and waste to energy sectors, which mitigate regulatory risks (e.g. Greencoat Wind, John Laing Environmental Assets, et.al)

6. Identified key bottlenecks

UK based respondents in the Capital Markets Union EU survey indicated the following bottlenecks[194]. It should be noted that these bottlenecks are not particular to the UK but represent the view of a selected range of stakeholders. Some of the perceived bottlenecks also apply to other countries.

- The key bottleneck to developing the green bond market is scale. To develop the scale required to finance the transition to a low carbon economy, incentivising green finance is necessary. This could be done through fiscal incentives from the national level, and disclosure obligations from the European level (HSBC)
- Being "too prescriptive" could impose unduly high barriers to entry. Therefore, voluntary compliance with market driven initiatives is the best way to support the green bond market (Clifford Chance LLP). As long as the market has expert opinions (either external parties such as CICERO, Oekom, CBI etc. or internal expertise shown by institutions such as EIB) on Green Bonds, the onus should

[194] Capital Markets Union EU survey

be with the investor to do due diligence, in line with standard practices evaluating other risks (HSBC)

- The green bond characteristics must fall under an asset class with associated benchmarks, including expected returns and volatility, as well as minimum liquidity requirements. A green bond therefore needs to either be a liquid (or government guaranteed) bond class or offer the higher returns of a well-rated corporate bond class. Factors which impinge upon the ability to invest in 'green bonds' are therefore no different to other niche or less developed assets – liquidity, scale and understanding the risks. Pension schemes have a fiduciary duty to invest in the most commercially competitive bonds after considering price, credit risk and liquidity – it is unlikely any scheme would, or indeed could, apply a premium to the "green" label (UK National Association of Pension Funds)
- The quality of a green bond must be ensured to maintain investor trust. This requires standardization of guidelines regarding transparency and disclosure on green bonds, including guidance for evaluating and reporting on the environmental impact. (International Corporate Governance Network).

Non-EU Countries

China

1. Market development and functioning

Key Milestones

2013	The China Banking Regulatory Commission (CBRC) published Green Credit Guidelines.
2014	The German car manufacturer Daimler issued the first corporate Panda bond. The Chinese government announced that municipalities were allowed to issue local bonds directly. Guangdong province is the first to issue a bond under the pilot scheme for municipal bond issuance.
2015	The Green Finance Task Force, co-convened by the People's Bank of China (PBoC) and UNEP, published a range of green bond policy proposals, including the development of official China-specific Green Bond Guidelines. Xinjiang Goldwind Science & Technology Co. issued China's first sale of labelled green bonds denominated in US dollars (value: USD 300 million). Hong Kong's CLP Holdings issued the first corporate green bond through its subsidiary in India, securing USD 90.3 million for capital expenditure and refinancing of wind power. Agricultural Bank of China issued the first CNY-denominated green bond issued by a mainland Chinese financial institution. PBoC published the Green Bond Guidelines and the Green Bond Endorsed Project Catalogue.
2016	Shanghai Pudong Development Bank Co. raised CNY 20 bn. in China's first domestic green bond. Industrial Bank of China launched the first Chinese green credit asset-backed securitisation in line with new PBoC guidelines.

In 2014, China was the **world's third biggest bond market** as per bonds outstanding (after the U.S. and Japan); since 2005 the country's domestic bond market has increased by more than 500 per cent. As a share of the economy, however, China's bond market is still much smaller than in other developed economies. In 2012, it stood at 47% of GDP, while in the U.S. and Europe, bond markets stood at 222% and 190% of GDP, respectively.[195] The Chinese bond market has particularly been growing due to significant issuance of infrastructure bonds through state owned enterprises

[195] CBI and IISD, Growing a green bond market in China, 2015

and the "quasi-public" sector. Between 2009 and 2013 about 80% of the country's infrastructure debt was raised through infrastructure bonds. According to cbonds, 250 government bonds and about 220 corporate bonds structured the Chinese bond market in March 2016.[196] These numbers might be misleading, as the majority of significant bond issuance in China is from central government institutions and policy banks. Most corporate bonds are short-term and subject to "strong implicit government guarantees."

While most bonds are traded in the **interbank market** (93%), the **exchange market** and the **over-the-counter (OTC) market** account for smaller shares of China's bond trading. China's domestic ("onshore") market is complemented by an "**offshore**" market in Hong Kong, called "**Dim-Sum-Market**". Here, domestic and international issuers can issue CNY denominated bonds for the international market, without being controlled by Chinese regulators. Another option for non-Chinese issuers to participate in the Chinese bond market is through so-called "**Panda bonds**" [197]. These bonds can be used by non-Chinese issuers in the domestic bond market; their issuance is subject to strict regulations and only allowed for a predefined list of institutions, including for instance international development banks and the IFC.

In line with the growth of China's domestic bond market, the country's **green bond market** has also grown rapidly, reaching an overall value of USD 1 bn. in 2015.[198] Speaking of "climate-aligned bonds", China heads the list of the world's top ten countries, accounting for 33 per cent of climate-aligned bonds worldwide. Accordingly, the Chinese yuan (CNY) is the most prominent currency in climate-aligned bonds, followed by USD and EUR.[199]

The most prominent feature of the Chinese green bond market is the enactment of the **Chinese Green Bond Guidelines**. The Green Bond Guidelines set out standards for the use of green bonds, including criteria for the management of proceeds and requirements on disclosure. Regarding the environmental dimension, the China's Green Bond Guidelines offer a "localised definition of green to the market". They emphasise pollution prevention and ecological protection, hereby addressing the country's most pressing environmental challenges.[200] A complementary **Green Bond Endorsed Project Catalogue** describes the type of projects that are eligible for green bonds and is based on Chinese environmental policies and international standards. [201]

Shanghai Pudong Development Bank Co. and **China Industrial Bank** were the first two banks allowed to issue green bonds. Shanghai Pudong raised CNY 20 bn. in China's first domestic green bond issuance in January 2016, with the bond being two times oversubscribed.[202] China Industrial Bank launched China's first green credit ABS in January 2016. It is worth approximately USD 401 million and was oversubscribed 2.5 times.[203]

In the future, the Chinese bond market is expected to grow further, including the development of an ABS market. Also, municipal and corporate bonds are expected to play a more prominent role with decreasing reliance on the banking sector.

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[196] CBonds, China: bonds, 2016
[197] CBI and IISD, Growing a green bond market in China, 2015
[198] CBI, 2015 Green Bond Market Roundup, 2015
[199] CBI, Bonds and Climate Change, 2015
[200] Environmental Leader, From Green Bonds to Green Boom, January 2016
[201] World Resources Institute, "With New Guidelines, China's Green Bond Market Poised to Take Off in the Year of the Monkey", 2016
[202] Bloomberg, China's $230 Bn. Green Bond Thirst to Supercharge Market, February 2016
[203] IISD, Green Bonds, Green Boundaries: Building China's green financial system on a solid foundation, January 2016

2. Main actors

The main actors in the Chinese (green) bond market include state institutions and regulators, rating agencies, different investor groups, as well as bond-issuing institutions, including banks, private companies, state-owned companies, and – most recently – municipalities.

State institutions and regulators

China's State Council promotes a labelled green bond market as part of the country's shift to green development."

The Chinese financial market is regulated by different governmental bodies:

The **Ministry of Finance** is responsible for the issuance of government bonds as well as for the development of preferential tax policies for green bonds.

The **Central Bank /PBoC** regulates all open bond market operations and supervises the credit rating agencies that are active in the Chinese bond market. The bank is also an important player in terms of advancing China's green bond market. In April 2015, the bank released ambitious policy proposals, including for instance the development of green definitions, an evaluation system for the impacts of green bonds, tax incentives, preferential risk weighting and fast track issuance. Earlier, PBoC had established the China Green Finance Committee which it also chairs. [204] In 2016, the bank received a Green Bond Award for being a "Pioneer in green bond policy development".[205]

The **National Development and Reform Commission (NDRC)** has the mandate to promote agendas for sustainable development and ecological improvement in bond markets. It supervises the issuance of enterprise bonds.

The **China Banking Regulatory Commission (CBRC)** does not explicitly regulate bond issuance, but by regulating banking activities it is involved in the securitisation of credit assets and therefore a relevant regulator regarding the issuance of green ABS. Moreover, the CBRC implemented the Green Credit Guidelines in 2012, which are often referred to as a benchmark for the recently implemented Green Bond Guidelines.

The **China Securities Regulatory Commission (CSRC)** regulates the exchange bond market, including for instance foreign investor quotas as well as rules and procedures for corporate bond issuance. By reforming these sectors, it can promote integration of the green bond market.

Rating Agencies

There are ten main crediting agencies for the Chinese bond market; the most relevant ones are China Chengxin International Credit Rating, China Lianhe Credit Rating and Dagong International Credit Rating. Together these three control 80 per cent of the market. The PBoC supervises the rating agencies.[206]

Besides this regular rating system, the Chinese wealth management service provider Noah Holdings Ltd. is trying to set up a ratings system for green debt with six rating organisations.[207]

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[204] London Stock Exchange Group, China Green Bond Conference, 2016
[205] CBI, Green Bond Awards, 2016
[206] CBI, Growing a green bond market in China, 2015
[207] Bloomberg, China to Boost $100 Bn. Green Bond Market for Renewables, 2015

Further, it is worth noting that rating regulations for green "use of proceeds" bonds differ from those for green ABS: while green bonds "would have the same rating as the issuer", green ABS would achieve a rating based on the performance of the underlying green assets."

Investors

Commercial banks are the dominant investors in China's bond market. They account for 64% of investments in the country's domestic bond market, followed by **mutual funds** (11%) and **insurance companies** (9%).[208]

While these domestic institutional investors particularly dominate the interbank market, relevant investors in the exchange market also include **smaller institutional investors** and **individuals**. In addition, **foreign institutional investors** are engaging with the Chinese bond market. This indicates an increasingly diversified investor base for the Chinese green bond market.

Banks

Banks are among the most relevant actors of the Chinese green bond market. While they conduct commercial banking operations, they are at the same time state-controlled. To date, the following banks have issued green bonds:

Shanghai Pudong Development Bank Co. and **China Industrial Bank** were the first two banks allowed to issue green bonds. Shanghai Pudong raised CNY 20 bn. in China's first domestic green bond issuance in January 2016, with the bond being two times oversubscribed. China Industrial Bank launched China's first green credit ABS in January 2016. It is worth approximately USD 401 million and was oversubscribed 2.5 times. Proceeds of these two green bond issuances are expected to fund environmental projects, including the reduction of carbon emissions.[209]

The **Agricultural Bank of China Ltd.** sold a green bond worth CNY 600 million in October 2015. The bond was eight times oversubscribed.[210] In 2016, the Bank received a Green Bond Award.[211]

Bank of Qingdao issued a green bond in March 2016. The bond was issued in two tranches, its lead underwriters were Guotai Junan Securities and Zhongtai Securities.[212]

Utilities, Private and State-owned Companies

Bond issuance by corporate entities accounts for about 25% of the Chinese bond market. In terms of absolute size, the Chinese corporate bond market is expected to overtake the U.S. corporate bond market within the next years. It is, however, worth noting that bonds issued by state-owned enterprises are also usually listed as corporate bonds.

China Datang Renewable Power Corporation issued a USD 995 million green bond for solar projects in June 2014.[213]

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[208] CBI, Growing a green bond market in China, 2015
[209] Carbon Pulse, Banks raise 30 bn. yuan for clean projects in China's first green bond auctions, January 2016
[210] World Resources Institute, With New Guidelines, China's Green Bond Market Poised to Take Off in the Year of the Monkey, 2016
[211] Bloomberg, China to Boost $100 Bn. Green Bond Market for Renewables, 2015
[212] Global Capital, Bank of Qingdao keeps China green bond momentum going, March 2016

China Railway Corp. is the largest issuer of any climate-aligned entity, with USD 171.5 bn. climate-aligned bonds".[214] Green bond finance has in this case for instance been used to finance China's fast-speed rail boom.

Xinjiang Goldwind Science & Technology Co. seems to be the most prominent example of a corporate bond issued in China. Xinjiang Goldwind is the second largest Chinese wind turbine manufacturer and in July 2015 it issued a USD 300 million green bond. This marked China's first sale of green bonds denominated in USD. The bond was almost five times oversubscribed. In 2016, Xinjiang Goldwind received a Green Bond Award.

CLP Holdings, based in Hong Kong, issued a corporate green bond through its subsidiary in India in September 2015. The issuance yielded more than USD 90 million for capital expenditure and the refinancing of wind power assets.[215]

Yalong River Hydropower Development Co. issued USD 973 million (CNY 6 bn.) of bonds outstanding for hydro projects.

Guodian Technology and Environment Group Corporation issued bonds worth USD 628 million (CNY 3.9 bn.) for renewable energy projects.[216]

Chaowei Power uses bond finance to develop electric bike batteries.

Municipal bond market

Municipalities have long been denied any role in the Chinese bond market. Since May 2014, however, they are allowed to directly issue bonds. A corresponding law obliges municipalities to release information on outstanding debts and the use of bond proceeds. A pilot scheme was launched in ten local governments (Shanghai, Zhejiang, Guangdong, Shenzhen, Jiangsu, Shandong, Beijing, Jiangxi, Ningxia, Qingdao). The first municipal bond issued under this pilot scheme came from Guangdong province in June 2014; its proceeds go to low-income housing and highway construction projects.

While the pilot scheme marked the start of a Chinese municipal bond market, it does not explicitly promote green municipal bonds.

3. Classification by sector

In China, bond markets have traditionally been used to fund large infrastructure projects.[217] With regard to green bonds, the vast majority of bonds outstanding are funding transport and rail projects, followed by renewable energy projects.

In the **transport / rail** sector prominent examples of bond finance are the green bond issued by China Railway Corp. and Chaowei Power's bond issuance for the development of electric bike batteries.

Most clean energy bonds issued in China to date have been used for **solar** power projects, as for instance China Datang Renewable Power Corporation's USD 995 million green bond in 2014.

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[213] CBonds, China: bonds, 2016
[214] CBI, Bonds and Climate Change, 2015
[215] Environmental Leader, From Green Bonds to Green Boom, January 2016
[216] CBI, How to issue a Green Bond in China, 2015
[217] HSBC, Green Bonds in China, July 2015

Hydropower is the second largest category of renewable energy projects financed through bond issuance. Here, Yalong River Hydropower Development Co. and Guodian Technology and Environment Group Corporation are prominent bond issuers.

It is expected that future issuances of green bonds will yield about USD 230 bn. of funds for renewable energy and environment projects within the next years. This development constitutes a significant growth in a market as recent as China's clean energy market.

4. Use and development of standards

Since 2007, China has been developing a framework for green credit financing. This process eventually led to the publication of **Green Credit Guidelines** by the China Banking Regulatory Commission (CBRC) in 2013. Building on this momentum, PBoC released China's **Green Financial Bond Guidelines** in December 2015. This makes China the first country in the world to publish official rules for the issuance of green bonds.[218]

The combination of both guidelines holds significant potential for the growth of China's green bond market. Given that the Green Credit Guidelines cover China's 20 most important banks that control about 80% of the country's lending, these banks are in a suitable position to issue green bonds as they already adhere to green standards in their financial operations.

The Green Bond Guidelines set out standards for the use of green bonds, including criteria for the management of proceeds and requirements on disclosure.[219] More specifically, green bond issuers are obliged to ensure that proceeds only go to those green assets disclosed in the bond issuing process. This may not be a problem for green bond issuers with specific environmental units (e.g. some of the large commercial banks, including Industrial Bank of China). However, issuers without environmental departments are required to set up specialised accounts.

Regarding the environmental dimension, the China's Green Bond Guidelines offer a localised definition of green to the market. They emphasise pollution prevention and ecological protection, hereby addressing the country's most pressing environmental challenges.

In addition to the Green Bond Guidelines, a **Green Bond Endorsed Project Catalogue** has been published bv PBoC. It describes the type of projects that are eligible for green bonds and is based on Chinese environmental policies and international standards. The catalogue classifies six project categories, including energy conservation, pollution control, resource conservation and recycling, clean transport, clean energy and ecological conservation and adaptation.

The Chinese government understands this first set of Green Bond Guidelines as a starting point. It has proposed a wide range of further supportive policies to promote the growth of the Chinese green bond market.

[218] IISD, Green Bonds, Green Boundaries: Building China's green financial system on a solid foundation, January 2016

[219] Environmental Leader, From Green Bonds to Green Boom, January 2016

5. Identified best-practice public sector measures

The following public measures have been **proposed** by China's central bank to further promote the country's green bond market:[220]

(1) Preferential risk weighting: in order to incentivise an increase in green bond issuance, green loans that are financed through green bonds may get more favourable risk weightings. Another option is that green bonds can get favourable treatment on the asset side, once held by investors. This would increase investors' demand. While for the green bond market preferential risk weighting is to date only a proposal, this measure has been tested in the Chinese bond market, with SME bonds being subject to preferential risk weighting already.

(2) Exemption from loan-deposit ratio cap for loans funded by green bonds is also discussed as a support mechanism.

(3) Another public measure proposed is a fast-track approval procedure for green bonds.

(4) Tax incentives for labelled green bonds in the form of tax exemptions may allow institutional investors to treat green bonds as treasury investments. Developing and implementing these tax incentives is expected to take one to two years. It is planned that the tax incentives will be in place for three to five years to incubate the investor base and that they will then be reduced.

6. Identified key bottlenecks

One challenge for bond markets in emerging economies such as China is the fact that many of the potential green bond issuers do not have investment-grade **credit ratings** from internationally recognised rating agencies. This can prevent international investors from engaging with the Chinese bond market.

Also, international investors might be hesitant to participate in the Chinese bond market due to its strong and rather complicated **regulatory regime** and the licenses required to operate in the market. Another bottleneck for international investors are the investment quotas that regulate the Chinese bond market in favour of domestic actors. These aspects, however, are less of a challenge to domestic investors. In fact, 98% of bonds outstanding in China are held by domestic investors.[221]

There exist **four major needs** before China's financial system – and especially its bond market - will be truly green: First, more domestic issuance of green bonds is required, possibly also at the local level. Secondly, more "championing of green bonds" is needed from domestic, institutional and international investors. Thirdly, universities or quasi-government institutions should assume a stronger role as independent assessors or second-party reviewers for green bonds. Fourthly, there is a need for more comprehensive data gathering to accurately quantify the environmental benefits of green bonds.

With respect to China's green bond standards, another challenge might be that while there are "large areas of overlap" between **international and Chinese standards**, there are also some differences. For instance, the Chinese understanding of green includes "clean coal utilisation" whereas the Climate Bonds Initiative excludes measures related for fossil fuel use.

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[220] CBI, Scaling Up Green Bond Markets for Sustainable Development, 2015
[221] HSBC, China embraces green bonds, 2016

Mexico

1. Market development and functioning

Key Milestones

2012	The Mexican wind industry attracts debt financing from international bond markets with Acciona Energía México's USD 298 million bond offering to refinance its 204 MW Oaxaca II and Oaxaca IV wind farms.[222] It is one of the first infrastructure projects in Latin America to receive an international scale investment grade rating. The projects meets all the requirements to qualify as a green bond. The Mexican Senate introduced Climate Change Law, which reassures the country's commitment to achieve a 30% reduction of GHG by 2020 and 50% by 2050.
2013	The Oaxaca wind farm project is awarded with "Latin American Project Bond Deal of the Year 2012" from Project Finance Magazine. [223] IFC green bonds support a new large-scale solar power facility in Mexico. IFC provided USD 25 million (USD315 million pesos), and has led the structuring of USD 50 million from Nafin to support the construction of the 30-megawatt Aura Solar I project, the country's first large-scale and first private solar power plant in Mexico. Mexico launches a voluntary carbon credit exchange with assistance from the UN Environment Programme (UNEP) and the UK Government. MEXICO2 provides carbon credits to the market that have been certified by internationally recognized methodologies and protocols.
2015	IDB and CTF launch the first phase of financing (USD 125 million) through the issuance of green bonds in the local capital markets for the energy efficiency projects developed by Mexican energy service companies (ESCOs) The first green bond is issued by Nafin (USD 500 million), Climate Bond Certified. Pemex, a government-owned oil company, has expressed an interest in green bonds and is considering to issue green bonds to support projects that otherwise would not get done. IDB approves financing together with Green Climate Fund to establish a regional Energy Efficiency Green Bond Facility (USD450 million) to underwrite energy efficiency projects.[224] Mexico will be the first country to implement this program.

[222] IFC Support for Mexican Wind Sector drives results, May 2014
[223] Acciona, ACCIONA wins Project Finance Magazine for the wind warm project in Mexico, March 2013
[224] IDB, November 2015

Mexico has one of the largest bond markets in Latin America and is now taking part in the global green bond market development. For this purpose, the country has established Green Bond Market Development Committee, which is led by the Mexican Stock Exchange, which launched the first green bond segment outside Europe.[225]

In 2013, Mexico's Stock Exchange helped to create a carbon trading platform called MEXICO2, which is now working on bringing green bonds to the domestic market.[226] In addition, Mexico's Stock Exchange plans to open the segment in Mexican pesos (in 2016), which is anticipated to encourage issuance in the country. The development of the green bond market is supported by '*Green Bonds Mexico: Channeling Private Investment into the Low-Carbon Economy*' project, which is backed by a steering committee that includes the Mexican Ministry of Environment and Natural Resources, the Mexican Ministry of Energy, the Mexican Banking Association, the Mexican Stock Exchange, The British Embassy in Mexico, HSBC, the World Bank and the Inter-American Development Bank.

The important step in the development of the market was the issuance of the first green bond in October 2015. It was issued by Nacional Financiera (Nafin), Mexico's state-owned development bank.[227] The Nafin green bond is worth USD 500 million for a coupon rate of 3.41% for a period of 5 years.[228] The bond was rated by Moody's and Fitch with A3 and BBB+ credit ratings, respectively. The bond have received Climate Bond Certification and it will be used to finance 9 wind energy projects located in Oaxaca, Nuevo Leon and Baja California. The demand for Nafin green bond reached an amount over USD 2.5 bn., which is 5 times more than the allocated amount. Bank of America Merrill Lynch, Credit Agricole CIB, and Daiwa Capital Markets America were the lead managers for the issuance and Sustainalytics provided a second review for the green bond.

Before the issuance of the first green bond, the Inter-American Development Bank (IDB) have supported promotion of efficient use of energy and reduction of GHG as well as development of a new asset class in the debt capital in Mexico.[229] In 2015, the IDB together with Clean Technology Fund (CTF) have closed the first phase of financing (USD 125 million) through the issuance of green bonds in the local capital markets for the energy efficiency projects developed by Mexican energy service companies (ESCOs[230]). According to the IDB, the first phase of this transaction was structured as a warehouse line for up to USD 50 million for the purpose of accumulating a portfolio of standardization energy efficiency receivables from two ESCOs: Soluciones Energéticas Integrales (ECON) and Veolus Energía y Gestión Técnica (VEOLUS). Afterwards, those investments will be securitized in a second phase through the issuance of green bonds in the local debt capital markets. Mexico's National Programme for Sustainable Energy Use (PRONASE) estimates potential savings in final energy consumption resulting from the implementation of the projects from 34,800 to 40,500 GWh by 2025.

[225] Environmental Finance, Mexico's Stock Exchange to launch green bond, 2015
[226] MEXICO2 Plataforma Mexicana de Carbono
[227] CBI, Viva Mexico!, November 2015
[228] Nafin, Reporting on Green Bond, 2015
[229] IDB, IDB to support energy efficiency financing through issuance of Green Bonds in Mexico, May 2015
[230] More on Energy Service Companies in Mexico, here

2. Main actors

National

Nacional Financiera (Nafin): is a national development bank in Mexico. Beginning in 1925 with the establishment of the Bank of Mexico, the nation's central bank, the Mexican government organized more than a dozen public credit institutions to aid in the reconstruction of the financial system and to support the development of specific sectors of the economy. In 2015, Nafin issued the first green bond in Mexico.

Mexican Stock Exchange (**Bolsa Mexicana de Valores, BMV**) is the only stock exchange in Mexico. It is the second largest stock exchange in Latin America after Brazil. It plays an active role in development of green bond market through creation of green bonds denominated in Mexican pesos. It also lunched MEXICO$_2$ (the carbon trading platform) is an initiative that responds to the needs of the country in the face of climate change.

Infonavit (Instituto del Fondo Nacional de la Vivienda para los Trabajadores) is the Mexican federal institute for worker's housing, founded in 1972. It is the largest mortgage lender in Latin America, with over 5 million mortgages on its books. Infonavit has developed a green mortgage scheme, which is a housing scheme to encourage the use of energy efficient systems and technologies for low-income households.

International

The Inter-American Development Bank (IDB): is one of the leading sources of development financing for Latin America and the Caribbean. The IDB supports the country in the following areas: public management; the financial system; labour markets; business competitiveness; social protection; health; urban development; rural development; and climate change. For instance, the IDB supports projects within energy efficiency developed by Mexican energy service companies (ECOS).

The International Finance Corporation (IFC): a member of the World Bank Group, is the largest global development institution focused exclusively on the private sector in developing countries. In Mexico, the IFC develops frameworks for effective private sector participation, supports energy-efficient projects, and develops infrastructure to strengthen competitiveness. The IFC also is one of the earliest issuers of green bonds, launching a green bond program in 2010 to help catalyse the market and unlock investment for private sector projects that support renewable energy and energy efficiency. The IFC green bonds are supporting companies like Mexico's Optima Energia, which helps hotels in Mexico achieve energy savings.

Moody's: is an international rating agency, which provides credit ratings, research, tools and analysis that contribute to transparent and integrated financial markets. The company rated the first Mexican green bond with A3 rating.

Fitch Rating: is an international rating agency, which provides credit ratings and research. The company rated the first Mexican green bond with BBB+ rating.

3. Classification by sector

The first green bond issued by Nafin supports wind energy projects in Mexico. Due to the country's strategic commitment to achieve a 30% reduction of GHG by 2020, it is expected that more green bonds will be issued to support renewable energy and energy efficiency projects.

4. Use and development of standards

The only labelled green bond in Mexico was issued by Nafin to finance wind energy projects. The joint lead managers for this issuance were Bank of America Merrill Lynch, Credit Agricole CIB, and Daiwa Capital Markets America. Sustainalytics provided the second review for this bond and it was verified as being compliant with the Climate Bonds Standard.[231]

5. Identified best-practice public sector measures

IADB has set-up a financial warehouse in Mexico for funding investments in energy efficiency. The warehouse operates as a Special Purpose Vehicle (SPV). The SPV makes a senior credit line of up to USD50 million available to three Energy Service Companies (ESCOs) for an 8-year term. These ESCOs are ECON Soluciones Energéticas Integrales and VEOLUS. They use the funds to finance energy efficiency investments among SMEs on the scale of around USD 3 million per investment . Each of the projects is expected to generate energy savings on the scale of 15%. Until 2025 the investments are expected to provide savings on the scale of 35,000 – 40,500 MWh.

In a second phase, IADB will make available another USD 56 million to purchase the loans from the SPV, aggregate them and issue them as green bonds on the Mexican market. The Clean Technology Fund makes available another USD 19 million as a credit guarantee for the underlying loans. The aim of this partial credit guarantee is to reduce the risks associated with the cash flow streams of the loans. In case, the cash flow streams of the energy efficiency loans are affected, the guarantee could be used pay the bond investors. The green bonds are executed with Water Capital (WCAP).

Additional support is provided through non-reimbursable technical cooperation to develop capacity and knowledge for the assessment and identification of energy efficiency opportunities in accordance to the guidelines for energy efficiency projects.

It is required that no operation in which funding is invested can exceed 5 MW of generation capacity, averaging roughly USD3 million in investment, and must generate energy savings of at least 15% relative to the pre-investment baseline or reduce at least 15,000 tons of CO2e over the life of the operation. The investments are spread across a diverse set of sectors with the largest including commercial facilities (28%), hotels (14%), automotive (12%), plastic manufacturing (11%) and industrial facilities (8%). Other eligibility criteria include that the investment takes place in Mexico, complies with local law pertaining to operating licenses and environmental and social risks, and conducts energy efficiency audits to determine savings. Moreover, it may not be a State related entity.

The project is now being replicated across Latin America with funding that has been made available by the Green Climate Fund (GCF) in November 2015.

Mexico's **National Green Bond Market Development Committee** is a good example of cooperation in the green bond market. The committee is set at the domestic level and unites different types of public entities which are committed towards climate friendly development and facilitates their cooperation. Stakeholders represented by the Committee include for instance financial regulators, the Ministry of Finance and development banks. The Committee is led by the Mexican Stock Exchange, which launched the first green bond segment outside Europe.

[231] Sustainalytics Verfication of Nafin green bond, 2015

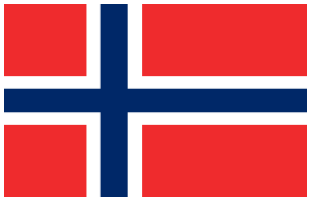
The purpose of these committees is to facilitate domestic cooperation between entities in pursuing development of the market. In Mexico, this is particularly useful as the country has one of the largest bond markets in Latin America and is increasingly engaging in the global green bond market development.

6. Identified key bottlenecks

The development of the green bond market in Mexico is limited by the weak structured demand. This is due to the lack of awareness towards new energy efficiency technologies, which entails new risks and additional costs for the unprepared market players.

No other specific bottlenecks were identified.

Norway



1. Market development and functioning

Key Milestones

2010	NIB created a framework for the issuance of NIB Environmental Bonds. The proceeds from NEBs to be used for lending to solutions for renewable energy, energy efficiency and public transport, and reduction of emissions into the air or water.[232] NIB's first Environmental Support Bond, the proceeds are used to finance the Climate Change, Energy Efficiency and Renewable Energy lending facility for environmental projects (CLEERE)[233]
2013	The first green bond issued by KBN worth USD 500 million with a 3-year maturity to finance climate friendly projects.
2014	The first corporate green bond by BKK, a Norwegian power company. The bond worth NOK 1.1 bn. (7-year maturity) will be used to fund hydropower projects on the West Coast of Norway. Green bond issued by Nord-Trøndelag Elektrisitetsverk (NTE), a Norwegian utility company, NOK 750 million (USD110.2m) in 3 tranches with varying tenor and floating coupons.[234] 1st green bond listed on Oslo's Stock Exchange (OSE). OSE announces that they will become the first stock exchange in the world to set up a separate list for green bonds (one listed at OSE and one for green bonds listed at Nordic ABM.[235]
2015	Oslo's Stock Exchange launched the green bond list. KBN issued its longest tenor green bond (USD500 million, 10 year tenor, rated AAA)

In 2010, the Nordic Investment Bank (NIB)[236] created a framework for issuance of Environmental Bonds, which allows investors to provide funds for the Bank's environmental lending.[237] This framework was created to support a growing number of fixed-income investors worldwide, who are concerned about addressing environmental challenges. Under this framework, the Environmental Bonds proceeds are used to finance projects that have a positive impact on the environment. However, only the projects located in a NIB's member country or EU may be considered for financing. Furthermore, the projects should belong to one of the following categories: energy efficiency, renewable energy, public transport solutions based on electricity and biofuels, electric-

[232] NIB, Environmental Bonds
[233] NIB, Environmental Support Bond, Dual Tranche Uridash1, 2010
[234] More information on the NTE green bond here
[235] CBI, Oslo Stock Exchange announces 1st green bond list on a stock exchange, 2014
[236] NIB is an international financial institution owned by Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway and Sweden. NIB acquires the funds for its lending by borrowing on the international capital markets
[237] NIB, Environmental Bonds

ity transmission and distribution systems, wastewater treatment and green buildings. Since 2011, the NIB Environmental Bonds have financed around 30 projects for a total of EUR 1.415 bn. focused on renewable energy (49%), green buildings (18%), energy efficiency (11%) and public transport (11%), waste management (9%) and wastewater treatment (2%).[238] Furthermore, NIB reaffirmed its commitment to continue issuing NIB Environmental Bonds and it is estimated that the bank can double the issuance in the coming years.

The first green bond by a Norwegian financial institution was issued by Kommunal-Banken Norway in 2013. [239] The bond is worth USD 500 million with a 3-year maturity and the proceeds are reserved for financing climate friendly projects according to the KBN Green Bond criteria. The bond was positively received and heavily oversubscribed by investors.

In 2014, the first corporate green bond worth NOK 1.1 bn. with (7-year maturity) was issued by BKK, a Norwegian power company. The proceeds of the green bond are used to finance hydropower projects on the West Coast of Norway. SEB was the sole organizer of the deal and CICERO provided a second party opinion on the environmental framework as well as presented an in-depth review highlighting relevant environmental concerns to investors. [240] Furthermore, BKK committed to report annually to investors on environmental impacts through a public investor letter.

Later the same year, Nord-Trøndelag Elektrisitetsverk (NTE), a Norwegian utility company, issued USD 110.2 million of corporate green bonds in 3 tranches with varying tenor and floating coupons.[241] Nordea Markets was sole underwriter of the bond and DNV GL provided a second party opinion, focused on compliance with GBP.

Oslo Stock Exchange (OSE) has played an active role in the development of the green bond market in Norway. It was the first stock exchange in the world to create a separate list for green bonds.[242] Two separate green bond lists were set up in late 2015, one listed on OSE and other one on Nordic ABM. This creation of the separate lists helps to drive standards in the market by setting up requirements to be listed on the stock exchange.

2. Main actors

National

Oslo's Stock Exchange (OSE, Oslo Børs): is the first stock exchange to launch a separate list for green bonds. The green bond list facilitates attention and visibility to green bonds and their issuers, and builds trust around green bonds.

Nordic ABM: is a marketplace for which Oslo Børs determines the marketplace rules in consultation with market participants. Nordic ABM is a separate marketplace that is not regulated or authorised under the terms of the Stock Exchange. Nordic ABM has a separate list for green bonds.

Kommunalbanken Norway (KBN): is the Norwegian municipal bank, has been issuing green bonds since 2013. KBN provides green loans to Norwegian municipalities at a slight discount to rates for its non-green loans.

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[238] NIB, Environmental Bonds, Presentation, 2015
[239] Kommunalbanken Norway, Green Bonds
[240] CBI, Norway Fjordland's BKK dives in with a green hydro bond, 2014
[241] More information on the NTE green bond here
[242] CBI, Oslo Stock Exchange announces 1st green bond list on a stock exchange, 2014

Norway's sovereign wealth fund: is the largest sovereign wealth fund in the world with USD 882 bn., it has expressed an intention to invest in labelled green bonds.[243]

Norwegian Sustainable Investment and Finance Association (Norsif): is an independent association of asset owners and asset managers, service providers and industry associations with interest in, and activities related to, responsible and sustainable investments.[244]

Center for International Climate and Environmental Research Oslo (CICERO) is an independent climate research foundation in Norway, has developed second opinions for 44 per cent of all the 474 labelled green bonds issued globally since June 2007. CICERO develops a second opinion by analysing whether the issuer's green bond framework is well aligned with a low-carbon and climate change resilient future, and how well this is supported by the issuer's policies and strategies.[245]

Nord-Trøndelag Elektrisitetsverk (NTE) is a Norwegian energy utility company, owned by North Trøndelag County Council. NTE issued senior unsecured "Green Bonds" to re-finance one of its hydro power project; "Kraftverkene i Øvre Namsen", which consists of four power plants.[246]

International

Skandinaviska Enskilda Banken AB (SEB), is a Swedish financial group for corporate customers, institutions and private individuals. SEB plays an active role in the green bond market (underwriter) and its mission is to make the Green Bond available across the credit and yield curves with all types of issuers and risk class.[247]

Nordic Investment Bank (NIB): is an international financial institution of the Nordic and Baltic countries. NIB finances projects that improve competitiveness and the environment of the region. It offers long-term loans and guarantees on competitive market terms to its clients in the private and public sectors. In 2010, NIB created a framework for NIB Environmental bonds and since 2011 have financed around 30 projects that have a positive impact on the environment.

3. Classification by sector

By early 2016, NIB Environmental Bonds have financed around 30 projects focused on renewable energy (49%), green buildings (18%), energy efficiency (11%) and public transport (11%), waste management (9%) and wastewater treatment (2%).

The first green bond by KBN was issued to finance environment friendly projects. These projects focus on renewable energy and energy efficiency (climate change mitigation) as well as climate resilient growth and sustainable development. [248] The following corporate green bonds by BKK and NTE were issued to finance hydropower projects.

[243] CBI, Scaling up Green Bond Markets for Sustainable Development
[244] More information on Norsif
[245] NIB, CICERO, A second opinion on green bonds, 2015
[246] DNV GL second party opinion on NTE green bond
[247] SEB Group, Green Bonds
[248] CBI

4. Use and development of standards

Oslo's Stock Exchange (OSE) takes an active role in the green bond market development and helps to drive standards by setting up the requirements for the green bonds to be listed on the stock exchange. According to OSE, green bonds must be used for environmentally friendly purposes, and a second opinion on the project has to be sought in order to be listed on the green list. It is also a requirement that the second opinion is made publicly available. In addition, the issuer's ongoing disclosure obligations from issuing a green bond should also be made publicly available through stock exchange announcements.

The requirement by OSE to provide a second opinion and make it publicly available is an important step towards defining the standards for green bonds. These requirements are stricter than the current market guidelines such as the Green Bonds Principles (GBP), because the GBP only recommend a second opinion.

5. Identified best-practice public sector measures

Public investments in green bonds through the Norway's "Government Pension Fund – Global" (since 2013/2014) is a good example of direct investments in green bonds by public actors. It is the world's largest sovereign wealth fund. The fund holds the surplus wealth produced by the country's petroleum income. According to the Sovereign Wealth Funds Institute (SWFI), it currently holds more than USD 850 bn.. Despite its name, the fund's financial backup is not derived from pensioners, but from oil profits.

Over the past years, the fund has slowly started to engage with the green bond market. Since 2009, the fund has had a programme for environmental investment mandates. However, it initially decided not to invest in green bonds under its new mandate; it considered the emerging green bond market to be immature. This changed with the growth of the green bond market. In 2013/2014, the fund reported first investments in green bonds under the environmental mandate. With the bond market growing and diversifying in terms of currencies, ratings and issuers, the Norwegian sovereign wealth fund is expected to increase its investments in green bonds.

6. Identified key bottlenecks

According to CICERCO, the global green bond market is driven by investors' confidence that the green bond proceeds are used to support transition to low-carbon economy. Currently there is no lack of green bond investors whereas the limiting factor is on the issuer side. The demand for green bonds is big, most of the issued green bonds are sold out fast and are oversubscribed.

In 2014, Norway's sovereign wealth fund stated that the main limitation to an increase in their investment in the green bond market is the relatively small size of the green bond market. With the recent growth and diversification of the market, this limitation may diminish.

United States

1. Market development and functioning

Key Milestones

2008	The U.S. federal government launched the Property Assessed Clean Energy bond (**PACE**).[249]
2009	The **State Treasury of California** is the first US investor to invest in the World Bank's first green bond (issued in 2008).[250] The U.S. federal government launched the Clean Renewable Energy Bonds (**CREBs**) and Qualified Energy Conservation Bonds (**QECBs**) programmes.[251]
2013	Hannon Armstrong Sustainable Infrastructure pioneered the **green asset backed bonds** (ABB) market by issuing a USD 100 million ABB backed by the cash flows of over 100 wind, solar and energy efficiency projects.[252] The US State of Massachusetts issued the **first labelled municipal green bond** to fund a range of environmental projects including the improvement of energy efficiency in public buildings, habitat restoration and water quality improvements.[253] The bond's volume was approx. USD 100 million.[254] Bank of America issued the **first corporate green bond** to finance renewable energy and energy efficiency projects.[255] SolarCity launched the **first solar-backed ABS** (i.e. bonds backed by rooftop solar panels).[256]

[249] Löffler et al., Climate bonds, 2013
[250] UniCredit, Green Bonds. The Chartbook, April 2015
[251] CBI , Scaling Up Green Bond Markets for Sustainable Development, 2015
[252] IFC, Next Season's Green Bond Harvest. Innovations in Green Credit Markets, June 2014
[253] KPMG, Gearing up for green bonds, 2015,
[254] Byrne et al., A solar city strategy applied to six municipalities. Integrating market, finance, and policy factors for infrastructure-scale photovoltaic development in Amsterdam, London, Munich, New York, Seoul, and Tokyo, 2015
[255] Bank of America, Bank of America issues $600 million "Green Bond", 2015
[256] Bloomberg, Green Bond market Outlook, 2014

2014	The Warehouse for Energy Efficiency Loans (**WHEEL**) was established in Pennsylvania. Regency Centers became the **first US Real Estate Investment Trust (REIT) to enter the Green Bonds space** with a 10 year, USD250 million corporate bond. The S&P Dow Jones **Green Bond Index** was launched. The District of Columbia (DC Water) issued the first "**green century bond**" with an announced maturity of 100 years. Massachusetts Institute of Technology (MIT) is the f**irst U.S. university to issue a green bond**.[257] **New York City** launched its Green Bond Program. The Bank of America Merrill Lynch **Green Bond Index** was launched.
2015	The electric utility Southern Power Company is the **first investment-grade utility in the U.S. to offer green bonds**. It issued two USD 500 million inaugural green bonds, yielding up to USD1bn to support its solar and wind projects development.[258] The **Clean Energy Victory Bonds Act** was introduced. New York Metropolitan Transport Authority issued the **first US municipal bond** to be certified under the **Climate Bonds Standards' Low Carbon Transport Criteria**.[259]

The U.S. bond market is very mature. The country's **government bond market** is the largest - and also one of the most reliable and liquid - bond market worldwide. Government bonds include treasury notes, treasury bonds and securities. The U.S. Treasury both sells these bonds to institutional and individual investors through public auctions. Auctions take place on a regular basis and follow a three-step procedure: announcement of the auction, bidding, and issuance of the purchased securities.[260]

The government bond market has recently been pushed through the introduction of the federal **Clean Energy Victory Bonds Act** in December 2015. The legislation aims at raising up to USD 50 bn. for investments in renewable energies (solar, wind, geothermal, biofuels), electric vehicles and energy efficiency. Under the Act, treasury bonds can be purchased by all American citizens, at minimum investments of USD 25.[261]

In 2015, the U.S. also became the **largest green bond issuing country**, surpassing supranational institutions as main issuers of green bonds. In total, green bonds worth USD 10.5 bn. were issued in 2015. This accounts for one fourth of the total amount issued worldwide.[262]

The main driving force behind the green bond market' growth are the **U.S. states and municipalities**.[263] Their bonds – sometimes referred to as "munis" – rank among the most significant on the climate bond market. In 2015, investors held a total of USD

[257] CBI, Cincinnati Uni issues $29.5m green bond, 2014
[258] PR Newswire, Southern Company subsidiary becomes first investment-grade U.S. utility to offer Green Bonds, 2015
[259] CBI, New York MTA $500m Triple Treat of Firsts!, 2016
[260] Cbonds, USA:bonds, 2016
[261] Green America, Clean Energy Victory Bonds will allow all Americans to invest in a clean energy future, 2015
[262] CBI, 2015 Green Bond Market Roundup, 2015
[263] UniCredit, Green Bonds. The Chartbook, April 2015

3.7 trillion of municipal bonds.[264] U.S. municipalities successfully use bonds to finance larger-scale climate projects, particularly energy efficiency and renewable energy projects. The municipal bond market is subsidised by the federal government through tax reliefs, reduced interest rates and specific US municipal bond schemes. The most relevant of these schemes are the Clean Renewable Energy Bonds (CREBs) and the Qualified Energy Conservation Bonds (QECBs) programs.

Besides government bonds and "munis", **corporate bonds** are also an important contributor to the U.S. bond market's strength. According to Cbonds Global, more than 13.000 corporate bonds (worth more than USD 8 trillion), 445 sovereign bonds (worth more than USD13 trillion) and 197 municipal bonds (worth more than USD 9 bn.) structured the U.S. bond market in March 2016.

According to an analysis by Bloomberg, sustained **growth** of the U.S. bond market will depend on a combination of increasing corporate bond issuance and emergence of solar and energy efficiency asset-backed securities (ABS). In fact, the U.S. green bond market seems to develop into that exact direction.

In contrast to most other countries, where the market for green ABS has not yet taken off, the US **green ABS market** kicked off in 2013, with three main ABS issues from Hannon Armstrong Sustainable Infrastructure, SolarCity and the Western Riverside Council of Governments. This is in line with the higher level of maturity of the U.S. financial markets in general and securitisation markets in particular.

2. Main actors

Given the maturity of the U.S. green bond market, a variety of significant actors can be identified, including federal government institutions, rating agencies, institutional investors, banks - both in their role as underwriters and as issuers of green bonds, municipal entities and utilities as well as private sector companies.

In the United States, state and federal governmental agencies are important stakeholders for the U.S. green bond market. The Environmental Protection Agency develops and enforces regulations that might require companies to address environmental concerns. These regulations could lead to increased green bond issuance. State Public Utilities Commissions are tasked with balancing the needs of consumers and utilities. They also look to foster new technology and competitive markets in an environmentally sound way, which supports the growth of green bond issuance. In 2013 The Executive Office of the President issued The President's Climate Action Plan, which makes the case for action to mitigate the effects of climate change. The plan includes carbon reduction measures and promotion of renewable energy initiatives that may serve as a signal/model to corporate issuers.

Federal Government

The **U.S. Treasury** is responsible of issuing government bonds through public auctions.

The **Overseas Private Investment Corporation (OPIC)** is the U.S. government's development finance institution. It offers credit enhancement tools for the public sector, including Green Certificates/ Guarantees (since 2014) and policy risk insurances against changes in feed-in-tariffs for renewable energy.

Rating Agencies

[264] Green City Bonds, how to issue a Green Muni bond, n.d.

Standard & Poor's (S&P), **Moody's**, and **Fitch** are the most prominent U.S. rating agencies. They also provide ratings for corporate and municipal green bonds. Further, S&P's has promoted standardization efforts in the green bond market by launching the S&P Dow Jones Green Bond Index in July 2014.

Institutional Investors

Green bonds offer particularly investment opportunities for institutional investors. In the U.S., the most relevant institutional investors include insurance companies, asset management companies and public pension funds.

Among the top ten holders of clean project bonds worldwide are six U.S. **insurance companies**, namely AIG (USD630m), Northwestern Mutual (USD261m), MetLife (USD202m), John Hancock (USD182m), Allstate (USD160m) and Variable Annuity Life (USD113m).

Examples for **asset management companies** investing in green bonds from the U.S. include State Street Global Advisors, TIAA-CREF Asset Management (TCAM), BlackRock, Vanguard Group and Breckinridge Capital Advisors.

Another group of relevant institutional investors are public pension funds, including for instance the second largest public pension fund in the US, **California State Teachers' Retirement System (CalSTRS)**.

Banks

Banks are important actors in the U.S. green bond market, where they act both as issuers of green bonds and as underwriters or providers of second review. Among the top ten corporate self-labelled green bond **underwriters** for 2013/2014 are four U.S. banks, namely Bank of America Merrill Lynch (ML), JPMorgan, Morgan Stanley and Citi.

The **Bank of America ML** issued the first corporate green bond to finance renewable energy and energy efficiency projects in November 2013. It had a size of USD 500 million. In May 2015, it issued its second green bond, worth USD 600 million. In terms of underwriting, the bank is the top self-labelled underwriter with more than USD 1 bn. in underwriting since mid-2013. Further, the bank as – similarly to S&P's – contributed to standardization efforts in the U.S. green bond market by launching the Bank of America ML Green Bond Index in November 2014. In 2016, the Bank of America ML received a Green Bond Award for having issued the first commercial bank green bond.[265]

Morgan Stanley issued its first green bond (USD 500 million) in June 2015, after having been active in the market as underwriter and co-founder of Green Bond Principles for quite some time. The proceeds of this bond are destined for wind, solar and energy efficiency loans.[266] In 2016, the bank received a Green Bond Certificate for being a pioneer in commercial bank second reviews.

Connecticut's green bank, the Clean Energy and Finance Authority (CEFIA) is relevant in terms of the green ABS market: In May 2014, the bank issued its first round of securities backed by a pool of loans funding energy efficiency upgrades in commercial buildings.

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[265] CBI, Green Bonds Awards, 2016
[266] CBI, Weekly blog: MS $500m inaugural GB ups ante with a rare US 2nd opinion, but v odd approach to pool, 2015

Municipalities and States

US municipalities are the main drivers of the country's green bond market. After the first municipal green bond had been issued in 2013 by the State of Massachusetts, the market soon gained momentum in mid-2014, with two key themes being green property for universities and sustainable water projects.

The **State of New York** raised USD 24.3 million in the bond market in August 2013. The money was used to finance energy efficiency projects as part of the Green Jobs – Green New York programme. The bonds were issued through the New York State Energy Research and Development Authority (NYSERDA) and backed by a guarantee form the New York State Environmental Facilities Corporation (EFC) through its Clean Water State Revolving Fund (SRF) programme. This was the first time that a state used a SRF – previously restricted to use for water and wastewater bonds – to support bonds to finance residential energy efficiency improvements.[267]

The **U.S. State of Massachusetts** issued both a conventional and a green bond in 2013. Even though both issues were priced identically, the green bond was 30 per cent oversubscribed while the regular bond remained undersubscribed. The issuance of this first municipal green bond in the U.S. marked the beginning of a growing municipal green bond market. The Massachusetts green bond had a volume of USD 100 million and is presented as a lighthouse project. The state's treasury publishes publicly accessible online "Investor Impact Reports" that contain detailed information and spending data on projects funded through the state's green bond. Generally, the bond provides funds for projects from four focal areas, namely: (1) land acquisition, open space protection and environmental remediation, (2) river revitalisation and preservation; habitat restoration, (3) energy efficiency and conservation, as well as (4) clean and drinking water.[268]

The state's **Massachusetts Clean Water Trust (MCWT)** issued another green bond (USD 207 million) in February 2016. The bond is rated AAA, Aaa and AA+ by Fitch, Moody's, S&P, respectively; the Bank of America ML acted as underwriter. The proceeds of this bond will be used to finance waste water and drinking water infrastructure projects.[269]

In September 201,4 the **Massachusetts Institute of Technology (MIT)** issued the first green bond ever issued by a U.S. university.

Soon, other universities followed this example:

The **University of Cincinnati** issued a series of green bonds worth USD 29.5 million in December 2014 to raise funds for the renovation of a residential student hall.

The **University of Indiana** issued a series of green bonds worth USD 66 million in December 2014 for green buildings renovations.

The **Colorado State University** issued a USD 42.1 million green bond to finance green buildings in September 2015. The underwriter of this deal was Morgan Stanley.[270]

The **University of Texas** issued a USD 206 million green bond in February 2016. It was rated AAA, Aaa and AA+ by Fitch, Moody's, S&P, respectively. The lead under-

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[267] Milford et al., Clean Energy Finance Through the Bond Market. A New Option for Progress, 2014
[268] MassGreenBonds, First Quarterly Investor Impact Report, 2013
[269] CBI, Green bond market report: 1st CBI certified Asian GB from HFE, 2016
[270] CBI, India's 1st green corporate bond from CLP (INR6bn), 2015

writer was Bank of America ML. The bond's proceeds will be used to finance green buildings.[271]

Another prominent example for continuous engagement with the municipal bond market are the State of New York and New York City:

The **New York State Environment Agency** issued a series of green bonds worth USD 367.5 million in September 2015. The bonds were rated AAA and Citi served as lead underwriter. The proceeds of these bonds will be distributed to local governments, state public authorities and specified private entities to help them (re-)finance clean water and drinking water projects.

While the states of Massachusetts and New York appear to have been particularly active on the municipal green bond market, other states have also joined in. The following list might not be complete but provides an overview of municipal bond action in the U.S.:

The **State of Connecticut** issued a USD 60 million inaugural green bond in 2014 to fund water projects.[272]

In **California**, the Western Riverside Council of Governments issued the first-ever PACE bond[273] in March 2014. To this end, the municipal agency cooperated with Deutsche Bank, which served as an underwriter. Further, the San Diego Unified School District launched a USD 100 million green bond in November 2015. The proceeds from this bond will be used for financing renewable energy and green modernisation schemes for green buildings.

The **State of Delaware's Sustainable Energy Utility** (SEU) issued a USD 73 million bond. The investment led to retrofits in participating buildings averaging 14 years to pay back. Although the SEU had not previously sold debt into the market, its bond offering received an AA+ rating from S&P.

Florida's East Central Regional Wastewater Treatment Facility issued its USD 87 million inaugural green bond in December 2014 to fund water projects.

The **New Jersey** Environmental Infrastructure Trust (NJEIT) serves as the state's financing authority. In 2015, it issued its inaugural green bond to support financing of State wastewater and water projects. The 19-tranche issuance had a volume of USD 9.56 million. The bond was rated AAA (S&P) and Aaa (Moody's) and was underwritten by Citi. The bond's proceeds are destined for smart growth projects, technology projects and small water system projects.

The **State of Vermont's** Educational and Health Buildings Financing Agency (VEHBFA) issued a USD 18.5 million green bond in November 2015. The aim is to finance the construction and renovation of residence halls of a private Catholic college. The bond was issued in 21 tranches, with maturity ranging from 1 to 27 years, and ratings of BBB+ (S&P) and Baa1 (Moody's). Morgan Stanley is the underwriter of this issuance.[274]

The **State of Hawaii** issued its second green bond in November 2015, worth USD 35 million. The bond's underwriter was Bank of America ML; it was rated AA (S&P's), AA

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[271] CBI, Green bond market report: 1st CBI certified Asian GB frm HFE, 2016
[272] CBI, US Green muni trio; Connecticut $60m up to 17yr, 2014
[273] Property assessed clean energy (PACE) is a way of financing energy efficiency or renewable energy investments for buildings. Under PACE legislation, municipal governments offer a specific bond to investors and then loan the money to consumers and businesses for these investments.
[274] CBI, Update: Vive Paris!, 2015

(Fitch) and Aa2 (Moody's). The proceeds will be used to purchase and preserve land, including the exclusive right to keep the land for conservation purposes (natural habitat protection).

New York City launched its Green Bond Programme in September 2014. It aimed at expanding the investor base available to the city and served as a model for other municipalities across the U.S.

The **New York Metropolitan Transport Authority (MTA)** issued its first green bond in February 2016. The bond is worth USD 500 million. It is the first U.S. municipal bond to be certified under the Climate Bonds Standards' Low Carbon Transport Criteria and thus the country's largest certified green bond to date.

The City of Spokane in **Washington State** issued its inaugural bond worth USD 181 million in December 2014 to fund water projects.

DC Water, the District of Columbia's water utility, issued the first green "century bond" in July 2014. The bond's maturity is announced to be 100 years. DC Water had already issued green municipal bonds before, usually with maturity of 30-35 years.[275]

Utilities and Private Companies

A significant number of water and energy utilities as well as of private companies has also been issuing green bonds over the last years. Again, the following list is not exhaustive but contains relevant examples.

Berkshire Hathaway Energy (formerly known as **MidAmerican Energy**) has issued some of the largest project bonds in the U.S. In order to finance the solar project "Topaz" it has issued a USD 850 million bond in 2012, followed by another USD 250 million bond in 2013. The 2012 bond represented the largest bond offering for a renewable energy project at that time. In June 2013, Berkshire Hathaway Energy issued a third bond of USD 1 bn. to finance the "Solar Star" project. This was the largest renewable project bond ever issued.

Tesla Motors Inc., an electric sports car manufacturer, issued a USD 600 million convertible green bond in May 2013.[276]

Exelon, a US utility with a large wind portfolio, issued one of the largest wind portfolio bonds in September 2013. The USD 613 million senior secured bond was backed by 13 different wind farm projects across Idaho, Kansas, Michigan, Oregon, New Mexico and Texas.

SolarCity was one of the first to enter the market for solar securitisation in the U.S. In November 2013, it issued its inaugural solar-backed ABS. The ABS had a volume of USD 54.4 million and was followed by a second ABS worth USD 70.2 million in March 2014. Both securities were underwritten by Credit Suisse.

Hannon Armstrong Sustainable Infrastructure is the first Real Estate Investment Trust (REIT) that is backed by renewables and energy efficient infrastructure. Its USD100 million ABS is backed by over 100 wind, solar, and energy efficiency projects across the US. The underwriters for Hannon Armstrong's ABS have not been disclosed. In 2016, Hannon Armstrong received a Green Bond Award for first green ABS.

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[275] CBI, DC Water issues AA+ $350m 'green century bond', 2014
[276] CBI, Tesla issues $600m, 5yr EV convertible bond, 2013 .

TerraForm Power Operating issued two green bonds in 2015, worth USD 800 and USD 300 million, respectively. The proceeds of the first bond are to be used for the acquisition of wind and solar power generation assets; the proceeds of the second bond are announced to be used mainly for the acquisition of a 460MW wind power plant from Invenergy.[277]

Renovate America is a provider of financing solutions for homes and communities. In 2015, it labelled one of its Property Assessed Clean Energy (PACE) loans as a green ABS worth USD 202 million. Until the end of 2015, it has financed more than USD 1 bn. through its HERO programme. The company has financed 90% of America's residential PACE programmes[278].

Southern Power Company, another U.S. utility, issued two USD 500 million inaugural **green bonds** in 2015. The bonds were rated as BBB+ (Fitch, S&P) and Baa1 (Moody's). . […] The emphasis of Southern Power's green bond is to finance current (financing started 12 months before issuance) or planned (financing occurring after issuance and by maturity date) solar and wind power plants in U.S.

Apple entered the green bond market in February 2016, issuing its first green bond (USD 1.5 bn.). The bond is part of a larger USD 12 bn. bond sale and has been rated by Moody's Aa1. The underwriters for Apple's green bond are Goldman Sachs, Bank of America ML, Deutsche Bank and JPMorgan. The proceeds will be used for financing green buildings, energy efficiency, renewable energy, energy infrastructure, water efficiency, recycling and pollution reduction.[279]

3. Classification by sector

Green bonds in the U.S. are primarily related to **clean energy**. This focus is promoted by the federal government's legislation (Clean Energy Victory Bonds Act) and its bond support programmes, namely the Clean Renewable Energy Bonds (CREBs) and the Qualified Energy Conservation Bonds (QECBs) programmes. These programmes allow municipalities and other eligible bond issuers (e.g. energy utilities) to finance projects based on subsidised interest rates.

In practice, "clean energy" refers to both energy efficiency and renewable energy projects, with the latter clearly dominating the green bond market in the U.S. big solar (e.g. Topaz / Berkshire Hathaway) and wind energy projects (e.g. Exelon, Terraform) have a significant share in green bonds and also seem to promise further growth of the green bond market in the future. With SolarCity engaging in solar securitisation progress in the green bond market is likely to be made in the clean energy sector.

The **buildings** sector also receives government support in terms of bond financing. In 2008, the federal U.S. government launched the "PACE" (Property Assessed Clean Energy) programme. The PACE bonds can be used to finance energy efficiency and renewable energy measures in the construction sector. The PACE programme provides low-cost financing for building owners, which is paid back via a special tax over a period of 10 - 20 years. For PACE bonds issued by municipalities, the U.S. government provides additional default guarantees. PACE is a collection mechanism for loans for energy efficiency and renewable energy investments in the residential and non-residential sectors whereby loans are repaid through an addition to local property taxes. This gives them very low default rates as failure to pay local property tax leads to repossession. The PACE programme suffered significantly during the crisis of the U.S. real estate market, coming to a "virtual standstill".

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[277] CBI, Weekly update: TerraForm Power Operating issues largest green bond of 2015 so far, 2015.
[278] Roy L. Hales, Renovate America's 5th Securitization Of PACE Bonds, December 2015
[279] CBI, How do you like them apples!, 2016

Examples of green bond activities in the buildings sector are the universities' green bonds, as well as the bonds issued in the States of New York, Vermont and California. The private sector, e.g. Hannon Armstrong and Renovate America, also supports the greening of the buildings sector through bond issuance.

In the **water** sector, green bonds are used for projects related to water quality improvement, water infrastructure, wastewater and water efficiency. Most water-related green bonds have been issued in the municipal bond market, as for example in Massachusetts, New Jersey, Connecticut, Florida and Washington.

Green bonds in the **transport** sector are less common. However, there are two prominent examples: New York City has issued a green bond to promote sustainable urban transport; and Tesla uses green bond financing for the development of electric sports cars.

At least two U.S. states, namely Hawaii and Massachusetts, use green bonds to promote projects related to **environmental protection and habitat restoration**. This includes river revitalisation and land preservation projects.

4. Use and development of standards

Several stakeholders of the U.S. green bond market have contributed to progress in the use and development of standards, both at international and at national level.

The establishment of the **Green Bond Principles** in 2014 has been actively supported by a number of U.S. American banks. Three of the drafting committee's four members came from the U.S., namely Citi, Bank of America MS and JPMorgan. Also, Goldman Sachs and Morgan Stanley were among the initial thirteen signatories.[280]

The **Climate Bond Initiative's Standard Scheme** is also supported by U.S. stakeholders: The Bank of America ML provides funding for the initiative and its Standards Scheme and the California State Treasurer and the pension fund CalSTRS are among the members of Climate Bond Standards Board.

In February 2016, the New York Metropolitan Transport Authority's green bond was the first U.S. municipal bond to be certified under the Climate Bonds Standards' Low Carbon Transport Criteria. The bond is worth USD 500 million and represents the largest certified green bond in the U.S. to date.

Banks are also among the main drivers for green bond standardization at national level. For instance, **S&P's** and **Bank of America ML** launched **green bond indices** in July and November 2014, respectively. These indices intend to help investors to benchmark green bond performance. The idea is that the inclusion on a green bond index could improve issuers' reputation, credibility and visibility to investors. The requirements for eligible green bonds differ for these two indices.

Also, most U.S. banks that are active in the green bond market, either as underwriters or as issuers, also provide **second review** for green bonds.

Another initiative for standardization at national level concerns the **securitisation of solar projects**. The National Renewable Energy Laboratory (NREL) of the Department of Energy has set up a working group for solar securitisation to develop standardised loan contracts for solar panels, including operations and management standards.

[280] Citi, Green Bond Principles Created to Help Issuers and Investors Deploy Capital for Green Projects, 2014

5. Identified best-practice public sector measures

The U.S. green bond market showcases some best-practice public sector measures at state and at federal level. At state level, innovative legislation and financing models have been developed in the states of New Jersey and Hawaii, for instance. At national level, the green bond market is supported through public sector measures related to taxes and warehousing.

Legislation and Financing Models

Since 2009, Morris County in New Jersey has been operating the so-called "**Morris Model**". Under this model, solar installations in public facilities have been financed through a "unique combination of low-interest bonds and power purchase agreements (PPAs)."

In May 2013, the **State of Hawaii** has enacted a legislation that allows the state to create and issue green infrastructure bonds. This innovative financing model combines "a bond-financed loan program for solar projects with an on-bill repayment program."

Taxes

The U.S. government provides tax incentives for the (green) bond market. The most significant type of tax incentive is tax-exemption. According to the Clean Bond Initiative, more than 80 per cent of the U.S. municipal bond market is tax-exempt. Specifically, interest on municipal bonds is exempt from federal income tax and bond coupons are usually exempt from state tax. The rationale behind these tax exemptions is to provide incentives for municipalities to increase funding for infrastructure projects.

Since 2009, the U.S. government has also been providing specific tax incentives to bonds financing clean energy projects through the **Clean Renewable Energy Bonds (CREBs) and Qualified Energy Conservation Bonds (QECBs)** programmes. Both programmes offer tax incentives to bonds financing clean energy; tax incentives are designed as partial tax exemptions.

QECBs can be issued by state and local governments for the purpose of financing qualified energy conservation projects. In total, the U.S. Treasury allocated USD 3.2 bn. to the U.S. states, according to population. States are obliged to use at least 70% of the allocated money for governmental purposes, the rest may be used to finance private activity projects. Eligible projects under the QECB programme include energy efficiency capital expenditure in public buildings, green communities, renewable energy production, R&D projects, energy-related measures for mass transit, as well as energy efficiency education campaigns. As opposed to QECBs, CREBs cannot only be issued by government entities, but also by public power utilities and electric cooperatives. Initial allocation by the U.S. Treasury was USD 2.4 bn.. Projects eligible under the CREB programme may relate to various forms of renewable energy, including solar, wind, biomass, solid waste, hydro, and others.[281]

While general (i.e. non-green) municipal bonds usually enjoy full tax exemption, municipal green bonds subsidised through the CREB and QECB programs may only enjoy partial tax exemption. Even though the QECB and CREB programmes are usually presented as good practice examples, concerns related to their functioning have also been reported. Until 2013, only about 20 per cent of the available funds for both programmes had been used. According to Löffler et al., this was due to "difficulties with implementation" and "problems associated with marketing the bonds." Also, it has

[281] U.S. Department of Energy, QECBs & New CREBs, n.d.

shown that the QECB programme induced more bond issuance than CREB, with CREB issuance remaining at approximately USD 400 million and QECB issuance having passed the USD 1 bn. mark. However, total allocation of funds remains limited for both programmes (QECB: 31 per cent; CREB: 17%).

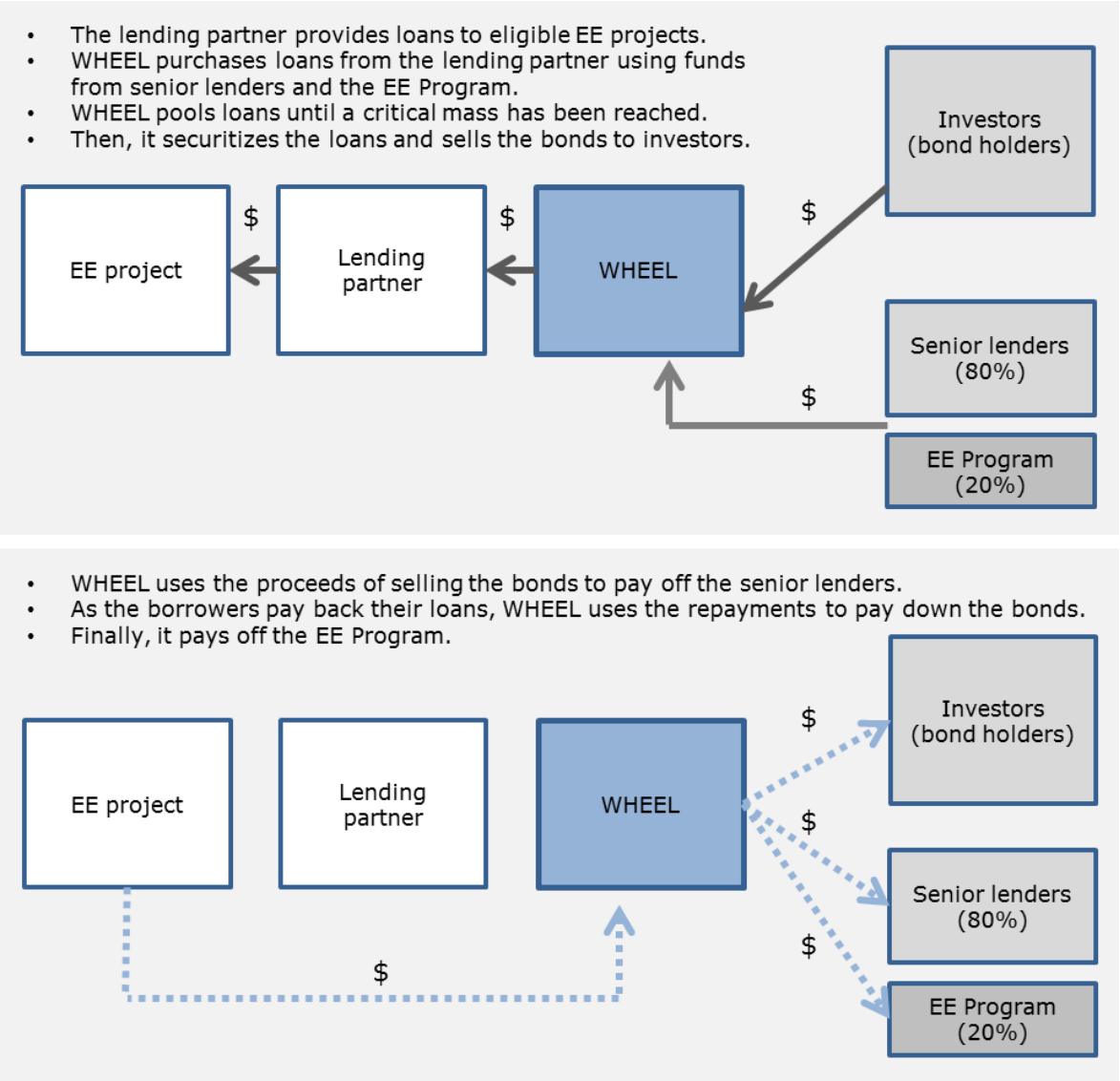
Warehousing

In 2014, the **Warehouse for Energy Efficiency Loans (WHEEL)** was established as a public-private partnership in Pennsylvania. The financial warehouse enables the issuance of green ABS through the bundling of smaller energy efficiency loans. The WHEEL programme emerged from the Keystone HELP programme of the Pennsylvania Treasury Department which used public funds to provide unsecured loans for investments in residential energy efficiency measures. When the USD 40 million of the Keystone HELP programme were spent, the Treasury looked for an opportunity to attract private capital for continuing its funding activities and developed the WHEEL programme.

The WHEEL programme is implemented by EPC, a joint venture of different national institutions (NASCSP, NASEO, NARUC, NEADA) with the goal to foster coordination and cooperation among state and federal agencies in the areas of energy policy and program development. Renewable Funding, a consultancy with expertise in clean energy upgrade programs, serves as the administrator of WHEEL. The Pennsylvania Treasury Department and Citigroup Global Markets Inc. function as senior lenders.

It is the strategic objective of WHEEL to create a secondary market for residential clean energy loans and thereby make cheaper capital for such investments available to state and municipal energy loan programmes. Participating state and local energy efficiency programs obtain loans from the WHEEL lending partner banks. The interest rate of these loans is below 10% and they have a maximum maturity of 10 years.[282] WHEEL purchases these loans from the lending partners using funds from senior lenders (Citi Bank and the Pennsylvania Treasury) and the Energy Efficiency Program. It pools the loans until a critical mass is reached and then securitizes and sells them to investors. Bonds sold will only amount to 80% of the total value of loans. This overcollateralization aims at giving the bonds a higher rating. The proceeds of selling the bonds are then used to pay off the senior lenders. As the borrowers pay back their loans, WHEEL uses loan repayments to also pay off the bonds. Finally, it pays off the Energy Efficiency Program.

Figure D-1: The WHEEL program



Source: Adelphi/COWI, 2016

The main mechanism by which the WHEEL programme aims to bring in investors is by standardising the underlying loans. A participating programme must offer an unsecured loan with a repayment term of maximum 10 years. They must also align their underwriting processes, minimum eligibility criteria and data collection protocols with the WHEEL requirements.[283] The WHEEL programme makes sure that the energy efficiency measure funded is on a list of approved energy efficiency measures. Additionally, they make sure that the measure is implemented by a contractor that is qualified by the WHEEL programme. The WHEEL programme requires participating state and local efficiency programmes to contribute capital to absorb potential losses[284]. Participating programmes must provide subordinated capital (approximately 20% of subordinated loan capital) to the WHEEL funding which is returned if the loans perform as expected. This funding is considered junior investment and exposed to a higher risk. It serves as credit enhancement[285]. In practice, a programme contributes around 20% of

the amount that it is giving out as funding. This means it has a leveraging effect of 5:1.

The issuance of ABS through WHEEL is further facilitated by data on the performance of energy efficiency loans offered under a low-cost loan programme that has been offered by the State of Pennsylvania since 2006. This availability of information allows investors to assess expected credit risks and financial performance.

The first goal was to issue USD 50 million in asset-backed securities in the fall of 2014, but the actual issuance was lower.[286] The first tranche that was issued with a total volume of almost USD 12.6 million was bought by the investment company Calvert Investment Management (a social impact investor) and had a coupon of 3.5% and had a tenor of 2.3 years.[287] In 2014, WHEEL held loans in the vicinity of USD 20 million.[288]

Standardization of contracts

To address the issue of a lack of standardised lease and power purchase contracts the United States Solar Access to Public Capital (SAPC) working group has developed standard residential lease and commercial power purchase agreement (PPA) contracts available for use by solar developers, customers, and third-party finance providers.[289] This contributes to improving consumer transparency, reducing transaction costs in the contracting process and to facilitating the pooling of cash flows for the purpose of securitization

The NREL has convened the Solar Access to Public Capital (SAPC) working group, which draws upon the experience and insights of over 450 professionals from the solar, financial, regulatory, legal, analysis, and advisory industries.[290] The SAPC has been tasked with the creation and adoption of standard power purchase and leases contracts in the residential and commercial solar sectors. This will allow for more transparent evaluation of solar assets by ratings agencies and investors and also enforce more robust origination and underwriting practices that could become market standards for originators of loans or issuers of bonds.

So far, the SAPC has developed two categories of contracts for lease and power purchase agreements (PPA): residential and commercial contracts. For residential contracts there are lease as well as power purchase agreements contracts available that apply to either an aggregated or disaggregated business model. The aggregated business model applies to vertically integrated developers and installers, whereas the disaggregated model is for developers who have a network of installation partners or third-party finance providers that are discrete entities[291]. The difference between the two is that vertically integrated or aggregated business models have the advantage that they can ensure a uniform quality across the whole PV life cycle. Disaggregated business models face the risk that their suppliers do not provide the required quality. In addition, a residential loan agreement is currently under preparation. For commercial contracts, a standardised lease and a PPA contract are available.

So far, developers like Solar City, Sunrun, Clean Power Finance; law firms like K&L Gates, Nixon Peabody; financing platforms like Mercatus, TruSolar, ModSolar; and

[286] IMT, WHEEL'S up for home energy efficiency loans, July 2015
[287] Renew Financial, IFR. Citi sells first Green ABS bond of consumer loans, June 2015
[288] Institutional Investor, WHEEL: Aligning Energy Efficiency and Securitization, May 2014
[289] Energy.gov, Solar Access to Public Capital, n.d.
[290] NREL, Best Practices in PV System Operations and Maintenance, March 2015
[291] NREL: Solar Securitization and the Solar Access to Public Capital (SAPC) Working Group, September 2014

programme administrators like the New York Power Authority have adopted the standardised contracts.[292]

Besides developing standardised contracts, the SPAC working group has also developed the largest public database of US PVB system performance (oSPARC).[293] The databases assess system performance of over 3.800 PV systems. This will support investors, asset owners and other organizations in better assessing the expected performance and thus risk of the systems.

In addition, the working group has published two best practice guideline documents - one on PV system installation and the other one on PV system operating and maintenance. They are intended to increase solar asset transparency for investors and rating agencies, provide an industry framework for quality management, and reduce transaction costs in the solar asset securitization process.[294]

Another element of the work of the SAPC is the development of performance and credit data sets to facilitate investor due diligence activities. Furthermore, the working group has worked on topics relating to risks perception by rating agencies and the development of best-practice guidelines for PV system installation.

Finally, the SPAC working group developed a mock portfolio of solar assets that very closely resembled a bond aggregating individual solar PV asset deals.[295] The two hypothetical securities comprised a residential and a commercial solar portfolio. Five large rating agencies assessed these portfolios and provided feedback. A report summarizes the feedback and serves for future security issuers as well as rating agencies as a guide on what concerns to consider and address.

Public investment in green bonds

The **California State Teachers' Retirement System** (CalSTRS) is the second largest pension fund in the U.S. and the world's largest "educator-only pension fund". It exemplifies direct investments in green bonds by public actors.

In February 2016, it held assets worth more than USD 178 bn.. [296] The fund has been active in the area of green investments for almost 10 years. In 2007, it established a "Green Initiative Task Force" to "identify, analyse and propose investment opportunities and risk-control strategies addressing climate change." Today, the funds "green" portfolio also includes investments related to land use, water sourcing, mineral extraction and waste disposal.[297] The Green Initiative Task Force publishes annual reports on the fund's green investments.

Since 2013, CalSTRS has been holding an increasing amount of green bonds. Starting with green bonds holdings worth USD 25 million, the fund's exposure to green bonds has grown more than tenfold in only two years, reaching USD 264 million in 2015.[298]

Apart from holding green bonds, CalSTRS is also actively supporting the development of green bonds standards. For instance, it is a member of the Climate Bonds Initiative's Climate Bond Standards Board. Moreover, it has been a signatory to an open letter published in February 2015 in which some of the biggest public and private investors argue for the need of consistent standards in the green bond market.

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[292] NREL, NREL Activities to open capital market investment and bank lending for solar deployment, 2015
[293] SUNSPEC, oSPARC Privacy Policy, 2015
[294] NREL, SAPC Finalizes Two Best Practice Documents, May 2015
[295] NREL, the Solar Access to Public Capital (SAPC) Mock Securitization Project, December 2015
[296] CalSTRS, CalSTRS at a Glance, 2016
[297] CalSTRS, Green Initative Task Force, 2016
[298] Green Initative Task Force, 2015 Annual Report, 2015

6. Identified key bottlenecks

Milford et al. identify **four major finance and policy problems** that "preclude clean energy finance from becoming a regular part of the portfolio of development finance agencies".

First, there is a lack of partnership / cooperation between bond-issuing agencies and the country's energy offices[299]. Given that bond agencies have traditionally focussed on conventional infrastructure projects, the clean energy sector appears volatile, risky and complex to most bond agencies. This perceived uncertainty is fostered by a lack of information on recent clean energy deals, including e.g. information on risk sharing and on patterns of interaction with state law and institutions.

Secondly, the relative infancy of the green market prevents a significant scaling up of clean energy bond financing. Many states and regions appear to be inexperienced with bond finance tools for clean energy. Further, the authors claim a limited use of conventional credit enhancement tools to reduce the financial risk of green bonds, or, respectively, a lack of easily adoptable credit enhancement tools for the clean energy sector.

Thirdly, a lack of comprehensive performance data and standardised documentation also prevent the scaling up of green bond finance models. This lack of information and data constitutes a risk that many bond finance agencies are unwilling to take.

Fourthly, the lack of performance information on previous green bonds as well as the lack of standardised data and a scalable pipeline might also depress institutional investors' demand for green bond finance. Specifically, many investors have difficulties in investing in unrated bonds as they are bound by their investment guidelines. Insufficient rating of green bonds, on the other hand, is due to rating agencies' problems in rating these bonds.

Also, Milford et al. find that states and municipalities might lack „catalytic program[me]s and policies" to further engage in the green bond market.

[299] National Association of State Energy Officials (NASEO), State Energy Offices, n.d.

ANNEX E: BIBLIOGRAPHY

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