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Public sector agenda for stimulating private market development in green securitisation in Europe

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Climate Bonds Initiative is a not-for-profit organisation with a mission to mobilise debt capital markets for climate change solutions. It promotes investment in projects and assets necessary for a rapid transition to a low-carbon and climate resilient economy. Its strategy is to develop a large and liquid green bonds market that will help drive down the cost of capital for climate projects in developed and emerging markets; to grow aggregation mechanisms for fragmented sectors; and to support governments seeking to tap debt capital markets. Its work focuses on market tracking and demonstration projects, developing a trusted Climate Bonds Standard and providing policy models and advice. More information about the Climate Bonds Initiative can be found at www.climatebonds.net.

Authors' statement of declared interests

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Contents

Executive summary

Scaling up investment in low-carbon infrastructure is of paramount importance for limiting global warming to 2º Celsius and for the European Union to meet its 2030 emissions targets. The annual global investment required for infrastructure in a low-carbon scenario amounts to trillions of euros; this is not being met.

Traditional channels of finance are not sufficient and fragmentation of low-carbon assets limits access to capital markets

Banks, utilities and governments are more financially constrained than they were before the 2007/08 financial crisis, and this limits lending to low-carbon infrastructure. Bond markets offer a supplemental channel of finance to long-term infrastructure projects. However, smaller-scale low-carbon investments such as rooftop solar, small-scale wind, energy efficiency upgrades, electric vehicles and batteries are prevented from accessing the bond markets directly; as such, assets require aggregation to create the deal size typically sought by bond market investors.

Green securitisation can unlock finance in debt capital markets for low-carbon assets

Securitisation refers to the process of transforming a pool of illiquid assets (for example, thousands of mortgages) into tradable financial instruments (securities). Low-carbon assets can be aggregated, securitised and sold to institutional investors; the investors' return on the security are drawn from the cash flows of the underlying assets, such as loans, leases or receivables.

Around US$5 billion-worth of labelled green securities were issued globally in 2016 from almost zero in 2013, with one issuance taking place in Europe for €526 million. However, the potential for issuance is far greater. The OECD estimates that €77 billion (US$84 billion) of 'green' asset-backed securities could be issued annually in the EU by 2035 for renewable energy, energy efficiency and private electric vehicles alone.

The public sector can play a key role in kick-starting and supporting the green securitisation market in Europe

Historically, public sector support has been key to promoting securitisation in new asset classes, including mortgages and student loans. In Europe, there is momentum to revitalise the securitisation market and to introduce sustainability elements into capital markets legislation; this should be capitalised on. Regulators have also been addressing a number of the risks around securitisation associated with the 2007/08 financial crisis.

Actions to stimulate the growth of green securitisation markets include:

- Issue guidelines for 'green' assets to support the identification of green investments in existing portfolios

This includes national governments, or the European Commission for harmonisation purposes, to both develop a 'green' definition and standards in order for originators to be able to tag green assets to include in green asset-backed securities, and financially support data collection for green assets at the initial stages of the market, as these could amount to thousands of data points.

- Develop standardised green loan contracts

Having standardised contracts, such as power purchase agreements for solar installations and loan contracts for energy efficiency upgrades, facilitates the development of a large pipeline of green assets that can be easily and cost-efficiently bundled together. This also facilitates aggregation of assets from different originators. National governments can support the development of standardised contracts by establishing or financing advisory public–private partnerships and working groups. At the European Union level the Capital Markets Union's convening power can be used to encourage harmonisation of contracts across Europe.

- Initiate financial warehousing of standardised green loans

Given the limited supply of green loans, a Europe-wide warehouse would facilitate the aggregation of a large volume of (standardised) green loans. However, different legal frameworks for securitisation across member states mean that a Europe-wide warehouse could prove challenging, at least in the short term. To begin with, two or three countries may need to take the initiative and as the loan volume increases, national-level warehouses could be established. The warehouses could be set up as private–public partnerships or hosted by a development bank such as the European Investment Bank.

- Provide credit enhancement to support demand

Low credit ratings for green asset-backed securities limit their exposure to institutional investors. Short credit history and limited pools of green assets backing green ABS mean that the securities struggle to achieve the typical AAA/AA/BBB tranches of securitised debt. EU national governments can enhance the appeal of green asset-backed securities to institutional investors by providing credit enhancement, such as guarantees or investing in subordinated debt.

- Supply cornerstone investment and incorporate environmental factors into risk weightings

To strengthen investor demand for green ABS in new classes, the European Investment Bank, the European Bank for Reconstruction and Development and national development banks can take a cornerstone investment in initial green ABS deals. The European Central Bank could include green securities, including green ABS, in its asset-purchasing programmes. EU and national regulators can also consider incorporating environmental factors into risk weightings for capital weights to stimulate capital re-allocation from institutional investors towards climate-friendly investments.

- Create a credible policy framework to deliver EU climate goals

Policy support for green securitisation must rest on a broader policy environment, both at the EU and member state level, which promotes the transition to a low-carbon economy and gives credibility to the EU's long-term climate gaols. This will drive demand and ensure that specific actions taken to promote green securitisation will be most effective. Robust green securitisation markets supported by strong investor demand will incentivise more lending towards low-carbon projects.

1. Introduction

To meet the Paris Agreement targets, investment in low-carbon and climate-resilient infrastructure is of paramount importance. Yet these investment needs are not currently being met. This paper examines the role that green securitisation could play in plugging the gap, and in particular how the public sector can kick-start and scale up green securitisation in Europe.[1]

First, the paper introduces the context and explains how securitisation – and green securitisation – works. Covering the rationale for green securitisation and the current challenges to growing a green securitisation market in Europe, the paper then focuses on priority actions for the public sector to facilitate the development of this market and increase deal flow. These include provisions to support both supply and demand for green asset-backed securities. To be effective, these specific actions need to rest on a broader policy environment that is supportive of low-carbon infrastructure investments.

How much investment in low-carbon infrastructure is needed?

European countries in the European Union are facing large infrastructure investment needs over the coming decades, as a significant part of existing assets need renewal and new infrastructure is developed. Estimates for EU infrastructure investment needs to 2030 range from 2.6 per cent to 4.5 per cent of GDP – the most conservative estimate of 2.6 per cent corresponds to an average annual investment of about €470bn (Inderst, 2013). The European Commission has estimated that €200 billion of annual investment are needed to finance clean energy and energy efficiency investments alone (European Commission, 2014).

Given the Paris Agreement and the EU 2030 targets, making this infrastructure low-carbon and climate-resilient is crucial and adds to the immediate investment challenge. Average annual additional investments under the 2030 climate and energy framework are projected to amount to €38 billion, although fuel savings will to a large extent compensate for these (European Commission, 2017).

Despite this urgency, these massive investment needs are not being met. The European Investment Bank has an annual volume of financing of €50–70 billion and the recently established European Fund for Strategic Investments (EFSI) seeks to mobilise €315 billion over three years.

The investment deficit in low-carbon and climate-resilient infrastructure is caused by a number of factors, including volatile government policies around feed-in tariffs[2] and other pricing measures, a lack of enabling policy in some countries around land use and grid connection, and lack of low-carbon infrastructure project planning for cities. A further issue has been a general reduction of bank lending for riskier sectors such as small and medium enterprises (SMEs) and renewable energy projects, as European banks faced liquidity crises after the financial crash of 2008 (European Banking Authority, 2012).

Why are traditional channels of finance for infrastructure insufficient?

Currently, low-carbon projects are dependent on lending from banks, project developers, utilities and governments (McKinsey Global Institute, 2016). Banks, utilities and governments in Europe are more financially constrained than they were before the financial crisis, and this limits lending to low-carbon assets. For example, changes to bank capital ratios mandated in response to the financial crisis of 2008 mean banks have reduced their lending, particularly to long-term projects that have less established credit

[1] In this paper, references are made to both 'Europe' and the 'European Union'. Non-EU Europe is small and has immature financial markets; financially more developed countries such as Switzerland or Norway that are not in the EU nonetheless have strong relationships with it. Statements and arguments therefore hold true irrespective of whether 'EU' or 'Europe' is used.

[2] The Spanish and British feed-in tariff framework change, for example, caused lack of trust, increasing write-downs and growing capital requirements.

performances; the latter include low-carbon projects, which are generally perceived as riskier than their high-carbon counterparts due to their relatively shorter credit history, and as a result they are penalised by higher costs of capital (Revoltella *et al.,* 2016).

Europe's utilities are not sufficiently increasing their low-carbon investments to address this shortfall, as their credit ratings and balance sheets have deteriorated since the financial crisis (Economist, 2013a). High levels of public debt mean that public sources of finance are also struggling to step in to close the investment gap for low-carbon infrastructure. Action is required to ensure climate and energy targets are met and infrastructure demand satisfied.

How fragmentation of assets limits ability to access capital markets

The €100 trillion bond market provides a supplemental channel of finance for long-term infrastructure projects, potentially at lower cost than traditional means of finance such as bank loans (Climate Policy Initiative, 2013). However, a number of low-carbon infrastructure investments – such as rooftop solar photovoltaic (PV), small-scale wind, energy efficiency upgrades, electric vehicles and energy storage projects – are smaller scale and prevented from accessing the bond markets directly, as such assets require aggregation to create the deal size typically sought by bond market investors (typically at least €50 million and usually above).

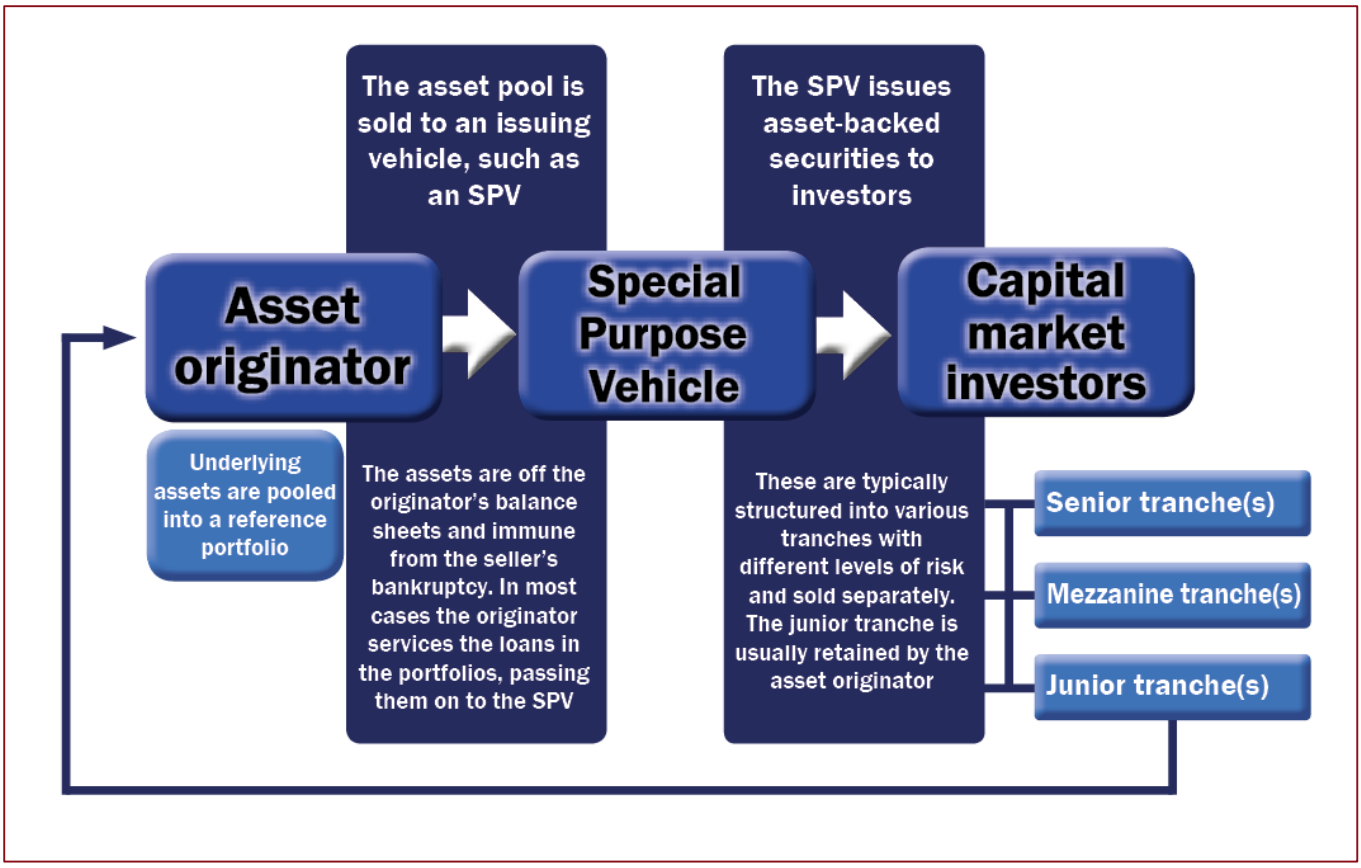
The role of securitisation in improving access to capital for small-scale projects

'Securitisation' refers to the process of transforming a pool of illiquid assets (normally many thousands of separate assets) into tradable financial instruments (securities).[3] The investors' returns on the securities are drawn from the cash flows of the underlying assets, such as loans, leases or receivables against other assets (see Figure 1). The vast majority of securitisation is used to refinance existing loans. Banks are the main issuers of asset-backed securities (ABS), thus refreshing their capital requirements.

Securitisation can give banks, primary lenders to small-scale projects (PwC, 2013) and others an opportunity to re-finance loan portfolios in the bond market. Loans to small-scale projects can be aggregated and then securitised to reach an adequate deal size for bond markets. Asset-backed securities offer a large potential to finance low-carbon infrastructure investments. They are less likely to be constrained by fiscal or balance sheets constraints (in contrast to governments, corporates or banks) as low-carbon technologies mature and investments scale up to meet climate and energy targets.

[3] The market for securitisation emerged with pooling and selling of mortgages in the US in the 1970s. New asset classes, in particular auto/car loans, credit card debt and student loans, were added to the market first in the late 1980s and 1990s. Today, the main asset classes in the securitisation market are mortgages, auto loans, credit card debt, student loans, as well as smaller amounts backed by a range of other assets – every asset with a stable cash flow can be securitised in theory.

Figure 1: The process of asset-backed securitisation



Source: Authors, based on Jobst (2008)

Green securitisation: unlocking finance in debt capital markets for low-carbon asset classes

A thematic 'green' market has helped make the link between low-carbon infrastructure and broader 'green' agendas related to climate change. The opportunity to develop securitisation around renewable energy – and other climate change-related investments – is enhanced by the growth of investor appetite for these types of investments.[4]

A securitisation can be defined as 'green' when cash flows backing it come from low-carbon assets. Green securitisation is suitable both for asset classes that are already being securitised, such as mortgages (where the 'green' loans would have to be identified) and for new asset classes that have not previously been securitised (lease payments for rooftop solar energy installations, for example).

During the transition period to a low-carbon economy, green securitisation can also refer to any asset-backed securities with proceeds raised to finance loans for green infrastructure (such as securitising car loans to finance loans to electric and hybrid vehicles).

[4] At the United Nations Climate Summit in late 2014 investors with some US$24 trillion of assets under management presented statements to the Secretary-General that climate change is a material, long-term threat to their portfolios. They also stated that they would invest in green financial instruments, subject to risk/yield requirements.

Table 1: Asset classes suitable for green securitisation

Within asset classes that are already being securitised	New asset classes
Mortgages to green buildings	Cash flows arising from solar and small-scale wind assets
Car loans to electric vehicles and hybrids	Loans for energy efficiency upgrades
Loans to green small and medium sized enterprises (SMEs)	Loans to battery and storage projects

Estimates from the OECD based on forecasts of investment requirements for renewable energy, energy efficiency and low-emission vehicles (LEVs) to achieve a scenario of a maximum rise of 2°C, predict that green asset-backed securities will play a major role in financing these technologies in the EU, with the potential to reach €19 billion of annual issuance by 2020 and €77 billion (37% of green securities) by 2035 (OECD, 2016).

A key role for the public sector in kick-starting and supporting the green securitisation market in Europe

In 2016, only US$5 billion of green ABS were issued globally (Climate Bonds Initiative, 2017), with one issuance for €526 million in Europe. The opportunity ahead lies in revitalising the European securitisation market and developing a 'green' theme to accelerate investments in green assets and maximise the contribution of a green securitisation market to closing the financing gap for low-carbon infrastructure. This is part of the EU's Capital Markets Union (CMU) action plan. Furthermore, a high level expert group on sustainable finance has been established to develop an overarching strategy for sustainable finance under the CMU (European Commission, 2016a), creating the momentum to move the green securitisation agenda forward. The European Commission has also recognised the role of green bonds to help finance the investment needs to achieve the EU's 2030 climate and energy objectives and the UN's Sustainable Development Goals as well as the potential for the public sector at the European level to support green securitisation (European Commission, 2016b).

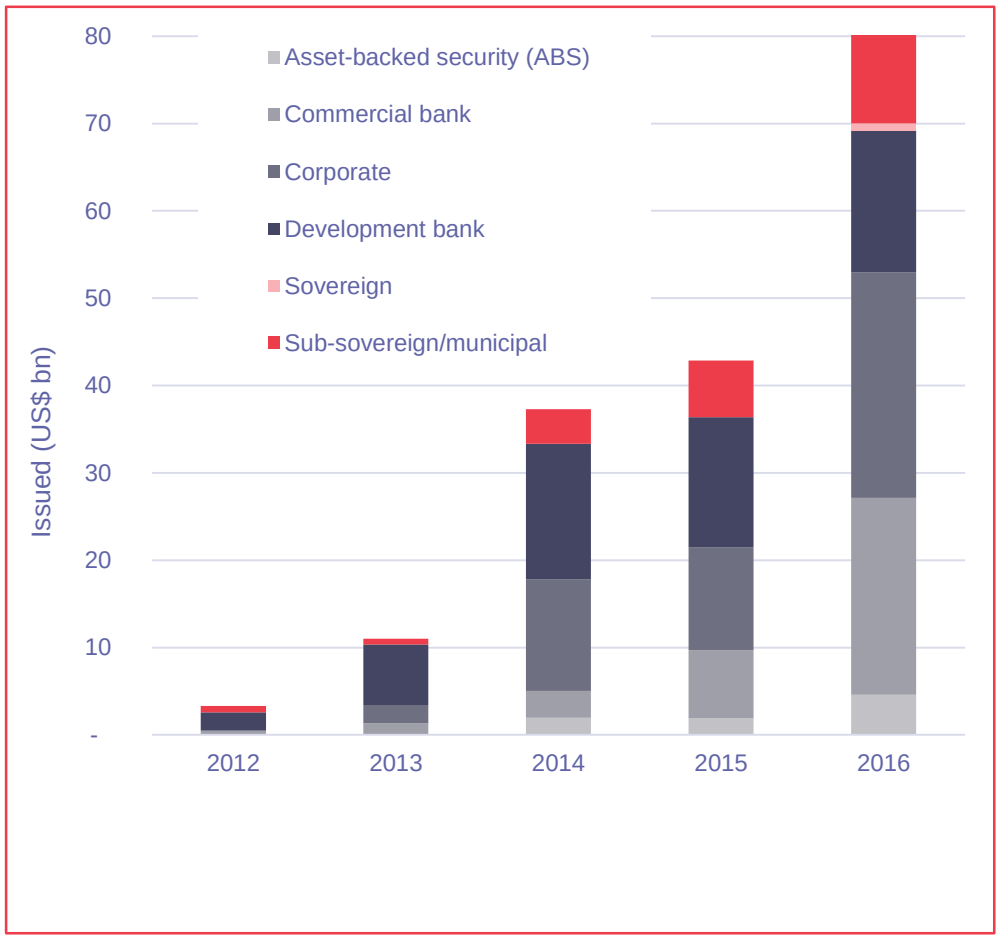
2. The rationale for *green* securitisation

Investor demand for green investments

A robust trend that could point to demand for green asset-backed securities (ABS) is institutional investors' strong appetite for financially competitive green investments. There are several reasons for this. Returns on low-carbon investments provide a good match to the long-term liabilities of many institutional investors. The short tenor[5] of many ABS currently in the market has been generally identified as limiting involvement from institutional investors in the securitisation market, suggesting longer-term green ABS can be more attractive (Segoviano *et al.,* 2015). In addition to the 2014 Global Investor Statement on Climate Change presented at the UN Climate Summit, investors managing US$10 trillion of assets signed a pledge in support of green bonds market development on the eve of the COP21 Paris climate negotiations (Climate Bonds Initiative, 2015).

The growth of the 'labelled' green bonds market, which almost doubled in size from 2015 to 2016 (see Figure 2), is evidence of this demand for what have become to be generally described as 'green' investments. This market is characterised by bonds where credit characteristics are comparable to other bonds from that issuer, but proceeds are explicitly allocated to 'green' (i.e. climate change-related) assets and projects.

Figure 2: Annual labelled green bonds issuance – the green bond market 2012–2016



Source: Climate Bonds Initiative (2017)

[5] The time to maturity of a bond.

The marketing of these bonds is generally accompanied by an 'external party review' of the green credentials of the portfolio and proposed allocation of proceeds. In essence, the green characteristics have become a marketing feature, providing benefits for issuers, including expanding the number of investors ('investor diversification'), enhanced investor loyalty ('stickiness') and, potentially, pricing. Over-subscription is common, with modest downward price pressure being reported in liquid markets (in US dollars and euros) as a result of that strong investor demand (Barclays, 2015).

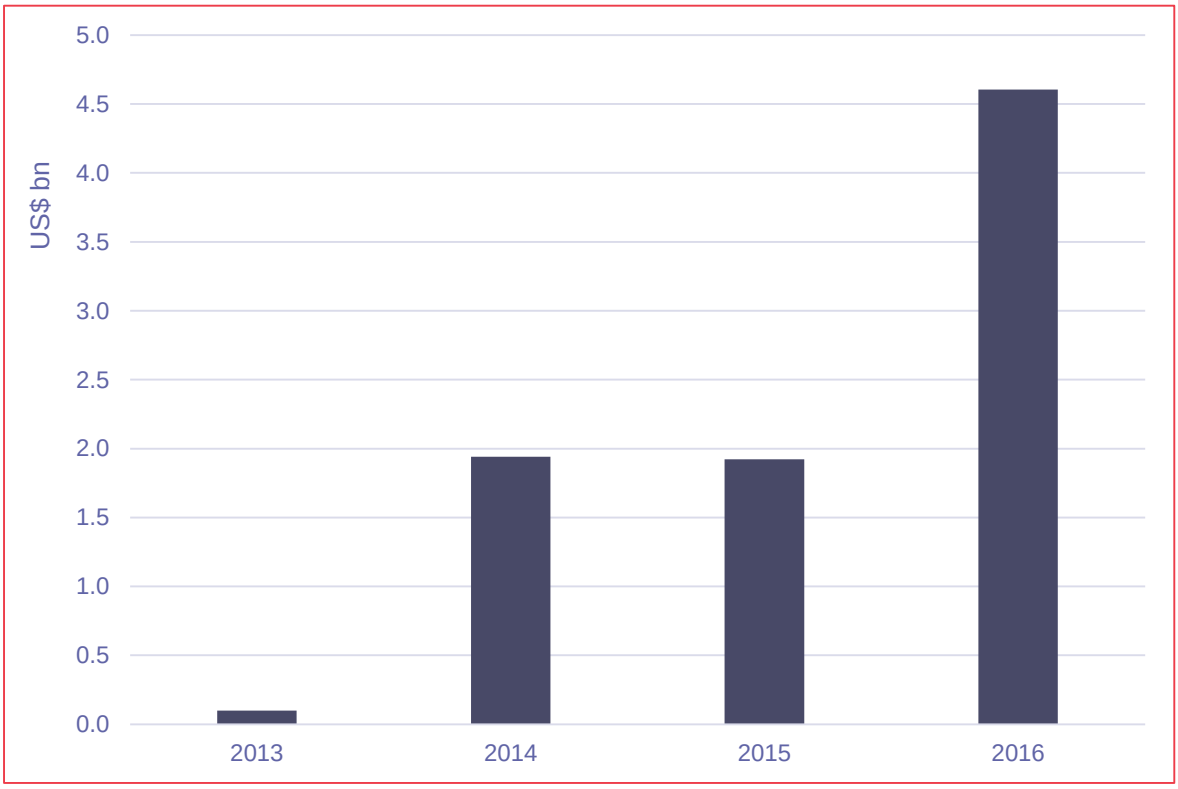
The Climate Bonds Initiative has for some years promoted the availability of what it calls 'climate-aligned' (or 'unlabelled') bonds, i.e. those that the issuers have not explicitly marketed as green (Climate Bonds Initiative, 2016). These bonds could be included in portfolios of investors looking to increase their exposure to 'green'. However, investors consulted by the Initiative, including BlackRock, Axa IM and Allianz GIM, say their stakeholders respond more readily to bonds that meet the conventions of the labelled green bonds market.

A growing global market for green asset-backed securities

Maturing green bond markets are increasing the potential for green asset-backed securities. As issuers and investors grow comfortable with the market, issuance has often expanded to different bond structures, including asset-backed securities. While the majority of green bonds have been unsecured senior notes, as is typical in a nascent market, a small but growing portion of the market is in asset-backed securities. In 2016, green ABS made up approximately 6% of global market share. These can provide a broader spectrum of risk, thereby expanding the universe of interested investors.

There are several examples of low-carbon asset-backed securities issued in the market, largely in the US, that provide examples of how this market could evolve in Europe as well. The overall growth of the global market for green ABS is set out in Figure 3 below.

Figure 3: Growth of green asset-backed securities issuance (US$ billion)



Source: Climate Bonds Initiative (2017)

Leading examples from the US market include solar developer SolarCity, energy efficiency lender Renovate America and sustainable infrastructure company Hannon Armstrong. Other markets are growing as well, as shown by the Canadian North Power and the Australian FlexiGroup ABS issuances (see Appendix A for detailed case studies). Europe also saw its first green ABS issuance in 2016 by Obvion, a Dutch mortgage provider wholly owned by Rabobank. Loans for energy-efficient homes in the Netherlands backed the securities, with the proceeds destined to a pool of green residential mortgages for new energy efficient homes, as well as refurbishments to improve energy performance.

Benefits of green securitisation: access to capital at scale and lower cost

The benefits of securitisation for green projects arise from improved access to capital, and potential access to capital at lower cost. A number of low-carbon investments such as rooftop solar photovoltaic (PV), energy efficiency upgrades, electric vehicles and storage projects are smaller scale and mostly financed through bank lending.

Loans to low-carbon small-scale projects can be aggregated and then securitised, improving access to capital for these projects for two reasons:

- Firstly, securitisation enables tapping into capital from institutional investors through bond markets to finance small-scale low-carbon projects (Segoviano *et al*., 2015). The scale of investment needed for small-scale low-carbon infrastructure (such as solar PV) to meet climate change targets is expected to be greater than banks can finance with their balance sheets. Prudential measures for banks since the 2008 financial crisis have also restricted their risk exposures, negatively impacting lending to long-term infrastructure.
- Secondly, capital raised through the sale of asset-backed securities by the loan originators can then be used to create a fresh portfolio of loans. A well-established green securitisation market will incentivise banks to expand their green lending activities.

Asset-backed securities issued in the public bond markets can also offer a lower cost of capital compared with bank financing. Accessing capital at lower cost is important to achieving low-carbon investments at the necessary scale, as for high capital expenditure projects – which low-carbon projects typically are – the cost of capital has a strong influence on the economic viability of the project. It has been estimated that financial structures that provide direct access to bond-like risk reward profiles for renewable energy projects, such as securitisation of loans and covered bonds, can reduce the cost of renewable energy by up to 20% (Global Commission on the Economy and Climate, 2014).

How reviving Europe's securitisation market aligns with the EU's financial policy agenda

Issuance volume in the securitisation market in Europe is still significantly below what it was before the financial crisis: 2016 securitisation issuance was some €230.6 billion compared with an average of €374 billion in the eight years leading up to the crisis (Association for Financial Markets in Europe, 2016), reaching €594 billion in 2007 (European Commission, 2015a). In recent years, EU policymakers have made it a priority to support the revival of a European securitisation market as it unlocks additional funding for businesses and households. Stronger public sector support for securitisation in the US market is considered a reason for the stronger recovery of the US securitisation market post-financial crisis (ibid). Securitisation is one of the main focus areas of the Capital Markets Union (CMU) (European Commission, 2015b). In September 2015, the European Commission launched a securitisation initiative that set out two legislative proposals[6] in support of a market for 'simple, transparent and standardised' securitisation (European Commission, 2015c). These have been accepted by the Council of the European Union and are now under the European Parliament's scrutiny.

[6] The two legislative proposals include a Securitisation Regulation and a proposal to amend the Capital Requirements Regulation.

Risks to securitisation exposed by the financial crisis

There can also be risks to securitisation as a financial instrument, as made evident by the financial crisis, where the US market for sub-prime mortgage-backed securities played a catalysing role (see, for example, Economist, 2013b). It is necessary to recognise and address these risks, but it is also important to stress that they do not make securitisation inherently risky. Rather, it was the risk embedded in the assets that were securitised that contributed to the sub-prime calamity in the United States.

The securitisation market in other asset classes, such as auto loans, functioned well throughout the crisis, and the US mortgage market functioned well from the 1970s until the late 1990s (Segoviano *et al.,* 2015). Although many possible supply-side problems with securitisation became evident in 2007/08, it is possible to mitigate many of these risks, and extensive efforts have been made in this area since the financial crisis.

Role of the market and regulators in addressing risks

The market and regulators are addressing many of these securitisation risks, in the ways described below.

Moving away from re-securitisation
A key problem of the mortgage-backed securities that contributed to the financial crisis was that re-securitisation was used extensively – asset-backed securities themselves were pooled together to create new products ('Collateralised Debt Obligation [CDO]-squared'), which made it difficult for investors to evaluate the quality of the underlying assets in the real economy. Such re-securitisations have now largely disappeared.

Higher risk-retention requirements
Regulatory requirements have also been strengthened post-crisis; in particular there are higher risk-retention requirements that mean banks originating their asset-backed securities must retain some of the risk, which incentivises them to originate higher quality securities – although it also increases their costs of originating securities (Economist, 2014).

Improved transparency of risk and investor-level risk evaluations
Lack of transparency was another issue in the lead-up to the financial crisis, as investors relied too much on credit rating agencies to assess risks of securities instead of undertaking their own due diligence (ibid). In Europe, new regulations around 'simple, transparent and standardised' securitisation, including a more risk-sensitive prudential framework, are under parliamentary scrutiny.

Recognition of systemic risks – particularly important for policy-reliant green ABS
Another risk in securitisation markets in the past has been lack of recognition of exposure of the securities to systemic risks, i.e. risks that the whole pool of assets backing the security are exposed to. The failure to recognise the systemic risk of falling house prices was a contributing factor in the collapse of the market for mortgage-backed securities during the financial crisis. The recognition of systemic risks in ABS markets is crucial also for a green ABS market. The systemic risks of the residential mortgage market – notably in the US where obligations around housing mortgage liability are lower than in other countries – would be equally applicable to green mortgage-backed securities. Green ABS backed by green assets that rely on policy support (e.g. solar loans relying on feed-in tariffs) face the risk of the policy support being adjusted or removed, and it is crucial that risk evaluations take this into account. In this sense, policy risk can greatly hinder the development of green ABS markets, as early market investors lose money and confidence is destroyed.

Despite the growth of the green ABS market, the scale is still minimal; public sector action is needed to accelerate its development. The following sections examine the challenges and solutions to growing a green securitisation market in Europe.

3. Current challenges for green securitisation in Europe

Barriers to existing and new asset classes

The challenge of green securitisation differs within asset classes that already exist in the securitisation market (mortgages and auto loans) and new asset classes (renewable energy and energy efficiency). The different barriers are set out in Tables 2 and 3 below.

Table 2: Challenges for green securitisation in existing asset classes

Challenge	Description
No clear, harmonic standards to define 'green' assets at the EU level	Developing clear standards for what is green makes it easier for issuers, investors and governments providing support to gain confidence that the green asset-backed securities have robust environmental credentials. Lack of commonly accepted standards in the market for what is green means investors and governments can incur significant transaction costs in evaluating the environmental credentials of green asset-backed securities. Green tagging provides an easily communicable framework for stakeholder reporting for fund managers, and reduces the due diligence effort for investors.
Identifying green assets in existing loan books	Once standards or other guidelines for what is green are developed, the next challenge is for lenders to identify which existing loans in their portfolios are aligned with those green standards. This is particularly applicable to the banks' portfolios of mortgages, which include sufficient volumes of mortgages that could qualify as green. Experience from the non-asset-backed green bond market shows that banks often do not know they are doing green lending until they bring in external environmental specialist consultants who can help identify the green assets already held by banks.

Table 3: Challenges for green securitisation in new asset classes

Challenge	Description
Supply side	
Loan contracts for renewable energy and energy efficiency are not sufficiently standardised	Standardisation reduces the due diligence of bundling many loans together and evaluating their risks. Easily available standardised loan contracts for relevant asset types, including solar PV, wind and energy efficiency loans, facilitates origination of a standardised green deal flow. Standardisation at origination is a lot easier than standardising post-origination, for example at the warehousing and issuance stage. Standardisation by asset class also enables aggregation across originators, enabling a faster scale-up of securitisation through financial warehousing [1].
Lack of sufficient volume of green loans within individual lenders to bundle in order to achieve deals at scale	To successfully tap debt capital markets using securitisation, banks and other lenders need a pipeline of loans big enough to ensure the deal will offer liquidity in a market. For renewable energy, energy efficiency and to a certain extent green vehicles, the limited size in individual lenders' green loan books within each new green asset class is a challenge (Climate Bonds Initiative *et al.,* 2015). Financial warehouses can address the issue of limited amounts of outstanding green loans for each individual lender.

Low credit ratings for green ABS due to lack of historical data on credit performance of green assets and limited asset pool	The credit risk in new asset classes, such as solar PV and energy efficiency loans, is relatively high at present, due to lack of historical data on default rates and loss given default (the secondary value of the asset of the loan is secured against, for example, the solar panel for solar leases). Without sufficient historical data on asset performance, there is uncertainty, leading to low credit ratings (see more details in Appendix B). A relatively small asset pool limits the number of senior tranches that can be obtained through the structuring of the securitisation [2].
Demand side	
Investor demand for green ABS in new asset classes cannot be proven until there are deals available in the market	Institutional investor demand for ABS generally has remained relatively low in Europe after the financial crisis. Currently in the market, the European Central Bank is a large buyer of ABS, with stimulus programmes launched in 2014 (European Central Bank, 2014). The high demand for non-asset backed green bonds suggests European institutional investors in search of green investments could mean demand for green ABS as well, especially in light of new regulation following the 2008 crisis. However, investor demand for green ABS may need to be incentivised in the nascent phase of the market to ensure scaling up of the market.

Notes

1. A financial warehouse plays a similar role to warehouses in the real economy, and collects an inventory of loans from different lenders until the pool of loans held in the warehouse is sufficiently large for it to be sold into the capital markets via packaging into a securitisation.
2. Renewable energy securitisations have in fact so far not been structured to achieve the typical AAA/AA/A/BBB tranches of securitised debt as normally seen in ABS structures due to, among other reasons, the limited asset pool.

Addressing barriers in existing asset classes in Europe

It is possible and increasingly simpler to identify green assets within existing asset classes in the securitisation markets and this is starting to happen in Europe. This is particularly the case for mortgages, as information on energy performance of buildings is available, and standards are emerging that establish thresholds for what level of energy performance can be considered aligned with the transition to a low-carbon economy. The Climate Bonds Standard and Certification scheme[7] has developed criteria for low-carbon buildings and other asset classes to support the identification of green asset pools (see Appendix D).

Kick-starting green securitisation with green mortgage-backed securities

Market players consider the barriers for green securitisation within existing asset classes, mortgages in particular, as more feasible to address in the short run, as the Obvion issuance shows. Starting with green securitisation within existing mainstream asset classes can then prime the market for subsequent securitisations of new green asset classes. Creating a market for green mortgage-backed securities can therefore provide a bridge for securitisation of other low-carbon assets, such as solar, small-scale wind and storage assets and loans. This could flow from issuers, underwriters, rating agencies, investors and policymakers as they become increasingly comfortable with the concept of a green securitisation market.

[7] The Climate Bonds Standard is a screening tool for investors and governments that allows them to easily identify and prioritise investments in climate change solutions. Building from the process guidelines set out in the Green Bond Principles (GBP), the Standard adds science-based sector-specific criteria for eligible projects, within an industry certification model.

4. A role for the public sector in green securitisation

Policy support to revive a securitisation market in Europe is needed to provide credible long-term support to demand for this asset class at the necessary speed and scale. Supporting the emergence of a robust green securitisation market should be part of efforts to ensure climate, energy and sustainable development targets are met, given governments' fiscal constraints and the limited capacity of banks' balance sheets to provide the investment required.

Policy support for green securitisation must rest on a broader favourable policy environment that supports investments in low-carbon projects generally. This builds an important foundation for securitisation of low-carbon assets by providing stable cash flows from low-carbon projects. As market participants have started to show interest in green asset-backed securities, there is a role for the public sector to provide the appropriate legal formats for the product to truly gain traction and become a tool to scale up investments in low-carbon and climate-resilient infrastructure.

Historically, public support has been key to kick-starting securitisation markets in new asset classes. Public sector entities have been involved in facilitating securitisation in policy priority areas since the market first started with the securitisation of mortgages in the US in the 1970s. Public entities have also facilitated the securitisation market for student loans. More recently in Europe, the European Investment Bank through the European Investment Fund has stepped up to support securitisation of loans to small and medium sized enterprises (SMEs) (European Investment Fund, 2016). Similar initiatives can be taken to grow the green securitisation market. The next subsection lays out the priority public sector actions, for both European and national policymakers, to scale up green securitisation markets in Europe.

Public sector actions for green securitisation

Action 1: Provide guidelines for 'green' assets to support identification of green investments in existing portfolios

The public sector can help issuers identify green assets within their existing portfolios by providing guidance on which assets qualify as 'green'. A number of countries including China and India have issued green bond standards and France is using the Climate Bonds Taxonomy to guide green investments. Such action could support green lenders, banks in particular, and reduce their costs in identifying their portfolio of 'green' in established asset classes such as green mortgages. For example, tagging bank loans for real estate and cars based on the asset's underlying energy performance, fuel efficiency or environmental standards could be a first step to identifying green loans (Robins and Sweatman, 2016). The European Commission has recognised this as an important first step to grow the market for green securities in the EU (European Commission, 2016b). The Capital Markets Union's high level expert group on sustainable finance is expected to take this recommendation forward. Uniform green definitions are important for avoiding 'greenwashing' and ensuring the majority of climate-saving investments are appropriately tagged as 'green' and can be increased with targeted policies.

In the green bond market to date, issuers have absorbed the costs of retaining external environmental consultants to help identify green assets. In the case of green asset-backed securities, data collection costs will be even higher for the issuer, as thousands of data points will need to be assessed for each deal. For example, a green mortgage-backed ABS requires green data points for thousands of loans. There is a potential role for the public sector to provide financial support in this process to help issuers absorb the costs at initial stages of the market, such as an EU-funded initiative to develop broadly accepted metrics, aimed at increasing their adoption.

Action 2: Support the development of standardised contracts for loans funding low-carbon assets
Having standardised financial contracts for low-carbon assets enables the development of a large pipeline of green assets that can easily be bundled together, as it lowers the transaction costs of evaluating the financial credentials of the pool as a whole. If each contract in the asset pool for a securitisation deal has a different structure and covers different financial issues, the transaction costs for rating agencies and investors in evaluating the financial performance of the overall pool will be too large for securitisation to be economically viable. Examples of relevant standardised contracts that could be developed are power purchase agreements and loan contracts for solar installations and energy efficiency upgrades.[8]

Public institutions can develop standardised contracts by:

a) **Establishing public–private initiatives and working groups, or offering direct financial support to existing market efforts on standardisation of green loan contracts, if those are in place.**

Outside of Europe, there are relevant public sector initiatives. In 2013, the National Renewable Energy Laboratory of the US Department of Energy set up a project to support the securitisation of contracts for solar assets in particular (see Box 1). In emerging economies, the Climate Aggregation Platform,[9] launched in December 2015, will support the development of standardised loan contracts, among other activities.

European policymakers can use the lessons from these initiatives to boost green securitisation in two ways. First, the best practice guidelines and standardised loan contracts developed by the US-

Box 1: Solar Access to Private Capital (SAPC) initiative under the US Department of Energy

The SAPC recommends taking a staggered approach to facilitating securitisation of a new asset class. The first three years of funding the initiative have focused on facilitating reduced transaction costs and increased investor confidence in solar PV. Specific actions included:

- Creating best practice guidelines for installations, operation and management of solar PV
- Collecting and creating a public database of performance data covering the performance over time of 3,800 PV systems from various parts of the US
- Developing standardised loan contracts for solar PV, both residential and commercial
- Undertaking a mock filing of a solar securitisation with rating agencies.

The SAPC worked closely with the private sector players, in particular law firms, developers and banks.

The initiative is currently planning for another three years. This second phase would focus on facilitating financial warehousing structures for solar PV loans. This would involve developing the conceptual and legal structures that other entities could use to establish warehouses, rather than directly setting up a warehouse. The SAPC will then work with private banks for implementation, and engage established public green banks that are looking for credit enhancement opportunities in the green space. Credit enhancement will be most relevant for unrated assets at the commercial/industrial level and lower rated residential mortgages. The SAPC aims also to encourage the use of its standardised contracts and best practice guidelines by the loan originators in this process to simplify the securitisation issuance process. The focus would be on housing with solar assets, as well as securitisation of solar assets on their own.

[8] Standardising the structure of loan contracts/power purchase agreements provided for green assets is about standardising the financial side of a green securitisation deal. This is a different challenge than standardising the environmental credentials of the deal. In existing asset classes, such as mortgages, standardisation on the financial side is already in place, as contracts for mortgages to green buildings will be structured in the same way as contracts for any other mortgage.

[9] The project is funded by the Global Environment Facility (GEF), which will be implemented by the Climate Bonds Initiative and UNDP, in partnership with the Inter-American Development Bank.

based initiative can be leveraged for developing European equivalents. It would be significantly easier to amend existing documents to fit European practices and law than starting from scratch. Second, similar initiatives could be established in Europe for each asset class relevant for green securitisation, in particular solar, wind and energy efficiency.

b) **Using the convening power of the Capital Markets Union to encourage harmonisation of standardised contracts throughout Europe.** Currently, working towards EU-wide standardisation for asset-backed securities is on the agenda for the CMU, together with the focus on sustainable finance. EU policymakers should therefore integrate low-carbon assets in their ongoing works to standardise loan contracts and information under the European Commission's proposal for simple, transparent and standardised securitisation. Standardisation of loan contracts can be encouraged by making this a requirement to qualify for other green securitisation support mechanisms, such as warehousing and credit enhancement. These will be explored in the following sections.

Action 3: Support financial warehousing of standardised green loans

Many lending institutions do not individually have a sufficiently large amount of loans to renewable energy or energy efficiency projects to be able to aggregate them into a green securitisation issuance. There is therefore a role for financial warehousing of green loans to collect loans across different originators.

In Europe, it would be beneficial to establish a cross-country, or Europe-wide, warehouse to make it easier to quickly aggregate a large volume of standardised green loans. Aggregation is important to enable small-scale solar or wind projects to access capital markets. A Europe-wide green financial warehouse can also have a demonstration effect by providing best-practice examples and guidelines for subsequent national-level green warehouses. A challenge is the presence of different legal frameworks for securitisation in different countries. The work of the Capital Markets Union to harmonise these will help address this issue. As a starting point, the warehouse could be developed between two or three member states.

Public institutions could set up a green warehouse entity:

a) **As a public–private partnership.** Warehouse for Energy Efficiency Loans (WHEEL) is an example of a leading institution in the US market (see Box 2 below). In Europe, the UK's Green Deal Warehouse was an attempt at an aggregation entity; in practice, its success was severely limited by low uptake of green deal loans by customers.

Box 2: Public–private partnership for energy efficiency securitisation: WHEEL

In Pennsylvania, US, the Warehouse for Energy Efficiency Loans (WHEEL) was established as a public–private partnership in 2014. First, approved local contractors offer low-cost loans to customers to finance energy efficiency projects. The loans are bought into a financial warehouse by the company Renewable Funding, using a credit facility provided by a mix of public money, from the State of Pennsylvania Treasury, and private money, from commercial bank Citi. Citi offers US$100m to renewable funding to facilitate the warehousing of the loans. This process continues until the aggregated amount of loans in the warehouse meets the size requirements of the capital markets, and the loans are bundled together and sold to institutional investors as securities backed by energy efficiency loans.

The issuance of asset-backed securities is made feasible by data on performance of energy efficiency loans under a low-cost loan programme offered by the State of Pennsylvania since 2006, which allows investors to evaluate the expected credit risk and financial performance of energy efficiency loans. Citi has replicated the process in New York State, in collaboration with the New York Green Bank.

Source: Citigroup Inc. (2014)

b) **Hosted or supported by a development bank or public green bank.** In the US, the green banks of the states of Connecticut (the Clean Energy and Finance Authority) and New York (New York Green Bank) both offer warehousing of green loans. In 2014, Connecticut Green Bank (CEFIA) issued US$30m of green ABS backed by loans funding energy efficiency upgrades in commercial buildings (Lombardi, 2014).

   In emerging markets, in 2014, the Inter-American Development Bank (IADB) and the Clean Technology Fund initiated a project for securitisation of energy efficiency projects in Mexico (Inter-American Development Bank, 2016). US$125m of securities are planned, which will be backed by energy efficiency loans to SMEs. The project includes provision of financial warehousing, as well as standardisation of loan contracts for energy efficiency and provision of partial public credit enhancement.

   In the EU, the European Investment Bank could be an appropriate entity to sponsor a green financial warehouse.

A sufficient amount of green loans would have to be identified to support warehousing. Policymakers should consider making public warehouse purchasing of loans conditional on the loans adhering to standardised green loan contracts. This would ensure there is a deal flow of standardised loans large enough to be aggregated and subsequently sold in the capital markets, while keeping transaction costs at a minimum. For example, the IADB's green warehouse in Mexico only purchases standardised loans from approved energy efficiency lenders.

The public sector could also consider implementing further actions to ensure there are enough existing 'green' loans to support warehousing. Governments and regulators can act on making lending to green assets more attractive in order to grow this asset class by offering preferential green lending rates or tax incentives or reduced capital requirements for green loans. However, it is important they only implement these actions if there is a credible and stable policy framework backing this. As the market grows, lenders will know they can easily sell on the loans they originate, incentivising them to increase their lending to those assets, and having a sufficient deal flow of loans will be less of a barrier over time.

Action 4: Provide credit enhancement to support demand

Institutional investors have restrictions on how much risk they can take and typically look for A-rating and above for the majority of their investments. Asset-backed securities are typically structured into various tranches with different levels of risk and sold separately. Short credit history and limited pools of green assets backing green ABS mean that the securities struggle to achieve the typical high-quality AAA/AA/BBB tranches that are attractive to institutional investors.[10]

In Europe, public credit enhancement is offered for SME securitisation transactions; this model can be replicated for green investments if the security does not achieve high-rated tranches through structuring. Under the joint EIB/EC SME Initiative, the European Structural and Investment Funds (ESIF) provides guarantees for the junior tranche, and a combination of ESIF and EU funds (COSME and Horizon 2020) and the European Investment Fund covers the mezzanine tranche. This is intended to make the senior tranche of the deals attractive to private institutional investors (Kidney *et al.,* 2015). Different types of public credit enhancement available for green ABS are set out in Appendix C.

Credit enhancement support can be combined with public–private warehousing solutions. This is particularly valuable at the early stages of the market, when financial warehousing is crucial to achieving scale. This combination of public sector support was instrumental in kick-starting the mortgage

[10] SolarCity's ABS senior tranche achieved rating of BBB+; the junior tranche was rated BB.

securitisation market in the US, as the government-sponsored enterprises Fannie Mae and Freddie Mac provided both warehousing and implicit guarantees. The green securitisation programme of the Inter-American Development Bank offers green ABS this joint package of warehousing and partial guarantees as well. However, the US experience highlights the importance of delivering transparent de-risking structures; the opportunity in a market of low interest rates is to keep public sector de-risking to the minimum required to achieve medium investment grade (from AA through BBB) rather than full AAA ratings.

Public credit enhancement could be made conditional on the use of standardised loan contracts to further encourage uptake of standard contracts, similar to the action of making financial warehousing conditional on the use of standardised loan contracts.

Action 5: Strengthen investor demand through cornerstone investment and preferential regulatory treatment

For green asset-backed securities in existing asset classes, such as mortgages, evidence from the green bond market proves that investor demand is strong, as the credit profile of the ABS is well understood and 'green' becomes a marketing feature. For green ABS in new asset classes, further strengthening investor demand for green ABS, by explaining the climate change relevance to investors concerned with the issues, can similarly have a positive pull-effect on the supply side, and incentivise increased issuance of green ABS.

There are actions available to the public sector to strengthen investor demand, most notably:

a) **Provide public cornerstone investment for green ABS**. At EU level, the European Investment Bank, the European Bank for Reconstruction and Development and national development banks can take a cornerstone investment role in initial green ABS deals and make their commitment to do this clear to market participants (European Commission, 2016b).

   Once an initial deal flow of green ABS is established, the European Central Bank (ECB) could include green securities in its asset-purchasing programme. The ECB is currently the largest buyer of ABS in the European market; inferring known demand from the Bank could provide strong incentives for issuers to take their buying preferences into account. Unlike private investors, the ECB can take a policy stance and commit demand at a high level before real deals are on the table.

b) **Consider incorporating environmental factors into capital weights.** EU policymakers recognise the possibility to provide adjusted risk weightings to green investments; this could be achieved by incorporating environmental factors into capital weights (ibid). However, this approach is considered controversial as any potential negative unintended consequences for financial stability would need to be avoided (ibid). There is evidence that certain asset classes, such as green mortgages, perform better but this needs to be corroborated by further research (Institute for Market Transformation, 2013).

The Commission recognises the somewhat unclear risk profile of green investments: on the one hand some of the technologies and financing instruments are less mature (such as batteries, storage, waste-to-energy) and this contributes to a lower credit rating; on the other, these investments help reduce climate transition risks to the economy. The two risk calculations materialise over different time horizons, meaning the economy-wide long-term perspective is not taken into account by investors with short time horizons (European Commission, 2016b). Research does suggest that not addressing environmental risk poses a systemic risk to the stability of financial institutions (Cambridge Institute for Sustainability Leadership and UNEP Finance Initiative, 2014).

A number of initiatives have started to emerge in Europe in support of lower capital weights for climate-friendly investments. A European Energy Efficiency Mortgage Initiative was launched in 2016 to increase

financing of energy-efficient improvements in building by creating a standardised ‘energy efficient mortgage’ based on preferential interest rates for energy-efficient homes. In France, the Banking Association has recently called for a ‘green supporting factor’ to lower capital requirements for exposure to assets that support the energy transition (Fédération Bancaire Française, 2016). The initiative mirrors the ‘supporting factor’ for SMEs included in the European Capital Requirement Regulation, which supports lending to SMEs; SMEs were particularly badly hit by reduced bank lending after the financial crisis. The same reasoning could be applied to green investments if recognised as drivers of sustainable economic growth.

5. Conclusions: key messages for policymakers

- **Securitisation is one option for addressing the challenge of financing fragmented low-carbon assets.** The alternative of relying almost entirely on the balance sheets of developers, utilities, banks and public sector entities to finance these investments is currently insufficient and not cost-effective to meet the €5.7 trillion of annual low-carbon global investment requirements.

- **Policymakers and market participants** have addressed many of the risks of securitisation exposed by the financial crisis and **are taking steps to revive asset-backed securitisation** as a viable channel to raise capital. Recognition of systemic risks associated with the different green asset classes, such as house prices for green mortgage-backed securities and policy support for solar PV, is important for the development of a simple and transparent green ABS market.

- **Simple, transparent, standardised and sustainable securitisation can facilitate access to capital at lower cost for small-scale low-carbon projects.** Tapping into the US$100 trillion bond market, and the institutional investors who provide the majority of capital in this market, is crucial for seeing investment in low-carbon assets at the level and pace required to meet the climate change policy goals that have been established in the EU and globally. Measures to facilitate aggregation are key to reach adequately sized deals for the bond market.

- **The public sector is well placed to support the growth of a green securitisation market.** This includes:

  - Providing clear and consistent definitions of what qualifies as ‘green assets’
  - Supporting the development of standardised contracts for green assets aimed at broad adoption among critical market players
  - Offering warehousing facilities for green loans through public banks or public–private partnerships
  - Providing credit enhancement in the early stages of the market to attract institutional investors
  - Providing cornerstone investment in green asset-backed securities
  - Considering preferential risk-weightings for green asset-backed securities

- **The timing to evaluate policy options to support green securitisation is appropriate, given the policy momentum to revive the securitisation market more broadly, particularly in the EU.** Securitisation and sustainable finance are on the agenda of the Capital Markets Union. Public sector involvement to facilitate securitisation in policy priority areas has been the norm since the market first started with the securitisation of mortgages in the US in the 1970s.

- **Green securitisation will be most effective in the presence of coherent and clear policies to support investment in low-carbon projects.** Without credible policies the potential of green asset-backed securities to reach annual issuance of US$20.4 billion for renewable energy, energy efficiency and electric vehicles alone will not be sustained. A complementary approach of real economy support and financial sector actions by policymakers to drive investment is well proven: it has been used to drive investment in other public good areas, such as infrastructure, for decades.

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Appendix A: Examples of green asset-backed securities issued in the market

SolarCity ABS issuances backed by residential solar power purchase agreements[11]

SolarCity, the largest installer of residential solar in the US, was the first US company to issue securities fully backed by cash flows from solar assets, in November 2013. The US$54.4m issuance was backed by the cash flows from power-purchase agreements for the electricity generated by a bundle of residential rooftop PV installations of around 5,000 of its customers. Since then, it has issued another two rounds of ABS backed by power-purchase agreements from their customers, with a gradual expansion in the size of the issuance and number of individual power-purchase agreements in the pool: the second issuance was for US$70.2m, made up of close to 6,000 agreements, while the third issuance was for US$201.5m, with close to 16,000 power purchase agreements backing the issuance.

SolarCity's securitisation offerings have shown a steady decline in coupon, providing the company with cheaper funding. The company's first issuance was rated BBB+ with coupon at 4.80%. In April 2016, the second issuance, US$70.2m, was also rated BBB+, but achieved a better coupon at 4.60%. In July 2014, the third issuance, for US$201.5m, achieved a lower coupon still. The upper tranche of this issuance achieved a rating of BBB+, and a coupon of 4.026%, with the lower BB tranche getting 5.45%, providing an overall blended rate of 4.32%. All of the ABS issuances from SolarCity have been private placement offerings.

Canadian company Northland Power ABS issuance backed by solar projects with proceeds for renewables[12]

In 2014, Canadian company Northland Power issued CA$232m (€166m) of ABS from a special-purpose vehicle (Northland Power Solar Finance One LP). The bond was backed by solar projects, and had an 18-year tenor with a semi-annual coupon of 4.397%. The Canadian rating agency DBRS rated the issuance BBB.

The specific assets backing the issuance were six 'Ground-Mounted Solar Phase I projects', each operating a 10MW solar facility that sell all electricity to the Ontario electricity grid. Stable revenue streams for the duration of the bond are provided by the 20-year feed-in tariff contract between Northland's solar projects and the Ontario grid. This is a good illustration of how policies providing price signals for green in the real economy can enable climate bond issuance. That the bond achieved a BBB investment-grade rating without further credit enhancement is exciting. As feed-in tariffs are in place in many countries, there are vast opportunities for other utilities to copy Northland's model for ABS issuance backed by renewable energy assets that have a less risky operational phase.

The securitisation allowed Northland to move operational-phase solar energy assets off its balance sheet, freeing up space to make new renewable energy investments. Proceeds from the bond were allocated to refinancing six solar projects backing the issuance and purchase of an offshore wind project, Nordsee One.

Essentially the bond is an ABS version of the corporate green use of proceeds bonds where proceeds are earmarked for specific green purposes. This matters as the bond not only refinances the underlying

[11] Wesoff (2014)

[12] Climate Bonds Initiative (2014)

projects but also enables Northland Power to grow its green portfolio; this refreshed capacity to fund incremental green assets is what so many investors are looking for.

Hannon Armstrong's US$100m ABS for wind, solar and energy efficiency[13]

Hannon Armstrong, a US-based listed sustainable infrastructure investor, issued US$100m (€90m) of low-carbon asset-backed securities in December 2013. The credit profile of the issuance was based on the cash flows from over 100 individual wind, solar and energy efficiency projects; all had investment-grade credit profiles. This deal is a good illustration that a blended portfolio approach, bundling a mix of different green assets in a single ABS issuance, is possible. This is important to make it easier for issuers to achieve scale in the fragmented climate investment market. In October 2014, Hannon Armstrong issued more low-carbon asset-backed securities for US$115m, backed by wind assets. Hannon Armstrong discloses annual emissions reduction estimations from both bond issuances to give investors confidence of the green credentials of the bond.

Flexigroup ABS for rooftop solar[14]

Australian based FlexiGroup Ltd issued a landmark green asset-backed security of AU$50m (US$39m) for refinancing of residential rooftop solar PV systems. The green ABS has received certification against the international Climate Bonds Solar Standard. FlexiGroup's issuance was the *first* Australian green labelled ABS as well as the *first* Climate Bonds Certified Australian ABS. A second issuance followed in February 2017.

The initial FlexiGroup Green ABS Notes were issued as part of a term securitisation transaction for the Flexi ABS Trust within a wider collateral pool of AU$260m of consumer receivables.

The certified green notes closed 5bps (basis points) lower than non-green notes issued at the same time by FlexiGroup and backed by the same wider pool of consumer receivables.

Toyota green ABS for low-carbon transport: the three largest green ABS issued to date[15]

Toyota Finance, the US lending and leasing arm of Toyota Car Manufacturers, has issued three separate green ABS, in 2014 (US$1.75bn), 2015 (US$1.25bn) and May 2016 (US$1.6bn), all three being the largest green ABS ever issued. They all received a strong investor demand. The bonds were fully backed by the cash flows from a specified portfolio of automotive financing. The securitised assets consisted of leases and loans against an eligible set of 'green' Toyota and Lexus Hybrid and Electric vehicles that meet specific emissions hurdles.

As an example, the 2014 ABS pool financed the purchase of 39,900 vehicles from a list of eight different models with specific criteria. The vehicles were also required to satisfy standards of energy efficiency in regulations set by the California Environmental Protection Agency's Air Resources Board.

[13] Hannon Armstrong (2015)

[14] Climate Bonds Initiative (2016c)

[15] Climate Bonds Initiative (2016b)

Obvion: green RMBS (residential mortgage backed security) from the Netherlands to finance low-carbon residential buildings[16]

This €500m (US$566m) Certified Climate Bond was issued in June 2016 by Obvion, a wholly-owned Dutch subsidiary of Rabobank. It was the world's first 100% green RMBS, with both the securitised assets and the proceeds of the ABS being 'green'. The bond was backed by a pool of green residential mortgages for energy-efficient houses in Holland, based on Dutch energy performance labels for private homes.

Renovate America/Hero Funding Trust issued eight green ABS to date, totalling US$1.7bn dedicated to low-carbon building projects[17]

Renovate America is the most recurrent green ABS issuer with US$1.7bn raised so far via a special purpose vehicle called HERO Funding Trust. Since its inaugural low-carbon building ABS in 2014, seven other similar debt instruments came to market, with three green ABS issued in 2016. These are referred to as PACE (Property Assessed Clean Energy). PACE legislation in the US allows local governments to fund the upfront cost of energy improvements on commercial and residential properties, which are paid back over time by the property owners.

Renovate America is a California-based residential PACE financing provider. It partners with local governments to provide its version of PACE, the HERO Program (Home Energy Renovation Opportunity), to homeowners who finance a wide variety of product installations to conserve water and energy. HERO finances more than 60 types of home energy improvements, providing renewable and alternative energy, energy efficiency and water efficiency renovations to homeowners through voluntary property tax assessments.

[16] Obvion (2016)

[17] RenovateAmerica (2016)

Appendix B: Risks of low-carbon investments

The reason why low-carbon investments are currently evaluated as higher risk than other similar projects in more established sectors is the same as for any market in the early stages of development: unknown risks associated with new technology, its production and operation and uncertainty in the policy and regulatory backdrop.

- **Technological risk:** This is one of the key risks that institutional investors care about, for example the risk that an offshore wind farm will not work as intended (OECD, 2014).
- **Production risk:** There is also a production risk beyond technical risk, as even if the offshore wind farm has no technical problems, there is a risk that there will not be enough wind to ensure expected production levels.
- **Policy risk:** This is another key risk investors attach to low-carbon investments: a high reliance on policy driven investment – e.g. feed-in tariffs – introduces the risk to investors that the policy and related tariffs will be removed or reduced. Policy risk can make some green securities exposed to systemic risk – i.e. a risk that is applicable to all of the assets in the pool. This can be problematic if this is not accounted for in the rating process, as was seen for mortgage-backed securities in 2007/08.
- **Credit risk:** This is a risk as with any investment. However, this may be higher due to the lack of history for low-carbon companies and their small scale. There can also be an element of perceived, rather than actual, risk due to unfamiliarity with the low-carbon assets.
- In addition to these risk components, which are specific to low-carbon investments, political risks and currency risks apply, as with any other investment. However, these are not be the focus of this report as they are not specific to the low-carbon investment challenge.

Box A1. Australia: lack of historic data is the main barrier for solar securitisation

One of the large Australian banks has clients interested in securitisation of solar PV assets. As solar PV penetration in Australia has risen to cover one in five houses and has reached grid parity for electricity, the number of green loans available for securitisation is sufficiently large and growing.

The main barrier to the green securitisation market kicking off for solar is a **lack of historic data** on:

- Rate of default. The risk here also depends on the ownership structure for the PV panel (installer, electricity company, homeowner), as their rates of default will vary. When ownership is with the homeowner, a proxy that can address the lack of data here is existing data on default on payment of electricity bills.
- The loss given default. The secondary value of the solar PV panels is not known, and expected to be small, as the cost to remove panels from the roof could offset a substantial share of the value of the panel at that time. Falling technology costs make it more difficult to know the secondary value of the panels in the future.
- How default risk can be minimised.

Another challenge can be that the default rate might change over time as the demographics of those buying solar changes.

Appendix C: Public sector credit enhancement tools

Table A1: Public credit enhancement options for green asset-backed securities

Type of credit enhancement	Description	Example
On-bill financing	On-bill financing addresses the high upfront costs that can characterise energy efficiency improvements. Utility customers can repay through additional charges on utility bills. Credit losses on both consumer and commercial utility bills tend to be lower than for other obligations.	Hawaii government issued green ABS backed by Green Infrastructure Fee on utility bills (State of Hawaii, 2014).
		Securities backed by Property Assessed Clean Energy (PACE) loans. The green loans are repaid through property tax bills. The PACE program is supported by legislation currently present in 30 states in the US (Clouse, 2015).
Partial guarantees	The public sector can provide partial-risk guarantees. This implies it lends its credit rating to the project.	Up to US$25 million of partial credit guarantee is made available by the IADB as part of the energy efficiency loans warehousing project in Mexico (IADB, 2016).
Subordinated debt	Public entities can invest in a project or portfolio, and take the position of accepting loss before private institutional investors. By the public taking a lower position in the repayment pecking order (a subordinated equity or debt position), the parts of the investment with higher priority in this pecking order (senior equity or debt) are protected from losses to a certain extent, which makes this part of the investment lower risk and can be issued at a higher rating.	The New York Green Bank can invest in subordinated debt in clean energy projects to provide credit enhancement (Mendelsohn *et al.,* 2015).
Loan loss reserve	Governments can set up reserve accounts to reimburse the ABS issuing trust for various types of losses and shortfalls. This improves the credit rating of the security.	The State of California has put in place a US$10m loss reserve account to reimburse first-mortgage lenders for losses from PACE loans, producing further credit enhancement for loans under the PACE programme. New York Green Bank commits capital to a loan loss reserve fund to backstop the repayment of a portion of energy efficiency loans by sub-investment grade municipalities (ibid).

Appendix D: Climate bond taxonomy