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N°05/13 APRIL 2013 | CLIMATE

EU Low-Carbon Investment and New Financial Sector Regulation: What Impacts and What Policy Response?

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CHALLENGES TO THE MOBILISATION OF LOW-CARBON FINANCE

The EU's climate and energy goals will require investments of around 1.5% of GDP per year. The banking sector and capital markets will be crucial to providing a large share of this capital. Three headwinds threaten the effective mobilisation of low-carbon financing. First, economic growth is low or negative in much of the EU. Second, the climate and energy policy framework, particularly after 2020, is too uncertain to send the necessary investment signals. Finally, new financial regulations are also being put in place for banks and insurers, which may impact the supply of capital for low-carbon investments.

FINANCIAL REGULATION EXACERBATES THE LONG-TERM FINANCING CHALLENGE

New financial regulation will induce structural changes in the financial sector, in particular a reduction in the capacity of banks to provide long-term credit. Without the mobilisation of new capital sources and financing models, there could be a shortage of long-term financing. However, the low-carbon securitisation market is largely non-existent and institutional investors face prohibitive transaction costs to scaling up direct equity investment in low-carbon projects. New financial sector regulations are also likely to slow the development of low-carbon bond products that could attract institutional investors.

BRIDGING THE LONG-TERM FINANCING GAP

There is a case for easing the regulation on infrastructure investment under the insurance sector regulation. Public banks will also need to play a stronger role. They could provide low-carbon refinancing guarantees, in order to bridge the long-term financing gap. A secondary bond market for low-carbon assets should be encouraged. This could involve the issuance of asset backed securities from the low-carbon portfolios of public banks, and the provision of public wrappers for low-carbon bonds. A framework for low-carbon covered bonds should be developed, given the favourable treatment of covered bonds under the banking regulation. Equity investments in low-carbon projects by institutional investors should be supported, for example through public-private or private-private matching agencies or equity funds.

This article is based on research that has received a financial support from the French government in the framework of the programme « Investissements d'avenir », managed by ANR (French national agency for research) under the reference ANR-10-LABX-14-01.

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Citation: Spencer, T., Stevenson, J. (2013), *EU Low-Carbon Investment and New Financial Sector Regulation: What Impacts and What Policy Response?*, Working Papers n°04/13, IDDRI, Paris, France, 18 p.

This project received kind financial support from the HSBC Climate Change Centre for Excellence. The authors would like to thank Nick Robins for his input into the project, and Lucas Chancel and Emmanuel Guérin from IDDRI for their significant research contributions and comments. All opinions and errors remain those of the authors.
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ISSN 2258-7071

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1. INTRODUCTION

The EU's energy and climate goals will require incremental investments in the order of 1.5% of EU GDP per year over the coming decades.[1] The banking sector and capital markets will be crucial to delivering this scale of low-carbon investment. However, the EU, and the Eurozone in particular, are experiencing interlinked sovereign debt, financial, and economic crises. New financial regulations are being implemented, such as Basel III and its EU equivalent, the fourth EU Capital Requirements Directive and Regulation (CRD IV). Regulators are also introducing new measures for insurers (Solvency II), which may impact on their ability to provide capital to the low-carbon sector.

Since the onset of crisis, EU low-carbon financing is itself experiencing a number of changes, as we have documented in our interviews (see annex 1). These include:

- the withdrawal of some banks from the low-carbon sector;
- an increase in the stringency and timeframe for internal loan approval processes;
- a decrease in the maturity at which banks are willing to lend and hence an increase in the use of hard or soft mini-perm structures;[2]
- a shift away from loan syndication to club deals;[3]
- sector-specific premiums on the cost of bank debt compared to historically low interest rates;
- a reduction in debt/equity project gearing.[4]

This raises the question as to what is driving these changes. Is it the overall macroeconomic deterioration and uncertainty, pressures from financial markets, uncertainty in climate and energy policy, new financial regulation, or a combination of the above? Is it a structural or cyclical phenomenon? What are the implications for low-carbon financing, in terms of the availability and cost of credit, loan tenors and refinancing of bank credit, and the broader long-term business model for capital provision to the low-carbon sector? Is there a need for a policy response to ensure this capital provision at acceptable terms, and if so, what response?

This paper aims to address the potential impact of new financial regulations on low-carbon investment in the EU. It places this issue within a broader context of macroeconomic instability and uncertainty in EU climate and energy policy frameworks, in order to assess the relative importance of financial regulation as a driver for investor behaviour in both the short and long term.

The paper is structured as follows. Section 2 briefly describes relevant financing models and barriers in the low-carbon sector. Section 3 addresses the financial sector more broadly, describing the *market* forces that may be driving some of the changes in bank behaviour listed above.

1. EC, "A Roadmap for moving to a competitive low-carbon economy in 2050", COM (2011) 112/4 Provisional Text, pp. 10.
2. A hard mini perm is a project finance structure that sets a legal maturity shorter than the full project term (typically around 7 years), forcing the borrower to refinance before maturity or default on the outstanding debt. A soft mini-perm is a structure without this default risk, where the loan maturity remains long-term but whereby increasing incentives are in place to encourage the borrower to refinance, for example increasing interest rates later in the loan period.
3. Syndication: a lead bank arranges and underwrites the loan, and then sells parts of the loan to other banks. The lead arranger retains the underwriting risk and the fees. Club deal: several banks club together and provide the loan, and share the underwriting risk and fees; there is no lead arranger.
4. Gearing: the level of project leverage, *i.e.* the ratio of debt to equity within the financing structure.

Section 4 assesses the potential impact of new banking sector regulations on low-carbon finance. Section 5 investigates the impacts of Solvency II on insurers. Section 6 provides implications and recommendations for policy and further research. Annex 1 describes the stakeholder interviews and review process conducted for this paper.

2. THE EU LOW-CARBON SECTOR

2.1. Low-carbon Investment Models and the Role of the Financial Sector

Overall, the European economy is significantly more dependent on bank intermediation than other developed economies. In the USA total bank credit adds up to just 50% of GDP, or 15% of total economy liabilities, compared to 120% of GDP and 40% of total economy liabilities in the Eurozone, according to the statistics of the OECD.[5]

Certain low-carbon financing models are also highly dependent on the supply of bank credit, in particular *project finance* and to a lesser extent *corporate finance* and *household finance* (see annex 2 for definitions). Thus low-carbon subsectors supported by project financing may be particularly at risk to changes in the supply of bank credit. These include larger-scale, centralized renewables and off-balance sheet infrastructure projects.[6] Bank credit is also important to corporate financing, although larger corporates also have access to bond and equity markets.

However, low-carbon financing models should not be seen as static, but rather responsive to market pressures and policy. Factors affecting low-carbon financing models include:

- The balance between centralized and de-centralized technology options;
- Policies to accelerate the recycling of capital in the sector or attract new sources of capital, such as institutional investors;
- Pressure on public budgets and financial regulation (see the following sections).

5. Garnier, O. (2012), "Vers quel nouveau modèle de financement de l'économie en France et dans la zone euro?", in Couppey-Soubeyran, J *et al.* "Le financement de l'économie dans le nouveau contexte réglementaire", Conseil d'Analyse Économique.

6. The majority of energy-related infrastructure financing (transmission and distribution) is traditionally financed by corporate balance sheets: see, Roland Berger, "The structuring and financing of energy infrastructure projects, financing gaps and recommendations regarding the new TEN-E financial instrument", 2011.

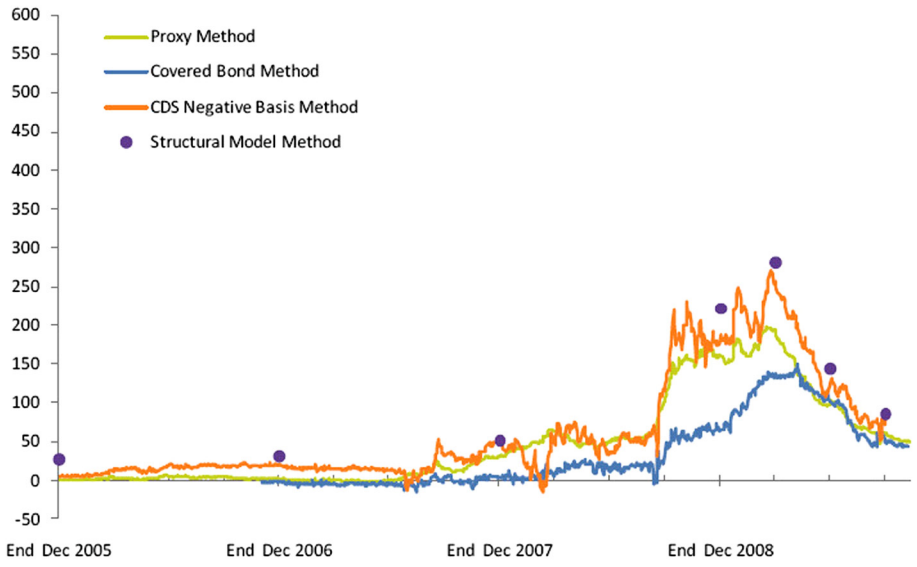
The potential impact of financial regulations on low-carbon financing models should therefore be seen in dynamic terms. One objective of this paper is to assess the likelihood of structural changes in low-carbon financing models induced by the new regulations, and the potential risks of frictions in such regulatory-induced changes in financing models.

2.2. Policy and Market Risks in the Low-Carbon Sector

Robust policy frameworks lower the risk-return profile of low-carbon projects and hence improve the terms at which investors are willing to finance them. Thus the changes in investor behaviour highlighted in the introduction may be in response to a perceived increase in policy and market uncertainty, for example:

- *The perceived political and social sustainability of low-carbon policy in the crisis context*: as one interviewee noted, "the economic crisis has crystallised the sovereign risk around low-carbon policy frameworks". In response to pressures on public and/or household budgets, policy makers have undertaken retroactive changes to low-carbon policy frameworks in some EU markets, such as Spain, Portugal, and the Czech Republic. This had negative spill-over effects on confidence in policy frameworks in other markets as well. The crisis is also slowing down the further development of EU and national low-carbon policy frameworks and weakening market confidence in the political will to implement policies with short-term incremental costs.
- *The absence of an EU policy framework after 2020*: for investors considering multi-decade investments, the absence of a post-2020 low-carbon policy framework has been described as "a very frightening gap". The Commission has launched work on the post-2020 framework, but it is difficult to envisage its adoption before 2015/2016. This creates significant uncertainties for investors.
- *Market uncertainties*: energy markets are undergoing significant changes. These include the increasing penetration of variable renewables in electricity markets and associated impacts on system balancing and pricing models based on short-run marginal costs; the US revolution in unconventional hydrocarbons and its perceived implications for the profitability of low-carbon options; and rapid cost decreases in many low-carbon options themselves. Issues such as bottlenecks in grid development and supply chains for some technologies (offshore wind and HVDC lines in particular) have also been

Figure 1. Bank liquidity premia in basis points



Source : CEIOPS (2010), "Task Force Report on the Liquidity Premium".

raised as concerns for investors. More generally, macroeconomic uncertainty has negative economic spillovers onto the low-carbon sector.

During our interviews, short- and long-term policy uncertainty was consistently highlighted as the most relevant barrier to EU low-carbon investment. Such concerns were given higher importance than perceived barriers relating to the supply of capital, *i.e.* its availability, cost and tenor. Nonetheless, the two are related: any increases in the cost of decarbonisation will have repercussions on the political and social robustness of policy frameworks, and *vice versa*.

2.3. The Macroeconomic and Market Context as Drivers for Bank Lending to the Low-Carbon Sector

It is important to understand to what extent changes in bank lending behaviour may be regulatory or market driven, and hence to what extent they are structural or cyclical in nature. This section therefore briefly assesses *market drivers* for bank behaviour; in section 3, we move to our central focus, namely the implications of *financial sector regulation*.

The financial and sovereign debt crises have led to a market re-evaluation of what constitutes a "safe" bank. The EU banking sector has experienced decreasing profitability and increasing instability, particularly in crisis-hit periphery countries.[7] This has largely been through two interlinked channels: bank funding costs and bank asset quality.[8] Regarding the latter, the crisis has created increasing levels of asset impairment for banks. This will take some years to play out, as banks are still holding large and growing stocks of non-performing loans, particularly in periphery countries. Concerns about bank liquidity/solvency have put pressure on bank wholesale funding costs. While the spike in wholesale funding costs has strong cyclical aspects, some of the increase in funding costs seem structural in nature,[9] and are also likely to be reinforced by new regulation (see below).

In response banks are scrambling to secure market confidence, strong credit ratings, and sustainable funding costs. Banks have adopted a number of strategies to adapt to market pressures, including an increase in risk aversion; deleveraging, in particular from risky, capital intensive assets; constraining loan growth; increasing capital buffers; increasing competition for retail deposits and hence a return to core activities (retail and commercial banking). Such changes in bank behaviour may result in longer-term changes in bank business models, such as the exit from riskier,

7. Greece, Ireland, Portugal, Spain, and to a lesser extent Italy.
8. In this context, "assets" are banks' sovereign debt holdings and retail and commercial loans.
9. See Le Leslé, V, "Bank Debt in Europe: "Are Funding Models Broken?", IMF, 2012.

more capital-intensive non-core businesses (trade finance, investment banking, and foreign activities). This shift in business models may be reinforced by national and international regulation (see section 3).

Figure 1 shows the explosion of the liquidity premium on bank credit as a result of the 2008/9 crises. The liquidity premium can be seen as a measure of bank desire to hoard liquidity in times of funding/asset stress, and hence their reluctance to allocate capital to illiquid, long-term assets, such as long-term project finance debt. It also shows how low liquidity premia were in the pre-crisis era: markets were awash with cheap long-term credit. However, this was based on systemically unstable funding patterns, *i.e.* high reliance on short-term wholesale markets and funding via asset securitisation.[10] Pre-crisis bank credit conditions were thus exceptional, but also systemically unsustainable.

In an environment of macro-instability, scarce capital, and funding uncertainty, banks are reluctant to take on longer-term, illiquid assets. It is easy to see how the low-carbon sector could be "collateral damage" of these market-driven shifts. Along with existing uncertainty in energy and climate policy frameworks, such financial market pressures seem an important driver for the observed shifts in low-carbon financing noted in the introduction. A key question is to what extent financial regulation will reinforce these trends. We turn to this in the following section.

3. THE IMPACT OF BASEL III AND CRD IV ON CREDIT PROVISION AND LOW-CARBON FINANCING

Basel III/CRD IV is largely a direct response to the perceived causes of the financial crisis. There is a degree of overlap between overall regulatory objectives and individual measures within Basel III/CRD IV. Therefore, section 3.1. is organized around the structural changes that the regulations aim to induce in the banking sector, and their potential impacts on the low-carbon sector. Section 3.2. then goes into more detail regarding these impacts on the low-carbon sector, in terms of the cost of bank credit, tenor, refinancing/securitisation, and impact on projects as a function of credit rating.

The following analysis is confronted, however, with a moving target. The regulations in question are still being defined, and their implementation will be phased in over the coming decade. Significant changes have recently been made to a key measure of the regulations, the Liquidity Coverage Ratio (LCR).[11] The EU transposition of Basel III, CRD IV, is still under negotiation. New regulations are under consideration at the national and EU level, such as those concerning the ring fencing of retail banking and procedures for un-winding insolvent banks while limiting public involvement.[12] Further, some measures and some regulatory impacts, such as cost and availability of bank credit, have been the subject of detailed quantitative assessment. Other impacts, for example on securitisation or the tenor of bank credit, have been subject to more qualitative assessment.

Thus we seek here to identify the broad structural changes in the banking sector that the regulations aim to induce, and to translate these qualitatively and where possible quantitatively into potential impacts on the low-carbon sector.

3.1. Regulatory objectives, measures and impacts on low-carbon financing

3.1.1. Liquidity measures

Basel III and CRD IV aim to increase the stability and liquidity of bank funding, and improve the temporal matching of assets and funding sources. The two central measures are the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). The LCR aims to ensure that banks have a sufficient stock of high quality, liquid resources to cover their funding needs during a 30-day period of funding stress. The NSFR requires banks to fund longer-term assets with stable funding of at least a one-year maturity. In short, the LCR aims to secure banks against short-term funding crises, the NSFR to force banks to use more stable, longer-term funding models. The phase-in of the LCR begins in 2015 and should be fully implemented by 2019, the NSFR by 2018.

The LCR in particular will induce a capital reallocation to highly liquid assets eligible for compliance (especially sovereign and central bank bonds, cash, and some highly rated corporate bonds). In order to comply with the NSFR, banks will make use of longer-term and hence in principle higher cost funding. This in turn will create incentives for

10. Gifford, M. (2012), "Fixing the Funding Machine: Why half of the new global financial regulation is misconceived", BSG, Oxford University.

11. See Basel Committee on Banking Supervision (2013), "Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools", Bank for International Settlements.

12. See at the EU level, Likkanen, E. (2012), "High-level Expert Group on reforming the structure of the EU banking sector".

a decrease in asset tenors in order to reduce the cost of regulatory funding requirements under the NSFR. Banks will become more sensitive to temporal mismatches between assets and funding, and hence more reluctant to hold long-term assets.

Given its reliance on long-term bank credit, the low-carbon sector may be particularly exposed to a reduction in the willingness of banks to lend long-term. This will increase refinancing risks for low-carbon borrowers. The NSFR will create incentives to move low-carbon assets off balance sheet through the sale of project finance loan books or the securitisation of low-carbon loans (see section 3.1.3. for a further discussion of low-carbon securitisation). Finally, contingent credit obligations, such as letters of credit and revolving credit facilities, are treated unfavourably under both the LCR and NSFR, which may have an impact on the provision of construction finance.

3.1.2. Regulatory capital

Basel III and CRD IV also aim to increase both the quality and quantity of bank capital held in order to protect against losses, and to establish a counter-cyclical element to regulatory capital.[13] In response, banks may follow a number of compliance strategies including:

- raising new capital via equity issuance or profit retention;
- increasing operational efficiency;
- accepting a decrease in return on equity compared to historical levels;
- reducing regulatory capital requirements by deleveraging or constraining new loans; and
- optimizing capital allocation across asset classes depending on regulatory risk weights (see section 3.1.3).

CRD IV and Basel III also include a leverage ratio that should cap non-risk weighted leverage both on and off balance sheet at 3% from 2018. This measure is intended to act as a backstop to regulatory capital requirements, preventing excessive and at times opaque systemic leverage.

Together, these measures could have an impact on low-carbon lending, *via* a higher cost or constrained availability of bank credit, and increased stringency of loan review procedures, *i.e.* higher risk premia for lower-rated projects (see section 3.2.1. for discussion on cost of credit impacts). Periphery banks will be forced to rely more heavily on deleveraging and credit rationing, as market turbulence will preclude equity issuance and profit retention as a means of compliance. We therefore expect a more onerous compliance effort and hence a greater impact on the low-carbon sector in periphery countries. There is also some potential that the leverage ratio has an adverse effect on long-term, illiquid assets, as these cannot be easily divested in the event a bank approaches the maximum leverage ratio.

3.1.3. Prevention of excessive risk taking and the internalisation of systemic risks

The crisis revealed a range of problems regarding risk evaluation and the internalisation of systemic risk in bank procedures.[14] In response, Basel III/CRD IV increases the regulatory capital risk weights of trading book activities, inter-financial exposures, some kinds of complex securitisations, and over-the-counter transactions. Complex securities perceived as highly risky, such as asset backed securities (ABS), are treated unfavourably by the regulation.[15] By contrast, securities where risk is retained on balance sheet, such as covered bonds[16], are given a favourable treatment under the regulation.[17]

These regulations will have impacts on European securities markets.[18] They will drive a flight to quality, *i.e.* sovereign securities, and higher rated (AA- or higher) corporate and covered bonds. They will further drive a flight to transparency, simplicity and on-balance sheet risk retention, *i.e.* a move away from complex securitisations. Finally, the regulations create incentives for the use of centrally cleared counterparties, *i.e.* toward standardisation.

13. The three key measures for our purposes are the increase in the highest quality common equity tier one capital (CET1), strengthened eligibility criteria for other capital instruments, and the two counter-cyclical capital buffers. CET1 should be implemented by 2015; the other two measures are phased in over a longer timeframe. The capital conservation buffers should be phased in by 2019, and the phase out of no longer eligible capital instruments will take place over a ten year horizon beginning 2013.

14. Evident in the use of complex securitisations, large trading book exposures, and insufficient protection against counter-party credit risks.

15. Asset backed securities are treated as a 100% outflow under the LCR and are not eligible as a high quality liquid asset, whereas, for comparison, residential mortgage backed securities are eligible as high quality liquid assets at a 25% haircut.

16. Covered bonds are bonds under which the investor has recourse also to a pool of assets that "covers" the bond. Covered bonds typically remain on the issuers balance sheets.

17. Under the LCR, covered bonds rated AA- or higher are eligible as high quality liquid asset at a 15% haircut. Under the NSFR, covered bonds rated AA- or higher have a required funding factor of 20%.

18. See Blommestein, H. *et al.* (2011), "Outlook for the Securitisation Market", *Financial Market Journal*, OECD.

Currently, securities play relatively little role in *direct* low-carbon financing. Bonds do play a role in corporate financing and public financing (public banks and government entities), and hence in low-carbon financing via these entities' balance sheets. However, low-carbon project bonds and the securitisation of low-carbon assets remain negligible. Nonetheless, the need to scale up and accelerate low-carbon investment has created interest in tapping new sources of capital such as institutional investors, including via low-carbon bonds and securitisation.[19] Broadly speaking, these regulations imply that the low-carbon sector will need to develop highly rated, transparent, liquid and standardized securities if it is to tap such sources of capital. Such instruments will likely be longer to develop than other established instruments, such as ABS. Given the relatively small size and lack of depth in low-carbon secondary markets, developing such instruments may be a challenge.

3.2. Aggregate Cost of Credit Impacts and Potential Structural Changes in Low-Carbon Financing Models

3.2.1. Aggregate Cost of Credit Impacts

Market pressures and EBA policy[20] have pushed European banks to make strong steps toward early compliance with the capital requirements mandated by Basel III/ CRD IV. In Europe, 88% of large internationally active banks[21] already meet the key capital requirement for 2015. In aggregate terms, the capital requirements do not appear onerous. In Europe, large banks would face a total capital shortfall of €434 billion, which does not seem substantial given the 2019 final implementation horizon for all the capital measures.[22]

The two liquidity ratios, by contrast, seem to impose a greater compliance effort (see annex 3). However, significant changes to the LCR agreed in 2013 extend the implementation timeline and relax the definition of the ratio, which will ease the cost of compliance.[23] Furthermore, capital raised for compliance with the capital measures can qualify for compliance with the liquidity ratios. The capital shortfalls for the two liquidity ratios, quoted in annex 3, consider each measure in isolation and do not take into account this compliance overlap. This would tend to further diminish the compliance effort required to meet the LCR and NSFR. However, the aggregate compliance costs obscure a strong variation across geography and bank size, with small and periphery banks facing much higher shortfalls and increased costs of compliance.

There also remains significant uncertainty with regard to banks' mitigation strategies, and the reaction of capital and equity markets to changes in banks' risk profiles. These questions have informed a major debate in both theoretical and empirical analysis of the impact of macro-prudential regulations, which is addressed in greater detail in annex 4.

Nevertheless, there exist a number of studies that attempt to estimate the impact of these regulations on the cost of bank credit. According to the literature, a "whole economy" increase in the cost of bank credit in the order of 40-60 basis points (bp) seems a reasonably consensual estimation for the aggregate equilibrium impact of the Basel III/ CRD IV regulation.[24] Impacts are likely to be higher for lower rated entities, in the order of an increase of 66-78 bp for BB to BBB ratings.[25] Thus, particularly given the phased approach of the regulatory changes, the aggregate impact on "whole economy" cost of capital appears to be marginal in the long run. However, such figures obscure potentially large differences by region, bank, and asset rating and tenor.

19. See Kaminker, C. and F. Stewart (2012), "The Role of Institutional Investors in Financing Clean Energy", OECD.

20. For example, in 2011 the EBA recommended the raising the total capital ratio of European banks to 9.5% in order to restore market confidence (EBA 2011).

21. Group 1 banks are those with Tier 1 capital in excess of €3 bn and internationally active. All other banks are categorised as Group 2 banks.

22. For a sense of magnitude, compare this to annual profits of €82.8 billion in 2011 for the same group of banks (EBA, 2012).

23. To our knowledge, quantitative impact assessments of the most recent changes to the LCR have not yet been undertaken.

24. See EC, "IMPACT ASSESSMENT Accompanying the document Regulation of the European Parliament and the Council on prudential requirements for the credit institutions and investment firms", SEC(2011) 949 final, 2011; Reifner, U *et al.* "CRD Impact Assessment of the Different Measures within the Capital Requirements Directive", European Parliament's Committee on Economic and Monetary Affairs, 2011; Elliot, D. *et al.*, "Assessing the Cost of Financial Regulation", International Monetary Fund, 2012; Slovik, P. and B. Cournède, "Macroeconomic Impact of Basel III", OECD, 2011; Pollin, "Analyses et quantifications des effets du nouvel environnement réglementaire sur les conditions de crédit" in Couppey-Soubeyran, J *et al.* "Le financement de l'économie dans le nouveau contexte réglementaire", Conseil d'Analyse Économique.

25. Ganguin, B. *et al.* (2011), "Why Basel III And Solvency II Will Hurt Corporate Borrowing In Europe More Than In The U.S.", Standard and Poors.

3.2.2. Before and After: Post Crisis, Post Regulation Low-Carbon Financing

Three key changes in low-carbon financing can be identified: on the cost of bank credit, on tenor and refinancing, and on potential securitisation models. It is important to note that each of these impacts is driven by a combination of macro-economic, market and climate policy factors, not just financial sector regulation.

1. *Low-cost credit is over.* The pre-crisis period was one of exceptionally cheap credit. The macro-economic situation, climate and energy policy uncertainty, and the new regulations all converge towards an environment of more expensive bank credit for low-carbon projects. In this context, the financial regulations themselves will add an incremental increase to the cost of credit (see section 3.2.1. above), particularly for lower rated entities and longer dated tenors.
2. *Long-tenor, illiquid debt will be scarcer.* Macroeconomic and existing climate/energy policy uncertainty, an environment of scarcer capital, and regulatory funding and capital requirements are all pushing banks to be more parsimonious with long-term, illiquid credit. The banking regulations will create incentives to reduce the tenor of assets, in order to save on regulatory funding and capital requirements, as well as to increase the liquidity of assets.
3. *Liquidity, risk retention, high ratings and standardisation are paramount for securities*: the regulations create two somewhat conflicting pressures. Firstly, they put a premium on liquidity, increasing bank demand for highly liquid assets and raising the cost of long-term, illiquid lending. This will create incentives to shorten asset tenor or shift long-term assets to other investors, notably institutional investors, in order to free up regulatory funding and capital. Secondly, however, they penalize certain securitisations, such as ABS, and favour others such as covered bonds. The regulations have implications for the forms that such securitisation of low-carbon assets could take, in so far as they place a premium on standardized, highly rated products with some degree of on balance sheet risk retention. Given the current immature and shallow secondary market for low-carbon assets, this may pose a particular challenge for the low-carbon sector.

Table 1. The post-crisis landscape for low-carbon finance

Impacts	Drivers Market/macroeconomy Climate/energy policy Financial regulation	Key impacts of the regulation on short-term and long term	Importance and implication for the low carbon sector
Increased cost of bank credit	Funding costs/macro uncertainty/ financial fragmentation Policy uncertainty/sector specific risk premia Capital, liquidity and stable funding requirements	Strong short term compliance effort, particularly in peripheral countries Structural increase in the cost of bank funding Uncertainities regarding bank behaviour and market reaction to reduced bank risk	Small aggregate, long erm impact on "whole economy" cost of credit (40-60 bp) More significant impacts on lower rated en99es (66-78bp for BB-BBB grade) and long term credit (see below)
Decreased willingness to lend long-term	Funding costs/macro uncertainty/ financial sector fragmentation Policy uncertainty/sector specific risk premia Liquidity and stable funding requirements/ leverage ratio	Structural increase in the cost of bank funding for long term assets/ preference for liquid assets over illiquid long term loans Structural incentives to decrease asset tenor/raise premia for long term assets, or move assets off balance sheet	Increased cost / decreased availability of long- term bank credit Refinancing risk Potentially increased interest in instruments to support recycling of bank capital, e.g. securitization
Low-carbon securities and securitization	Collapse of over the counter securi9zation and ABS markets Absence of deep secondary markets, standardized products, and market makers Liquidity and stable funding requirements / risk premia on complex securitizations	Structural incentives to move assets off balance sheet through sale of loan porVolios, securities, or securitization Preference for higher ratings (AA-) Preference for sovereign/ corporate/ covered bonds/RMBS, over ABS	Preference for highly rated, standardized products, with balance sheet risk retention (covered bonds) Likely to slow down potential low carbon securitization due to treatment of ABS

4. SOLVENCY II AND THE IMPACT ON INSURERS' INVESTMENTS IN THE LOW-CARBON SECTOR

In principle, institutional investors are natural candidates for holding long-term, illiquid assets, such as many kinds of low-carbon investment. As noted above, banking regulations may encourage a banking sector disintermediation of such assets. Consequently, there has been emphasis recently on involving institutional investors in the scaling-up of low-carbon finance. While there has been an increase in equity investments by institutional investors in low-carbon projects, there are large transaction cost barriers to scaling up direct equity investments by institutional investors. Moreover, as a relatively new, immature and policy exposed sector, liquid securitisation markets for low-carbon investment are yet to develop. Recent regulation on the insurance sector (Solvency II) may pose a further impediment to institutional investor involvement in the sector. Insurance companies account for approximately 45% of all institutional asset holdings in Europe, making them a primary player in European debt and equity markets.

Like CRD IV, Solvency II increases the quantity and quality of regulatory capital (SCR charge) held by insurers to cover their insurance and investment risks.[26] For the first time these regulations address both the liability and asset side of insurers' balance sheets. The regulations are therefore expected to induce a significant reallocation of insurers' assets, *i.e.* investments. The following points summarize the main impacts of the regulations, and their potential implications for the low-carbon sector:

- *A movement away from equity*: Equity investments are subject to a higher SCR charge than debt, due to their higher volatility. Therefore, the regulations are likely to induce a broad shift away from equity investments, and toward debt. To the extent that a change in demand from insurance companies will affect demand overall, this will have cross-sectoral impacts on equity markets and hence on low-carbon equities.
- *Higher rated, shorter dated securities*: the Solvency II regulation creates incentives for higher rated, shorter dated securities. SCR charges are inversely proportional to the investments' rating; they are also increasing with increasing tenor.[27] Low-carbon pure players are generally smaller, lower rated companies, and this may increase the cost of their access to capital markets. By contrast, the structure of SCR charges may benefit larger, more diversified players such as integrated utilities or multi-sector equipment providers, as these tend to benefit from higher credit ratings. As noted above, the banking regulations will also drive this kind of flight to quality in corporate bond markets.
- *Infrastructure investments*: Solvency II will have ambiguous impacts on insurers' investments in infrastructure, *i.e.* direct equity investment in capital assets, such as power plants, energy transmission infrastructure, or transport infrastructure. On the one hand, Solvency II no longer quantitatively limits the amount that insurers may invest in non-listed assets (infrastructure, private equity, venture capital), as was previously the case under Solvency I. Macroeconomic conditions, notably historically low yields on sovereign debt, are also increasing institutional investor interest in such non-traditional assets; several low-carbon projects in the EU have recently attracted equity involvement from institutional investors, notably pension funds. However, under Solvency II infrastructure investments are subject to SCR charges in excess of the expected annual returns, which tend to be low but consistent.[28] This mismatch between SCR charge and return for infrastructure investment creates a strong disincentive against direct investment in infrastructure. This may have negative repercussions on the low-carbon sector, in particular given the underdevelopment of the low-carbon securities market.

The impacts of Solvency II on the low-carbon sector are more prospective in nature, given the current small role played by institutional investors in general. However, in the context of banking sector disintermediation from long-term lending, institutional investors may have a role to play in bridging the long-term financing gap. Concerning insurers, Solvency II will discourage this kind of investment, specifically equity investment in infrastructure. Given the underdevelopment of low-carbon

26. The regulation also established a less stringent Minimum Capital Requirement, which acts as a final regulatory buffer. The regulation establishes a Solvency Capital Requirement (SCR charge), which mandates that insurers hold sufficient capital against their assets and liabilities, in order to absorb sustained losses during times of stress.

27. Foulquier, P. *et al.* (2012), "The Impact of Solvency II on Bond Management", *EDHEC Financial Analysis and Accounting Research Centre*.

28. L'hoir, M. and M. Sauve (2012), "Solvency II Has and Will Make Corporate Bonds More Expensive", AXA Research and Investment Strategy.

securities and the unfavourable treatment of ABS under Basel III/CRD IV, direct equity investment in infrastructure could be a key channel for insurers to participate directly in low-carbon investment. The treatment of infrastructure under Solvency II seems incoherent with the public policy objective of mobilizing institutional investors as sources of long-term capital, particularly in low-carbon infrastructure.

5. IMPLICATIONS AND POLICY RECOMMENDATIONS

5.1. Summary of Implications

On balance we can reasonably characterize the emerging low-carbon financing landscape in terms of three broad shifts. These are driven by a combination of the post-crisis macro and market environment, the uncertain policy context in the low-carbon sector itself, and financial regulation specifically.

- *Bank disintermediation from long-term credit:* EU banks will be more parsimonious with long-term credit. This implies decreasing loan tenors and higher overall costs for long-term borrowing. This creates refinancing risks that may make some projects unbankable due to uncertainty regarding the total weighted cost of capital over the project lifetime.
- *A potential gap in other sources of capital:* The relative underdevelopment of a market for low-carbon debt securities and the higher transaction costs of equity investments will impede the financing of low-carbon projects through institutional investors. This is compounded by the regulatory disincentive created by Solvency II for insurers to directly invest in infrastructure holdings, and by the premium placed by Basel III/CRD IV on highly-rated, standardized securities with on balance sheet risk retention. Together, these factors may constitute a barrier to the entry of institutional investors in the low-carbon sector.
- *Divergence between core and periphery countries in Europe:* The low-carbon sector in the periphery is under three pressures, and is therefore more adversely impacted by the changes described in this paper. Firstly, as noted earlier, macroeconomic and financial instability in periphery countries have reduced the ability of the banking sector to provide credit. Secondly, these conditions make compliance with new regulations more onerous for periphery banks. Finally, the low-carbon sector itself is subject to heightened policy risk as a result of sovereign pressures, making it even more difficult for this sector to obtain capital in these markets.

5.2. Policy Recommendations

Continued action is needed to address underlying macroeconomic instability and in particular uncertainty in low-carbon/energy policy. However, the structural changes emerging in low-carbon financing may merit a targeted policy response. We make the following recommendations:

1. *Create a low-carbon refinancing guarantee facility in public banks and enhance the role of public banks*: public banks will need to play a crucial role in providing an attractive tranche of first loss credit or credit guarantees behind low-carbon projects, in order to encourage the involvement of private banks. This should be taken into account when considering the role of existing or new public banks, for example the Public Investment Bank in France (Banque Publique d'Investissement, BPI). Specifically, the new financing environment will be one of increased refinancing risk for long-term projects, due to the decreased willingness of banks to lend long-term. A *low-carbon refinancing guarantee facility* could reduce refinancing risks for project developers, and hence mitigate the impacts of constrained long-term credit. The KfW has provided a similar instrument for trade finance (traditionally dependent on long-term bank credit) in response to the financial crisis. A refinancing guarantee could potentially be more cost effective than directly supplying long-term tranches of credit, and would support the market development of financing models less directly reliant on long-term bank credit.
2. *Create a secondary bond market for low-carbon assets*: it will be necessary to develop new financing models that can accelerate the recycling of limited long-term bank credit and tap new sources of capital such as institutional investors. One of these will be the securitisation of low-carbon assets. For this several things need to happen:
   a. *Standardisation*: The new regulations make transparency and standardisation even more important for bond markets. Developing standards for low-carbon bonds will therefore be vital. Public banks should work with initiatives such as the Climate Bonds Standards in order to developing and apply standardisation to their own portfolios of low-carbon assets. Regulators such as the European Securities Market Authority

and credit ratings agencies should also be involved.

b. *Test the market via the issuance of low-carbon asset backed securities by public banks*: the issuance of low-carbon asset backed securities by public banks (given a zero risk weight under Basel III/CRD IV) could both free up bank balance sheets and habituate capital markets to such instruments.

c. *Develop a framework for low-carbon covered bonds*: the favourable treatment of *covered bonds* under the regulation strengthens the case of considering this vehicle for low-carbon investment. Changes to national legislation and potentially an EU framework would be required to make low-carbon assets eligible for covered bonds.[29]

d. *Provide public wrappers for low-carbon bonds*: public banks or agencies can also provide a subordinate tranche of debt or a wrapper in order to incentivize the development of low-carbon bonds.

3. *No sector specific derogation from the banking regulations*: Overall, we do not consider that it would be desirable to create sector-specific derogations for low-carbon project financing within the banking regulation itself at this stage. This could be achieved in theory via a reduction in the NSFR for certain kinds of long-term loans. We believe that the verification procedures around such derogations would probably be prohibitive, and would likely open the regulation to further lobbying (already significant). Likewise, in the absence of secondary market of sufficient size, standardisation, and liquidity, a regulatory derogation for low-carbon ABS would be difficult to justify under the logic of the financial regulation. However, to the extent that secondary markets for low-carbon debt do begin to develop in Europe, additional research on specific low-carbon ABS designs that conform both to market characteristics and regulatory imperatives could be merited.
4. *Support direct equity investments by institutional investors in low-carbon infrastructure:* given the likely slow development of low-carbon bond markets, it is also necessary to support direct equity investments by institutional investors. This will require both addressing limitations in their expertise and human capacity in this field, and the regulatory biases mentioned above:

a. *Create public-private and private-private platforms for equity investors*: transaction costs and simple limitations to human capacity and expertise are key barriers to institutional investors' equity involvement in low-carbon projects. A *public matching facility* or *public/private equity funds* could be housed under national/EU public banks, with the objective of facilitating institutional investors' equity involvement in low-carbon projects. A model for this could be the UK Pension Infrastructure Platform currently under development between HM Treasury and major UK pension funds. Similar private-private platforms and infrastructure funds could be developed between the banking and institutional investors, building on the banking sector's practical *savoir-faire*. The Commission's High Level Roundtable on Resource Efficiency could be one place where such private-private discussions could be supported.

b. *Address the SCR charge for infrastructure investments under Solvency II*: it seems difficult to justify the treatment of infrastructure investment under Solvency II. A reduction in the *SCR charge for infrastructure investment under Solvency II* would encourage investment in infrastructure, and the low-carbon sector would profit from this more broadly.

5. *Ensuring coherence between financial regulation and low-carbon objectives:* There is need to consider ways to support a sustained dialogue about cross-sectoral regulatory coherence. The EU's green paper on long-term investment is a good example. Institutions like the EBA, EIOPA, and the ECB could be charged with assessing the interactions between financial markets and other policy objectives like climate change. New regulatory initiatives in the financial sector could also be assessed from this standpoint. There is also a need for further research to quantify the broad structural trends outlined in this paper, particularly regulatory impacts on the tenor of bank credit and on securitisation.

29. Damerow, F. *et al.* (2012), "How Covered Bond markets can be adapted for Renewable Energy Finance and how this could Catalyse Innovation in Low-Carbon Capital Markets", *Climate Bonds*.

ANNEXES

1. Stakeholder interviews and review.

As part of this paper, IDDRI conducted a short series of semi-structured interviews with stakeholders from low-carbon investment, regulatory affairs, public policy institutions, academia, and NGOs, at both the EU and Member State level. These were conducted under the Chatham House rule. 21 individuals were interviewed; their views provided highly useful context and concrete insights and material for the study. We would like to thank those interviewed. The paper received comments from a number of stakeholders, for which we are very grateful. Of course, all views and any errors are our own.

2. Description of low-carbon financing models.

Household finance refers to investments undertaken from household balance sheets, e.g. in solar PV or energy efficiency. Such investments are often supported by publically subsidized capital (concessionary loans from public banks, for example) or other regulatory policies such as feed-in tariffs.

Corporate finance refers to investments from corporate balance sheets, *e.g.* in industrial energy efficiency, energy transmission lines, or traditional thermal power plants. Financial intermediaries and sources of leverage include corporate bank lending, and corporate bond and equities markets.

Public finance refers to investment from the balance sheets of central and local governments or public agencies such as public banks.

Project finance refers to a financing model based on project cash flows rather than the balance sheet of project sponsors. Project sponsors typically put a share of equity into an off balance sheet vehicle (Special Purpose Vehicle) and a bank or group of banks provides the remaining share as credit. Such loans are secured against the project asset and paid from the project cash flow, rather than the balance sheet of the project sponsor.

Project bond refers to the issuance of a tradable bond by a project entity, the repayment of which is linked to the project cash flow.

Low-carbon securitisation refers to the pooling of loans to the low-carbon sector (renewables, energy efficiency, etc.) and the issuance of a tradable bond backed by the receivables (loan repayments) from the underlying assets.

Table 2. European banks' compliance effort required to meet Basel III/CRD IV

Measure		Capital shortfall to reach 2015 minimum (4.5%)	Capital shortfall to reach 2019 minimum (7%)[1]
Common Equity Tier 1 ratio	Group 1 banks[2]	€8 billion	€199
	Group 2 banks	€10 billion	€26

		Total capital shortfall to meeting the 2019 binding requirement (8% total capital + 2.5% capital conservation buffer)
Total capital ratio + capital conservation buffer	Group 1 banks	€434 billion

		Current Tier 1 leverage ratio, to be compared to proposed requirement of 3% in 2018
Leverage ratio	Group 1 banks	2.9%
	Group 2 banks	3.3%

		Current liquidity coverage ratio, to be compared to 100% requirement by 2015*	Total liquidity shortfall*
Liquidity coverage ratio	Group 1 banks	72%	€1.17 trillion (or 3.7% of total assets in the sample)
	Group 2 banks	91%	

		Current net stable funding ratio, to be compared to 100% requirement by 2018	Total net stable funding shortfall
Net stable funding ratio	Group 1 banks	93%	€1.4 trillion
	Group 2 banks	94%	

1. N.B. this 7% figure therefore includes the Common Equity Capital Ratio and the capital conservation buffer, *i.e.* 4.5% and 2.5% respectively by 2019.
2. Group 1 banks are those with Tier 1 capital in excess of € bn and internationally active. All other banks are categorised as Group 2 banks.

3. Distance to compliance with Basel III / CRD IV

The most recent quantitative assessment by the European Banking Authority of the compliance effort required to meet the regulations dates from September 2012, and takes into account data from end December 2011.[30] It should be noted that this does not take into account the changes to the Liquidity Coverage Ratio announced in January 2013; this figure is therefore marked with an asterisk. The key results are shown in table 2.

4. The debate on the cost of credit impact of prudential banking regulation.

There is a wide theoretical and empirical debate on the impact of banking sector regulation on the cost and availability of credit. Two key uncertainties relate to banks' mitigation strategies in order to reduce the impact of the new regulations, and the reaction of capital and equity markets to changes in banks' risk profiles as a result of the regulations:

- *Bank mitigation strategies:* it is unclear who will bear the cost of raising further capital. Costs could be passed onto borrowers (an increase in interest rates), equity investors (decline in the return on equity), or retained by banks themselves (reduction in salaries or bonuses, or an increase in operating efficiency, for example).[31]
- *Capital and equity market reaction to changed risk-return profiles:* a central uncertainty relates to the reaction of capital and equity markets. Theoretically, prudential regulations should reduce the riskiness of banks' debt and equity, and thus its price (the so-called Modigliani-Miller theorem). This would then offset (some of) the incremental cost of raising further capital, as compared to a scenario in which banks continued to finance themselves at low cost from short-term sources, such as interbank markets, for example. The literature suggests that a Modigliani-Miller effect does exist, but that it may not offset the full incremental cost of an increase in capital requirements.[32]
- *Macro-uncertainty*: finally, the impact of banking regulation depends on the macro-environment, via the channels of *inter alia* funding costs, asset quality, and interest rate earnings. Clearly there is a great deal of uncertainty regarding macro-economic evolutions.

These factors mean that an increase in capital requirements cannot be mechanically translated into increased cost of bank credit without considering different scenarios for bank and market behaviour.

30. European Banking Authority, "Results of the Basel III monitoring exercise based on data as of 31 December 2011", September 2012.

31. See *e.g.* McKinsey and Company, "The Triple Transformation: Achieving a Sustainable Business Model", 2nd McKinsey Annual Review on the Banking Industry, October 2012.

32. For a theoretical explanation of the effect of higher capital requirements on bank funding and credit rationing, see *e.g.* I. Augur, "Wholesale Bank Funding, Capital Requirements, and Credit Rationing," IMF Working Paper 13/30, January 2013. On the Modigliani-Miller Theorem specifically, see Y. Braouezec, "Modigliani–Miller Theorem," Encyclopaedia of Quantitative Finance, 2010; and J. Schanz *et al.*, "The Long-Term Economic Impact of Higher Capital Levels," BIS Paper no. 60, 2011.

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