CARBON RISK FOR FINANCIAL INSTITUTIONS

A PERSPECTIVE ON STRESS-TESTING AND RELATED RISK MANAGEMENT TOOLS

DISCUSSION PAPER – OCTOBER 2014

2° Investing Initiative

1. INTRODUCTION

2°INVESTING INITIATIVE

The 2° Investing Initiative [2°ii] is a multi-stakeholder think tank working to align the financial sector with 2°C climate goals. Our research and advocacy work seeks to:

- Align investment processes of financial institutions with 2°C climate scenarios;
- Develop the metrics and tools to measure the climate performance of financial institutions;
- Mobilize regulatory and policy incentives to shift capital to energy transition financing.

The association was founded in 2012 in Paris and has projects in Europe, China and the US. Our work is global, both in terms of geography and engaging key actors. We bring together financial institutions, issuers, policy makers, research institutes, experts, and NGOs to achieve our mission. Representatives from all of the key stakeholder groups are also sponsors of our research.

AUTHORS

Authors of the discussion paper are Jakob Thomä (2° Investing Initiative) and Stanislas Dupré (2° Investing Initiative). The discussion paper forms the basis of the subsequent research reports planned in partnership with CDC Climat and the UNEP Inquiry on Designing Sustainable Financial Markets

From climate science to economics. The science of climate change has arrived in the mainstream. Governments, businesses, and households are almost universally beginning to recognize the threat of climate change to the health, security, and prosperity of today's and future generations. In order to limit the impact of climate change, the international community has articulated the global goal of limiting climate change to +2° C. Realizing this goal will become the defining challenge of today's generation, realizing *the transition from a high-carbon to a low-carbon economy.*

The energy transition – a capital reallocation challenge. Realizing the transition from a high-carbon to a low-carbon economy will require a significant reallocation of capital. The implications for the financial sector in terms of climate goals are enormous, the scale of capital mobilisation (and reallocation) unparalleled since World War II. Estimates suggest the energy transition will require an extra annual $1 tn in investment in clean energy above current levels in the medium-term. Similarly, a significant amount of capital will need to be moved out of current high-carbon investments in a range of sectors, including fossil-fuel mining, utilities, certain types of high-carbon manufacturing, transport infrastructure, and real estate.

Energy transition and carbon risk. While the scale of the capital reallocation challenge is increasingly clear, the risks associated with this transition for financial institutions arise on a similar scale. To date, the mainstream debate has largely focused on the risk of not realizing climate goals – in other words the risk of climate change to today's business models. Indeed, this focus is somewhat warranted.

At the same time, the nature of our response to this threat itself gives rise to a new set of risks: The risk of being high-carbon as the economy transition to a low-carbon world; the risk of betting on the wrong technologies; The risk of misunderstanding the set of diverse 'energy transitions' each country faces. And of course, the risk of betting that we will achieve the +2°C.

These broad set of risks can be labelled 'energy transition' risks and the subset of these risks – the family of risks associated with high-carbon investments in the midst of a transition to a low-carbon world – 'carbon risks'. Indeed, beyond climate change, it is this type of risk that is likely to pose the biggest challenge to financial institutions over the next twenty years.

The big unknown. To date, the nature of these carbon risks for financial institutions remains largely an unquantifiable variable. While a range of institutions have begun to attempt to highlight (and quantify) some of these risks for financial institutions, the analysis remains limited to specific industries (e.g. oil & gas, coal, etc.) and generally fails to provide a comprehensive insight into the exposure of a whole financial portfolio to carbon risks. The analytical shortcomings are largely a function of the sheer breadth of the task. Quantifying carbon risks requires understanding not only the whole typology of carbon risks and how they might affect industries, it also requires a view as to the exposure of financial assets (e.g. bonds, equities, etc.) to these risks (and the possibilities for hedging this exposure with low-carbon investments). To name one example, the long-term carbon risk to a coal plant may be material to a company, but not to a financial institutions providing a one-year or three-year loan. These linkages need to be understood and reflected in the analysis. In addition, all carbon risks require the articulation of a scenario as to the nature of the energy transition that financial institutions are expected to face.

Opportunities for stress-tests. As carbon risks, largely thanks to the "carbon bubble" and "stranded assets" narrative developed by the Carbon Tracker Initiative, become mainstream, so too does the demand of financial institutions to quantify these risks. The premier tool to satisfy this demand are likely to be stress-tests, analyses designed to measure the exposure of what is being tested (e.g. a physical asset, an industry, a financial portfolio, etc.) to various scenarios. The energy transition, from today's perspective, needs to be understood in exactly this way – we are facing a multi-scenario world (high-carbon, low-carbon, medium-carbon) and understanding carbon risks will require tests as the performance of assets under various scenarios. Stress-tests remain the ultimate instrument in this regard.

Despite this, carbon risk stress-tests are still ill-understood. This short working paper constitutes a first attempt to understand the nature of current stress-tests, their application to date with regards to carbon risks, and the potential for developing a new generation of stress-tests to measure the exposure to carbon risks in the context of the energy transition.

2. THE CURRENT RISK MANAGEMENT FRAMEWORKS

2.1 FRAMEWORK

Risk management at all levels. Stress-tests are applied to different levels in the investment chain. These different types of tests to date use different data and work with different methodologies. Moreover, stress-tests at portfolio level will have different implications for banks and institutional investors (cf. GEF study on the carbon bubble in Europe, 2014). Understanding the stress-testing tool and its functionality will require a review of the state-of-the-art at all the individual levels (Fig. 1):

• **Asset impairment tests:** These tests relate directly to the impairment of physical assets in the context of the energy transition – for example the close-down of a coal power plant.

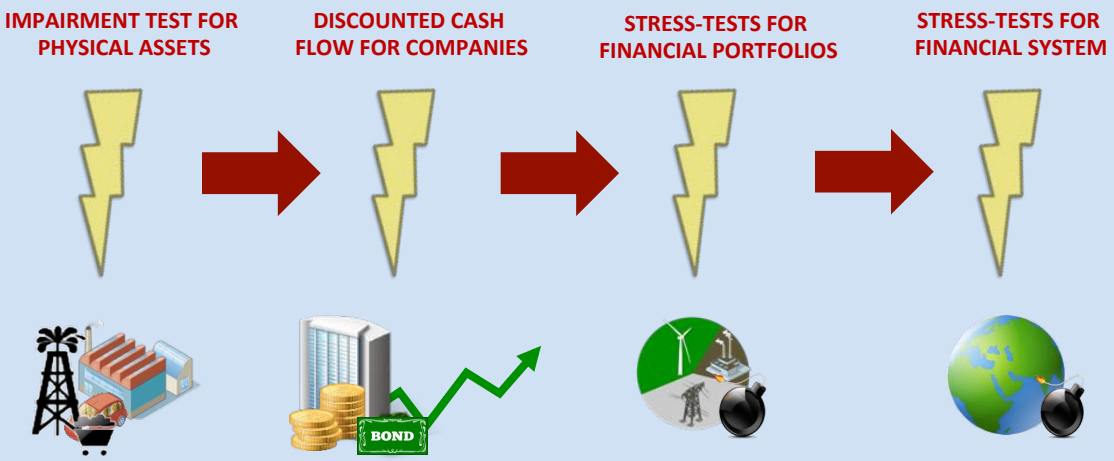
• **Discounted cash flow models for companies:** These tests model the estimated future cash flows of a company. They form the basis, along with other factors such as cost structure, for the valuation of financial assets. These models are also applied to sectors.

• **Stress-tests for financial portfolios:** These models 'stress-test' loanbooks or investor portfolios to 'climate policy shocks'

• **Stress-tests for financial system:** These models look at the general risk to financial stability.

Definition of stress-tests. In literature and practice, the word 'stress-test' is frequently used for asset impairment tests and discounted cash flow models. Technically however, they are limited to tests at portfolio level. Given the focus of this paper, these types of tests are of particular interest. They can be defined as a "what-if analysis that examines the effect of scenarios or sensitivities on the financial position of a bank, or a group of banks." (Cass 2013). Stress-tests are conducted internally by financial institutions as part of their risk management strategy, by regulators as part of the macro prudential policy framework, or by outside actors providing external analysis. They usually (either explicitly or implicitly) contain a benchmark in terms of the performance.

FIG. 1: RISK TESTS THROUGHOUT THE INVESTMENT CHAIN (SOURCE: 2° INVESTING INITIATIVE)



2.2 STRESS-TESTS TODAY

Stress-testing logic. The stress-testing methodology is visualized in Fig. 2. The stress-test general involves three parts: i) identification of the potential variables significant in the course of the stress-test, ii) a scenario analysis of these variables, and iii) a definition of targeted/minimum benchmark (in the case of financial institutions usually capital and liquidity. The tests evaluates the resilience of the company/bank/institutional investor/industry to an extreme adverse economic scenario and then lays out resiliency requirements. It usually involves a scenario analysis based on economic assumptions. In particular, these economic assumptions are usually derived from historic benchmarks or experiences, which are then used to 'predict' what a potential 'worst-case' or 'severely adverse' case might look like. Scenarios can range from a baseline (or better) scenario to a severe shock scenario. Stress-testing usually has two goals, namely to identify large vulnerable institutions subject to economic shocks and larger systemic risks.

The concept of "stress-testing" for financial institutions. Although stress-testing is a standard tool of risk management, it has only come under the purview of macroprudential financial regulation in the wake of the financial crisis. Since then it has enjoyed a 'boom', increasingly becoming a standard part of the financial regulators toolset. In addition, in the case of the United States for example, internal stress-testing by covered financial institutions under the Dodd-Frank Act has also become mandatory. The growth of stress-testing has led to a considerable evolution in the form and application of these tests (Fig. 3). The Bank of International Settlements for example issued a new catalogue of recommendations in terms of stress-testing in 2009.

Stress-tests after the financial crisis. Stress-tests became a prominent policy tool in the wake of the financial crisis. They are seen as an instrument to understand and be able to respond to the exposure of both the financial sector as a whole and specific financial institutions to economic shocks. Stress-tests have been conducted in all major global financial centers.

FIG. 2: STRESS-TESTS FOR THE FINANCIAL SECTOR (SOURCE: 2°II)

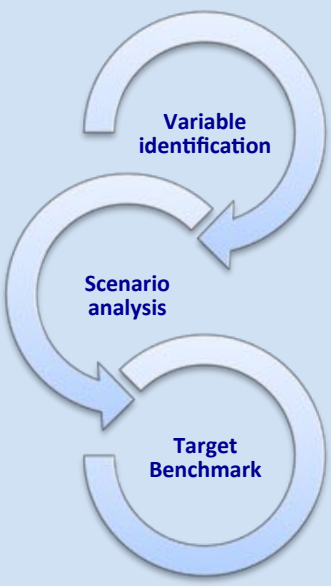
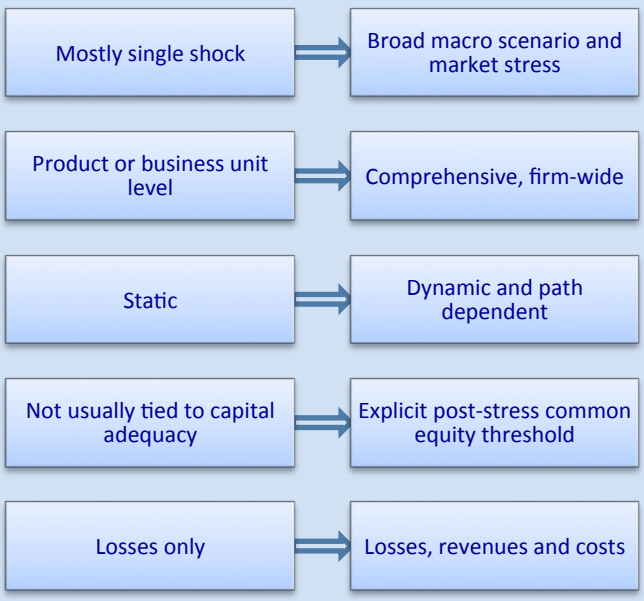


FIG. 3: THE DEVELOPMENT OF STRESS-TESTS PRE-/POST- FINANCIAL CRISIS (SOURCE: OLIVER WYMAN, 2°II)



2.3 STRESS-TESTS BY REGULATORS

The growth of the 'stress-test industry'. Stress-tests are now being conducted by regulators in all major financial centres. While the most prominent application has been in the United States (see below) and Europe (three stress tests since 2009), stress-tests have also been conducted in emerging markets, notably China, Japan, Brazil

Case Study United States. The US Federal Reserve (Fed) conducted its first stress-test of the US banking system in 2009 and has since then repeated the exercise annually. With the Dodd-Frank Act, the landmark financial market reform following the financial crisis, these stress-tests have become part of the mandate of the Fed, to be conducted annually. In addition, covered financial institutions must conduct 'mid-cycle' tests based on the Fed scenario assumptions. The stress-tests are supposed to evaluate whether a covered company has the capital, on a total consolidated basis, necessary to absorb losses and continue its operations by maintaining ready access to funding, meeting its obligations to creditors and other counterparties, and continuing to serve as a credit intermediary under stressful economic and financial market conditions.

As part of this supervisory stress test for each company, the Federal Reserve projects the balance sheet, net income, and resulting post-stress capita levels, regulatory capital ratios, and the tier 1 common ratio under three scenarios (baseline, adverse, and severely adverse) using data as of September 30. The crucial reporting pertains to the 'projected bank losses' (Fig. 4), significant from a risk-return and financial intermediation perspective, and the capital ratio following a 'severely adverse' scenario (Fig. 5), relevant from a macroprudential perspective.

Stress-tests in Europe. The European Banking Authority has been performing EU-wide stress-tests since 2009 (back then as the Committee of European Banking Supervisors). Since then, there have been significant developments in terms of transparency and quality associated with methodologies. For the 2014 stress-tests, a constrained bottom-up stress-test is planned on a 124 EU banks.

LIST OF VARIABLES STRESSED IN US DODD-FRANK ACT STRESS TEST 2014

Domestic variables: Nominal GDP growth, real disposable income growth, unemployment rate, CPI inflation rate, 3-month treasury rate, 5-year treasury yield, BBB corporate yield, mortgage rate, prime rate, Dow Jones Total Stock Market Index, House Price Index, Commercial Real Estate Price Index, Market Volatility Index.

International variables: UK real GDP growth, UK inflation, USD/GBP, Euro area real GDP growth, Euro area inflation, USD/EUR, Developing Asia real GDP growth, Developing Asia bilateral dollar exchange rate, Japan real GDP growth, Japan inflation, USD/yen.

FIG. 4: PROJECTED BANK LOSSES ASSUMED IN US STRESS-TEST 2014 (SOURCE: FED 2014)

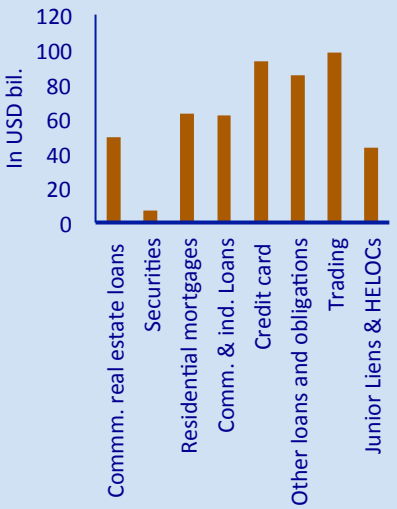
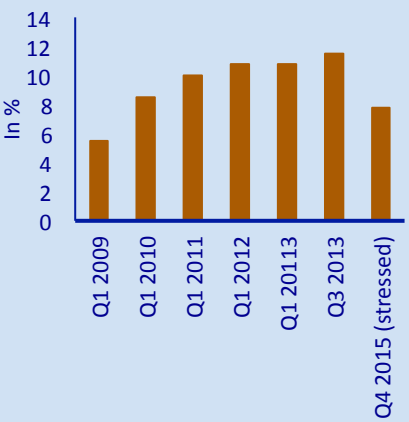


FIG. 5: HISTORIC AND STRESSED TIER 1 COMMON RATIO (SOURCE: FED 2014)



3. THE CONCEPT OF CARBON RISKS

3.1 CONTEXT

Carbon risk excluded from stress-tests. To date, carbon risks are outside of the mainstream debate on stress-testing financial institutions. This can partly be blamed on the nature of mainstream stress-tests focused on mainstream economic variables (e.g. inflation, unemployment rate, etc.) and ignoring larger questions associated with risks around an economy in transition. Thus, although stress-tests have played a strong role in improving the public and policymakers' (and sometimes financial sectors') understanding of the exposure of the financial sector to certain risks, their analysis does not in fact address the nature of these risks. In particular, the analysis is based on 'traditional' risks, especially those prominent in the course of the financial crisis, and thus is itself at risk of testing the wrong risks. This working paper contends that the main 'omissions' in terms of risks in this regard is 'carbon risks'.

Civil society advocacy. A number of advocacy, non-profit actors have begun to push on this issue. Indeed, with regard to carbon risks to the high-carbon industries, they have frequently been joined by financial institutions. In Oct. 2013, a group of 70 global investors managing more than $3 trillion of collective assets called upon 45 of the world's top oil and gas, coal and electric power companies to assess the financial risks that climate change poses to their business plans. The investor effort, called the Carbon Asset Risk (CAR) initiative, is being coordinated by Ceres and the Carbon Tracker initiative, with support from the Global Investor Coalition on Climate Change. A UN summit on climate and carbon risk organized in January 2014 supported this push. Exxon Mobil has responded by agreeing d to provide information on carbon risk exposure, whereas BP has rejected this call for action. The extent to which this information is being integrated by mainstream financial institutions into stress-tests and investment processes at portfolio level is unclear however.

3.2 TYPOLOGY OF CARBON RISKS

Defining carbon risk. Carbon risk can be defined as the family of risks correlated with the GHG-emissions allocated to an asset. Generally, these risks exclude climate change-related physical and macroeconomic consequences, such as variation in temperature, the rise of the sea level and their impacts on national economies.

Risk for financial institutions. Rsk is not always clearly associated with the direct emitter or investee. Thus, risk can be partially (or wholly) transferred to those who finance and own these entities, since a drop in asset value creditworthiness translate into losses accounted in their books. There are two important implications for this. The first is that financial institutions are implicated in the risks for GHG-emitting companies and assets. The second however is that the risk is 'transferred' through the financial asset that connects the bank or investor with the investee. The exception is where investment regulatory frameworks, or fiduciary duty related litigation, impacts the financial institution directly.

Annual vs. cumulated emissions. Some types of risk result from 'boomerang effects'. An example for this is the potential for climate related litigation to affect investees. In this context, the 'family of risks correlated with the GHG-emissions allocated to an asset need not be limited to annual emissions or even future emissions, but can also be related to past or cumulated emissions. While to date the narrative around climate litigation may appear as 'science fiction', it is important to account for the whole scope of potential risks associated with GHG-emissions.

Types of carbon risk. The discussion on the following page and Fig. 6 (next page) provide a typology of the potential sources of carbon risks.

A. Industrial carbon-related policy risks. The most prominent source type of carbon risks is industrial carbon-related policy risks. They include for instance caps on GHG emissions, carbon taxes, and norms regarding vehicles emissions.

B. Market constraints. An energy transition will see changes in the demand and prices for different energy options. This could be linked to a range of factors including falling prices for alternatives, economic slowdowns, technological advances, efficiency measures, etc.

C. Climate litigation. Lawsuits targeting companies with high cumulated past emissions can create liabilities, based on the company's 'share of responsibility in the cost of global warming'. For financial intermediaries, the risk relates to a first wave of prejudices or settlements occurring during the holding period and turning the emissions of their investees into liabilities.

D. Investment regulatory frameworks. Investment regulatory frameworks include all 'top-down' mechanisms that directly or indirectly impact the cost and availability of capital for financial intermediaries, including: capital requirements, eligibility of collateral, taxes on capital, interest and transactions, credit guidelines, etc.. To date, these investment frameworks only include climate goals in a positive way (i.e. incentives for investments in green mortgages).

E. Fiduciary duty related litigation. If the 'carbon bubble' bursts (i.e. massive write-offs and/or provisions at investee level related to the materialization of risks A, B or C), institutional investors might face claims for negligence. While this litigation may primarily affect institutional investors, they can in turn file suits against banks and investees, based on their lack of disclosure.

FIG. 6: THE CARBON RISK LANDSCAPE FOR FINANCIAL INTERMEDIARIES AND SOCIETY (SOURCE: 2°II)

4. CARBON RISK MEASUREMENT METHODOLOGIES

FIG. 7: STRANDED FOSSIL FUEL RESERVES UNDER VARIOUS CLIMATE SCENARIOS (SOURCE: CTI 2013)

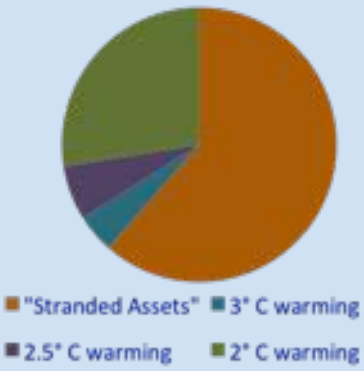


FIG. 8: CURRENT / PLANNED GAS-POWER MOTHBALLING AND CLOSURES MARCH 2012 – DEC 2013 (SOURCE: OXFORD UNIVERSITY 2014)

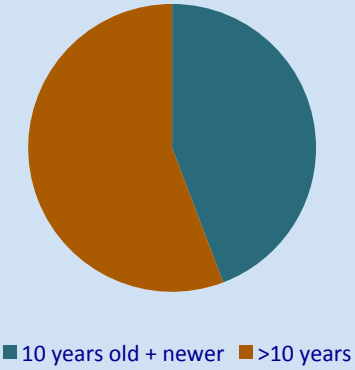
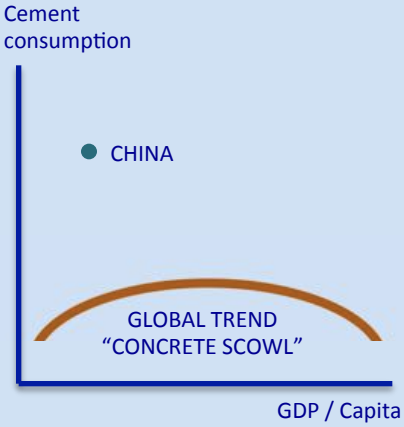


FIG. 9: RATIO OF CEMENT CONSUMPTION TO GDP PER CAPITA – CHINA VS. THE "CONCRETE SCOWL (SOURCE: GLOBAL CEMENT REPORT 2011)



4.1 IMPAIRMENT TESTS FOR PHYSICAL ASSETS

Concept of stranded assets. Impairment tests for physical assets are usually associated with the concept of stranded assets. While the idea of 'stranded assets' is not specific to climate change, there are 'stranded utility' bonds for example, whose economics are entirely disconnected from climate change, the term has gained particular currency in the course of the transition to a low-carbon economy. The Carbon Tracker Initiative, credited with introducing the term to the climate change debate, defines stranded assets as "fuel energy and generation resources which, at some time prior to the end of their economic life, are no longer able to meet the company's internal rate of return, as a result of changes in the market and regulatory environment associated with the transition to a low-carbon economy."

Stranded assets for fossil fuel reserves. The first work on stranded assets on impairment tests associated with physical assets in the fossil fuel sector is by the Carbon Tracker Initiative, which demonstrated the extent to which, under various scenarios, fossil fuel reserves are 'unburnable' (Fig. 7). This work uses the concept of a 'carbon budget' associated with a scenario as the benchmark.

Stranded assets in the utility sector. Arguably the most prominent example of existing stranded assets is in the European utility sector, where between March 2012 and December 2013, over 8000 MW of power plants that were 10 years or younger were either closed or where the closing of the plant was announced, over 40% of all closures (Fig. 8). While not all related to climate policies, this shows the potential scope of stranded assets.

Other sectors. While usually connected to the fossil fuel and power sector, stranded assets may also apply to other sectors, such as transport and real estate. The Chinese case of over-investment in real estate and the associated 'ghost towns' are an example of this (although not climate change related) (Fig. 9). In the future, this analysis related to climate change may become more relevant.

4.2 RISKS AT COMPANY AND SECTOR LEVEL

Carbon risks at asset level. In the past couple of years, a number of different organisations have conducted scenario analysis to understand the exposure of high-carbon industries to carbon risks. The methods reviewed by the 2°Investing Initiative to date rely on adjusting discounted cash flow (DCF) calculations to account for higher prices on direct or induced CO2 emissions. These approaches have been pilot-tested by brokerage houses and researchers on climate-sensitive industries.

Impact on market capitalization. The first studies in this regard by Carbon Trust / McKinsey (2008) showed the impact of a 2°C scenario on companies' valuations can reach up to 35% for oil companies, 44% for pure players in coal mining, and 65% for car manufacturers and aluminium producer. This analysis, however, is at sector level and not company specific. A subsequent company by company analysis is provided by HSBC (2012), specific to the oil and gas sector. Their results suggest that a 2°C scenario, with the associated 'stranded assets' and price effects, will impact European oil and gas companies across the board with over 40% of market capitalization (Fig. 10).

From studies to tools. The transition in risk assessment is slowly being made from studies and research analysis to tools for investors. Bloomberg launched a *Carbon Risk Valuation Tool* to measure the potential impact on market capitalization of five different climate-related scenarios, including scenarios related to oil prices, and direct changes in EBIT.

Impact on revenues. Whereas the HSBC analysis focuses on market capitalization, work by Kepler Cheuvreux (2014) focuses on revenues. According to a recent report, Kepler-Cheuvreux estimates potential lost revenues of $28 trillion for the oil, gas and coal sector until 2035 under the IEA 450 scenario. These lost revenues are calculated relative to the benchmark IEA New Policy Scenario.

Distribution of risks within sectors. A key question in terms of risk is the distribution of risks within sectors. While this work is improving with regard to the oil and gas sector, notably through the analysis of HSBC and recent studies by the Carbon Tracker Initiative on the cost curves of the oil and coal sector (with a similar study planned for gas), there are significant question marks with regards to the distribution of risks in the utility sectors, with a significant divergence in terms of different fuels in the power generation mix.

FIG. 10: IMPACT OF A "UNBURNABLE RESERVES" AND PRICE EFFECT ON MARKET CAPITALIZATION (SOURCE: HSBC 2012)

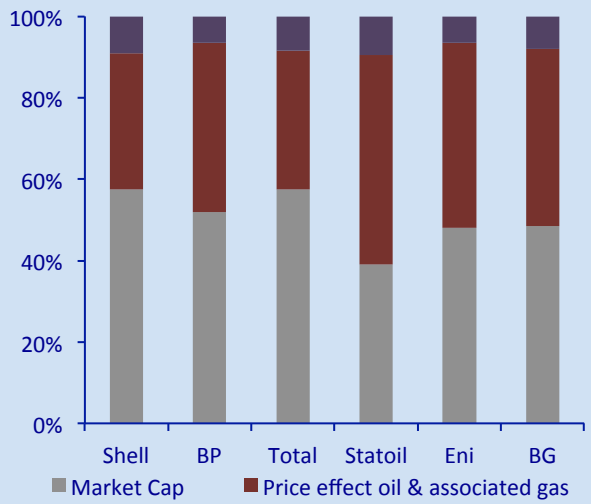
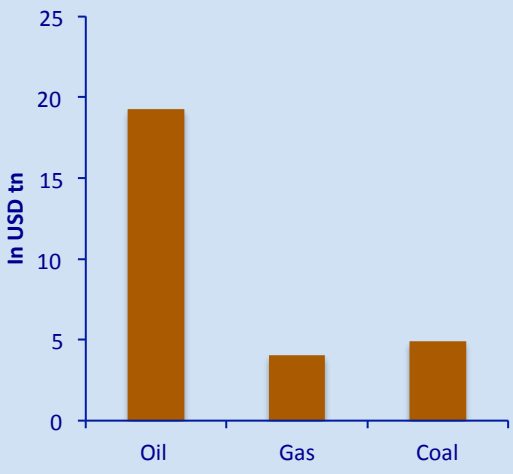


FIG. 10: LOST REVENUES UNDER A 2° C SCENARIO UNTIL 2035 (SOURCE: KEPLER-CHEUVREUX 2014)



4.3 STRESS-TESTING FOR FINANCIAL INSTITUTIONS

Limited case studies. No comprehensive stress-test of carbon risks for financial institutions exist to date. While the recent months have seen a number of initiatives under way, there are three notable examples, where carbon risk stress-testing for financial institutions has been explored.

Mercer 2011. In 2011, Mercer assessed the potential impact of climate policies and change on various parameters including GDP, investment flows, cost of mitigation and adaptation, etc. They then modeled the impact on the risk-return profile of each asset class (equities, sovereign fixed income, equity, corporate bonds, cash) and some specific sub-categories (renewable equities, agriculture, etc.) to come up with an optimal allocation strategy for each scenario. Mercer concluded that climate policy risks account for about 10% of total risk exposure of an average portfolio (Fig. 12). Mercer is currently planning an upgrade of the study to be launched in the beginning of 2015

FRR 2008. The French public investor FRR launched in 2008 a similar project targeting the definition of investment strategy, with a wider perspective (environment: climate, fossil resources, biodiversity and water). The report (self-labeled as preliminary) proposed to investigate several ways to integrate environmental issues in strategic allocation, on the basis of four (climate) scenarios. For each, risk/return ratios are built for different asset classes, and discussed in terms of geographic and sectorial impacts. Ultimately, the preliminary report was not followed-up by further analysis, the visionary appraoch perhaps 'ahead of its time' in terms of materiality.

GEF 2014. Similar to risk assessment for portfolios, carbon and climate risk assessment for banks has been limited. The only major study on this topic was published in 2014 by the Green European Foundation (GEF). The results showed a limited impact, specifically a 0.4% loss of total assets in the European banking sector and 2.5% for the European pension fund sector (Fig. 13). Interestingly, there was a significant European variation among institutional investors, with losses of slightly more than 7% for the Universities Superannuation in the UK.

FIG. 12: CLIMATE STRESS-TEST FOR AN INSTITUTIONAL INVESTOR (SOURCE: MERCER 2010)

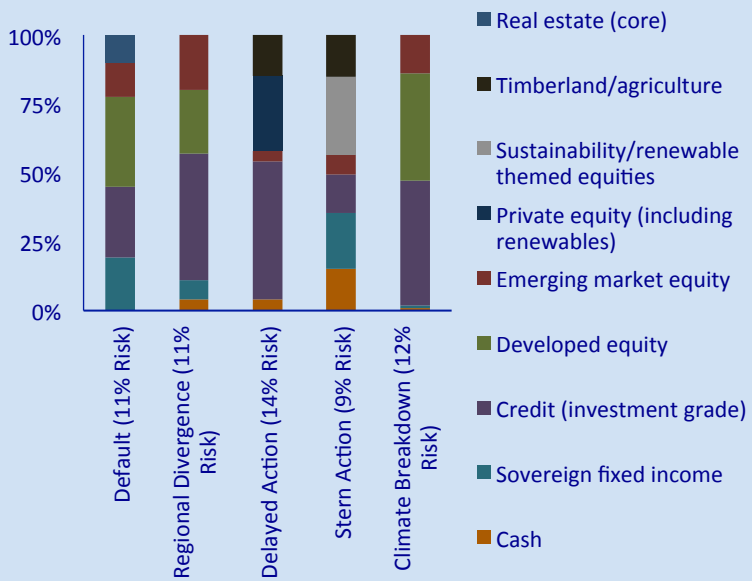
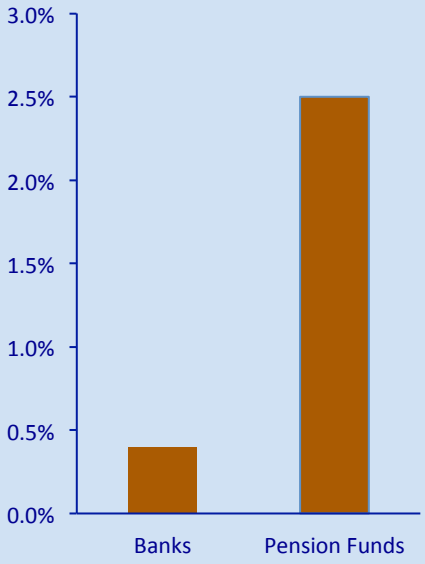


FIG. 13: LOSSES AS % OF TOTAL ASSETS IN A 2° C SCENARIO (SOURCE: GEF 2014)



4.4 GAPS IN THE ANALYSIS – RISKS FOR FINANCIAL INSTITUTIONS

Time horizon. A big question mark with regard to the existing carbon risk stress-tests for financial institutions is the issue of time horizons. Thus, the Mercer analysis does not take the time horizon of assets or their holding period into account. While this may be less material for companies, the short time horizon of financial assets (in terms of maturity and holding period), and the likely long-term nature of the risks, makes the issue of time horizon key (cf. 2°Investing Initiative discussion paper on artificial short-termism in the finance sector and implication for climate performance and carbon risks). Similarly, while the research of the Green European Foundation takes time horizon of the assets into account, they assume the short-term materiality of risks, which seems unlikely in the current policy environment.

All sectors, within sectors. When looking at carbon risks, the analysis at portfolio level must account both for all sectors and for risks within sectors. Thus, the GEF study only looks at the oil and gas sector, and ignores risks in the utility sector for example. In addition, for both the GEF study and the Mercer work, the analysis stays at first sector classification level. In other words, there is no distinction of risks within sectors, notably for different types of utility companies or oil & gas companies with a particular exposure to high-cost projects. By extension, the analysis also does not consider potential 'hedges' to the risks with regard to the exposure to the green economy for example. While it is unclear whether such hedges exist, the analysis only provides one side of the coin.

Stress-testing gradual, disruptive, long-term risks. The methodologies employed to date to assess carbon risks at financial institution level are stress-tests. Equally, it is unclear whether carbon risks, by their nature, lend themselves to this type of analysis. Carbon risks are likely to be disruptive to the economic model, but are unlikely to appear as shocks, given the incentives for policymakers to minimize the cost of climate policies. Given that stress-tests use economic shocks as inputs, it is difficult to reconcile these two dynamics. Moreover, they are likely to appear as medium- to long-term risks and thus likely out of the time horizon of investment frameworks. They may give rise to asset bubbles today, and will be relevant 'when the music stops', but short-term stress-tests are unlikely to capture these factors.

4.5 SYSTEMIC CARBON RISKS FOR THE FINANCE SECTOR

No major risks at financial institution level. As outlined in the beginning of this discussion paper, the final stage of risk analysis is at systemic level – for the financial system more generally. The limited analysis done at financial institution level suggests that in the current framework, there are no systemic risks. At the same time, this does not suggest that from a finance sector perspective – these risks are irrelevant. Thus, while the finance sector may currently not be significantly exposed to these risks in the short-term, there is the medium-term risk of an asset bubble related to high-carbon assets, which may feed into medium- and long-term risks for financial institution.

Financial networks. While individually the risks appear limited to date, this does not take network effects into account. While there is no analysis in this regard to date, and there is no framework to conceptualize how the issue of carbon risk interplays with pass-through effects through the finance sector, the financial crisis has shown that the issue of networks has a key role with regard to systemic risks. By extension, any discussion of systemic carbon risks also needs to consider financial market networks.

2. THE WAY FORWARD

Next steps. The last 12 months have seen significant momentum around the issue of carbon risks. Today, our understanding of carbon risks at physical asset level and company and sector level has improved substantially. An increase in the number of institutions in the field, both in terms of the growing inputs by academia on the topic, and the growing adoption by commercial actors, notably research analysts and data and tool providers, has started to 'mainstream' the concept. At the same time, there still appears an impasse with regard to measuring and managing these risks at financial institution level.

'Carbon risk' tools for financial institutions. The stress-testing methodologies used to date are likely to be limited with regard to their ability to help financial institutions manage this risk. While new tools for assets may potentially help for specific investment decisions, they do not work as portfolio management tool. Similarly, investment products advertised to reduce carbon risk for portfolios are not actually risk products in the true sense of the word – in terms of measuring risk – but simply seek to reduce the exposure of investors to GHG-emissions. Moreover, given the gaps in the methodologies related to accounting GHG-emissions (cf. 2°Investing Initiative study on financed emissions methodology and discussion paper on climate-related investment products), it is unclear to what extent they actually reduce the risk in practice.

The paths forward. It seems clear that given the materiality of these risks at physical asset and company / sector level, methodologies and management tools must improve for financial institutions. An 'ignorance is bliss' approach will not suffice. Similarly, from a regulators perspective, these risks are likely to be a concern moving forward, both in terms of risks to specific financial institutions and asset bubbles.

From stress-testing to alignment with energy-transition roadmaps. One potential path forward in this regard is moving from stress-testing to alternative frameworks that act as an indicator for the misalignment of financial portfolios with energy-transition investment roadmaps. While the ultimate configuration of the transition to a low-carbon economy is not known, these frameworks could help signal a potential growth of an asset bubble. Similarly, they could be used at financial institution level to begin to understand the potential long-term risks building in a portfolio. While such frameworks currently do not exist, a number of institutions are exploring their development.

As complicated as the measurement of carbon risks is, and the review has demonstrated some of the challenges to that effect, the underlying logic is relatively simple – carbon risks arise for financial institutions when their investment decisions become misaligned with the long-term economic trajectory (whether linear or not). It is then that capital gets misallocated to physical assets, companies cash flows suffer, and financial asset bubbles may appear. By extension, a framework to measure the alignment and misalignment, whatever its form, is the first step to managing carbon risks for financial institutions and the financial system as a whole.

The 2° Investing Initiative [2°ii] is a multi-stakeholder think tank working to align the financial sector with 2°C climate goals. Our research and advocacy work seeks to:

• Align investment processes of financial institutions with 2°C climate scenarios;
• Develop the metrics and tools to measure the climate performance of financial institutions;
• Mobilize regulatory and policy incentives to shift capital to energy transition financing.

The association was founded in 2012 in Paris and has projects in Europe, China and the US. Our work is global, both in terms of geography and engaging key actors. We bring together financial institutions, issuers, policy makers, research institutes, experts, and NGOs to achieve our mission. Representatives from all of the key stakeholder groups are also sponsors of our research.

CONTACT:
2°Investing Initiative
47 Rue de la Victoire
75009 Paris, France
www.2degrees-investing.org
contact@2degrees-investing.org
@2degreesinvest
Paris: +33 1 4281 1997