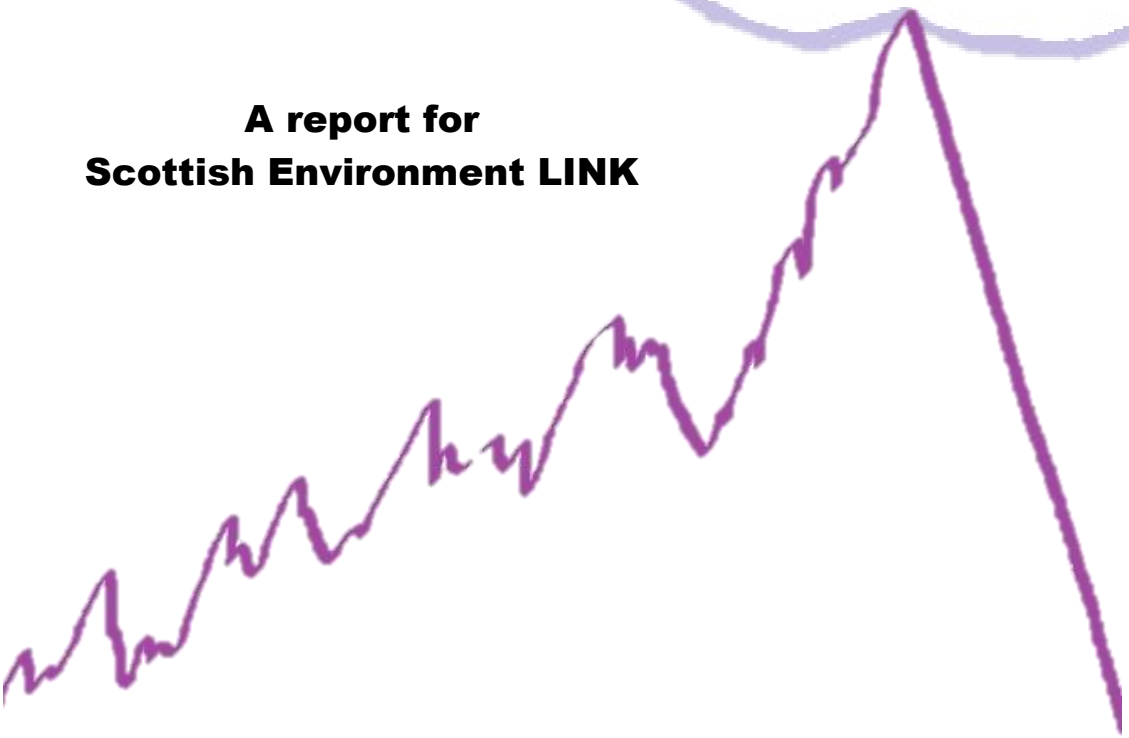
Scotland

and the Carbon Bubble

A report for
Scottish Environment LINK



Scottish Environment LINK

FOREWORD

Matthew Crighton, Convener of LINK's Economics Task Force

Capitalisation of the fossil fuel extraction industries is largely based on the world's known reserves of oil, gas and coal - and the assumption that those reserves can be extracted and burned. Most of our financial institutions have invested heavily in these industries on that basis. But the scientific evidence points, with ever greater clarity, to the simple fact that if humans extract and burn even a fraction of those reserves ("*No more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2 °C goal"* according to the International Energy Agency) we will face "*catastrophic climate change*" (according to the United Nations International Panel on Climate Change). It is becoming starkly apparent that this situation is unsustainable - in both environmental and economic terms.

Scottish Environment LINK commissioned this report looking into the "carbon bubble" and Scottish preparedness, as part of our work in coming to a greater understanding of the economic drivers of our society and their impact on the natural environment. Carbon bubble is the term which has emerged to describe the financially perilous consequences of the mismatch between our current approach to valuing and extracting fossil fuels, and the fast diminishing capacity of our climate to cope with fossil fuel usage.

In the course of the producing the report, and as we learned more about the issues surrounding the carbon bubble, it became apparent that there is a spectrum of outcomes in this matter - ranging from the financial bubble spectacularly bursting with devastating economic consequences but this making a major contribution to climate change being averted, all the way through to nothing changing in the economy, with disastrous climatic consequences. In between the extremes, there are possibilities for states, communities and individuals to act in a way which might manage the situation, deflate the bubble and continue to develop and implement the concept of sustainable development.

Some of these ways forward are explored in this paper, and related to our specific circumstances in Scotland - but only tentatively. We are aware that a great deal more work is required (and being done) by politicians, businesses, economists, and civic society, including ourselves, to develop thinking in this matter – but, in parallel, there is also a hugely urgent need for action to be taken if we are to avert the worst.

In particular we look forward to a great deal more urgent work on actions to deal with the carbon bubble as we move towards sustainable development. We believe that the following areas require urgent attention and action.

- International political agreements which commit governments to urgent action on climate change are desperately required. These can be negotiated and implemented in a planned and strategic way which brings social and economic benefits. To do otherwise carries the highest risks of disaster for our economies and our society as well as the planetary climate.
- Unilateral national political actions – including further developing Scottish initiatives - are required to ensure that people are truly involved in the process of change and that the markets and businesses understand that there is no standstill option
- Incentives and subsidies for carbon emitting energy sources such as fossil fuels should be transferred, urgently, to low carbon alternatives.

- Renewable energy is fast becoming cheaper than fossil-fuelled energy and there should be a transfer of investment from damaging to beneficial energy for economic as well as environmental reasons.
- Scotland should pursue a development strategy based on the firm assumption that fossil-fuelled energy will quickly reach a peak (if it has not already done so) and then fall as we make the transition to a low (or no) carbon economy.
- Every effort must be made to direct markets and their perceptions to the reality that the long-term boom in fossil fuel use is over. We will support calls for disinvestment of public and private funds from fossil fuel investment – and we will seek to involve all of civic society in this call.

We very much hope that others will join us in this work. It is urgently required.

December 2014

Scotland and the Carbon Bubble

Jessica Pepper, July 2014

with additions from members of the LINK Economics Task Force
October 2014

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1. Introduction

1.1 Purpose of this report

Commissioned by Scottish Environment LINK[1], this report takes a snapshot of the global debate on the carbon bubble and considers its relevance to Scotland.

There is much more to explore about the carbon bubble and associated issues than can be addressed in this paper, but hopefully it will begin to inform a conversation which is relevant to individuals, investors, businesses, public sector organisations, politicians, the Scottish Government and others in Scotland.

1.2 The carbon bubble

The term 'carbon bubble' describes a potential financial bubble that is steadily inflating and is at risk of bursting, causing a financial shock that could impact upon the global economy and those of individual nations, particularly those whose financial sectors are heavily dependent on the fossil fuel industry.

A carbon bubble is inflating because the value of fossil fuel companies continues to be based upon the assumption that all their known fossil fuel reserves will be burned. Yet the scientific reality is that to avoid catastrophic climate change, we cannot afford to burn more than one third (perhaps less) of all known fossil fuel reserves. The other two-thirds of known reserves are unburnable. They cannot be burned, unless we are committed to catastrophic climate change.

As the scientific reality is accepted, actions taken to achieve a safe climatic state will result in 'stranded assets' to the fossil fuel industry, i.e. those investments into carbon assets that are not going to be burned will consequently lose their value.

The more rapid and sudden this transition is, the more likely it is that the financial bubble may burst. However, the longer it takes to align with a safe climatic future, the greater the chance of creating climate change that will be catastrophic for the whole world, including the global economy.

Immediate action, therefore, is imperative to drive an orderly transition to a low-carbon future.

Globally, the increasing awareness that these reserves cannot all be burned, and the widely accepted understanding of the vulnerability of carbon based assets, is striking.

From the United Nations to HSBC, the House of Commons to Bloomberg, the Universities Superannuation Scheme and BT Pension Fund to London City Corporation, active discussions are underway on the action that needs to be taken to manage the risks associated with carbon based assets responsibly.

> **"***We're not going to be able to burn it all.*"
> President of the United States of America, Barack Obama, June 2014[2]

[1] LINK is the network of Scotland's non-government environment organisations. For information visit www.scotlink.org

[2] http://www.nytimes.com/2014/06/08/opinion/sunday/friedman-obama-on-obama-on-climate.html?hp&rref=opinion&_r=1

There are those who deny that stranded assets will be an issue, and those who argue the market for fossil fuels will continue to be strong, for example the Bank of England and fossil fuel companies (such as Shell[18], BP[3] and Exxon[4]).

1.3 Context

Evidence indicates that the amount of carbon dioxide (CO2) in our atmosphere, despite much being absorbed by the oceans, is the highest it has been at any time over the last 15 million years. Since the industrial revolution, we have already seen a global temperature rise of 0.8ºC with the burning of fossil fuels being the main contributor.

If we continue with business as usual, the global temperature could be on a path to a 4ºC rise by 2100, (or even by 2060). Scientific consensus now highlights that major tipping points in planetary functions may even be reached at 1.6 ºC.

To reduce the risk of tipping over a 2ºC rise in global temperature, and what the world's climate scientists describe as catastrophic climate change, we must keep the level of carbon dioxide in the atmosphere below 450 parts per million (or even less to stay below 1.5ºC).

The impacts of climate change are already catastrophic for some, and will become increasingly so around the world, affecting the world's most vulnerable hardest.[5]

Meanwhile the fossil fuel industry continues to search for new reserves to exploit. Technologies such as Carbon Capture and Storage, designed to abate net increases in carbon emissions, are developing only slowly.

1.4 This report

This report aims to take a snapshot of the big picture, the global debate surrounding the carbon bubble and significant contributions that are informing that debate. It acknowledges some of the activity around the world in response to the perceived risk and identifies consistent themes that are emerging for action.

It considers what conclusions are being drawn about the risks, for the UK and the significance of the issues raised for Scotland's financial sector and the wider Scottish economy. Having sought key opinions, it considers the level of awareness of the concept of the carbon bubble, and what assessment of and preparation for risk, if any, there has been in a Scottish context.

[3] http://www.businessgreen.com/bg/analysis/2345604/shell-rejects-alarmist-carbon-bubble-risks
[4]http://online.wsj.com/news/articles/SB10001424052702304157204579473970546727520
[5] T**urn down the Heat: Why a 4ºC Warmer World Must be Avoided** The World Bank, A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics November 2012 - Executive Summary

2. Questions about the carbon bubble

2.1 Why does the carbon bubble continue to inflate?

Despite increasing awareness and overwhelming scientific consensus which confirms that the burning of fossil fuels is causing climate change, and that consumption needs to be limited, the markets' assumption that we will burn all reserves we have access to, continues to hold. Investment in fossil fuel based assets continues and the stockpile grows.

As oil and gas companies run out of cheaper and easy access reserves, they are trying to find assets in increasing challenging environments. Investments in unconventional oil or gas, such as Arctic, deepwater and ultra-deepwater projects, along with continued investment in probable and possible reserves of oil and gas, will only add to the stockpile. The science is clear. We cannot afford to burn more than one third of known reserves, never mind any more. Investments in further reserves are even more exposed to becoming stranded assets and the capital committed to new projects could be 'wasted.

2.2 What is the carbon potential of all known reserves compared to the global carbon budget?

The total carbon potential of Earth's known fossil fuel reserves (the CO2 that would be released if they were all burned), is 2,860 gigatonnes $(Gt)_2$. Our actual carbon budget is much lower. To reduce the risk of >2ºC global temperature rise we cannot afford to burn more than 900 Gt of CO2 before 2050, with reductions in other greenhouse gases. To have a chance of staying below 1.5ºC, our budget is smaller still: only 525 Gt of CO2[6] Yet:

"*Governments and global markets are currently treating reserves equivalent to nearly five times our carbon budget for the next forty years as assets.*" [7]

Within this global context, Carbon Tracker's research in 2011 concluded that:

"*The UK has less than 0.2% of the world's coal, oil and gas reserves, and accounts for around 1.8% of global consumption of fossil fuels. Yet the CO2 potential of the reserves listed in London alone account for 18.7% of the remaining global carbon budget.*"

This brings a fresh perspective to the climate emission responsibilities of the UK. Carbon Tracker points out:

"*Just one of the largest companies listed in London, such as Shell, BP or Glencore Xstrata - has enough reserves to use up the UK's carbon budget to 2050'*[8]

[6] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital

[7] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble

[8] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble Page 2

2.3 If the carbon budget is respected, what will be burned?

Of known reserves globally, 65% of this carbon potential is held in coal reserves, 22% in oil and 13% in gas.[9] In line with current levels of consumption of oil, gas and coal, "it is assumed that within the budget, 40% of what will be burned will be oil."[10] Without reduced consumption, projections from the International Energy Agency estimate the carbon budget could be used up within just 17 years. The carbon budget may even be used up more quickly, reaching 'unburnable' carbon even sooner.

2.4 When could the bubble burst?

The carbon bubble could burst at any time. It will burst when the market accepts that not all fossil fuels are going to be burned. Carbon based assets could become stranded assets and lose value overnight, causing a financial shock which could pose a threat to economies whose financial sectors are heavily dependent on the fossil fuel industry.

It could happen quickly in response to an international political agreement which commits governments to urgent action, but it may not necessarily depend on international agreement. It could happen as a reaction to extreme weather events which trigger national political commitments to action, or it may be that market forces, cheaper alternatives (for example solar energy reaching grid parity) or general behaviour change may influence it. In explaining why it will not necessarily depend on international political agreement, Carbon Tracker's James Leaton has said:

"..*there is already a patchwork of regulation around things like air quality that we are seeing China move on...and in the US coal has declined due to competing technologies. We are seeing the price of other options coming down all the time...stranded assets could appear from a range of factors*." [11]

If it is international agreement that triggers a carbon crash, this could happen as early as next December at the international negotiations in Paris, if not before. If the bubble has not burst, prompted by extreme weather events or other factors before then, a deal in Paris may be possible. Recently, the US and China have sent strong messages in relation to their climate commitments and even climate campaigners have been cautiously optimistic about the latest preparations for Paris in 2015:

"*Three of the big emitters, China, the US and the EU, signaled plans to submit concrete proposals on their national contributions: the EU by late this year; the US by early next year; and China by June at the very latest...More than 60 nations also supported the idea of phasing out dirty fossil fuels and replacing them with 100% renewable energy sources, in line with what the NGO and scientific community are calling for.*"[12]

[9] **Carbon supply cost curves: Evaluating financial risk to oil capital expenditures** Carbon Tracker Initiative 2014
[10] **Carbon supply cost curves: Evaluating financial risk to oil capital expenditures** Carbon Tracker Initiative 2014
[11] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf
[12] http://tcktcktck.org/2014/06/world-takes-steps-towards-global-climate-deal/62612]

2.5 If the bubble bursts, who will pay the costs?

While internationally, governments have committed to work towards a world where global temperature rise is limited to 2ºC, Triodos Bank in written evidence to the Environmental Audit Committee's inquiry raised the…

"*...specific concern that oil companies are planning for a world with a temperature rise far in excess of 2 degrees - possibly more than 4 degrees. Whilst the World Bank has called a 4 degrees rise potentially 'devastating', carbon-intensive companies may be banking on the costs being mostly socialized (e.g. falling on society rather than them). This will largely be influenced by future government regulation.*" [13]

In their 2011 report, Carbon Tracker summarised some knock-on effects for savers, pension fund holders and investors if the carbon bubble is allowed to continue to inflate:

"*Exchanges with above average investment in fossil fuel assets [such as London] expose their domestic and international investors to, as yet, unquantified risks of stranded carbon. These risks increase in direct proportion to their absolute exposure to fossil fuels. Where exchanges have a high proportion of listed fossil fuel companies owning unburnable carbon the knock on effects to others within the financial markets are worth noting. Pension funds risk funding shortfalls to their member pension entitlements if they are unable to realise value from their fossil fuel investments. Bank lending exposures to the sector may mean that central bank regulators will require significant haircuts to be taken to the value of their fossil fuel loan books. Savers as a group will face considerable uncertainty as to the true value of their portfolios if their investments blindly track carbon intensive markets*.'

The Shareaction campaign, with supporting members including Oxfam, Christian Aid, Friends of the Earth, WWF and unions such as Prospect, Unite and UNISON asks "is your pension inflating the carbon bubble?" They are clear as to why individual pension funds are at risk.

"*Most pension funds are heavily invested in big fossil fuel companies; those companies' valuations are vulnerable to firm action to address climate change."*[14]

If the carbon bubble bursts, as the European report 'Too Little Too Late' from the Green European Foundation has summarised, it could 'create a shock with severe consequences for our financial system'.[15]

2.6 Will Carbon Capture and Storage provide a solution?

Many papers on the carbon bubble are clear that the difference that Carbon Capture and Storage (CCS) could make to the amount of fossil fuels that can be burned will be marginal.

It could take a further decade or more to get CCS technology operating properly at an industrial scale, and by the time it is established, the budget of carbon that can affordably be burned may have been reached or even exceeded.

[13] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Ev 103
[14] http://www.shareaction.org/carbonbubble-faqs#1
[15] **The Prince of Doing too little too late, The impact of the carbon bubble on the EU financial system.** Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html

Even if mainstreamed more quickly, it will not make a huge difference to the amount of fossil fuels that can be burned.

Indeed, Carbon Tracker have assessed that under the International Energy Agency's more idealised scenario, targeting an 80% chance of stabilising global temperatures at 2°C, this would mean that 3,800 CCS projects would need to be operating by 2050 and that would only extend the Carbon Budget by 12% to 14%, even if the investment is made.

2.7 What can be done about the carbon bubble?

We can stick to business as usual, keep inflating the bubble and, without political agreement to act, head towards a 4ºC world. Some argue this is what some fossil fuel companies are not only resigned to, but planning for.

Reaching 4ºC, which on current trends could happen as early as 2060, will lock us into reaching a 6ºC rise or warmer[16]. Before then, the consequences of climate change will be devastating for the whole planet including the global economy.

We can keep investing in fossil fuels, valuing fossil fuel companies as if all their reserves - and more - will be burned, and wait for the financial carbon crash before the most devastating effects of climate change kick in. Or we could recognise the reality of the science, the vulnerability of the assets based on this reality, take steps to deflate the carbon bubble and reduce exposure to the risks it presents.

Consistent themes emerge throughout current assessments and reports both internationally and within the UK, as to why the bubble continues to be inflated and how these might be managed to deflate it. These emerging themes are explored in Section 4.

[16] **Turn down the Heat: Why a 4ºC Warmer World Must be Avoided** The World Bank, A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics November 2012

3. Snapshot: the big picture - Global, European, UK context

Recent quotes capture just some of the commentary on the carbon bubble and stranded assets**.**

3.1 *"We're not going to be able to burn it all. Over the course of the next several decades, we're going to have to build a ramp from how we currently use energy to where we need to use energy. And we're not going to suddenly turn off a switch and suddenly we're no longer using fossil fuels, but we have to use this time wisely, so that you have a tapering off of fossil fuels replaced by clean energy sources that are not releasing carbon … But I very much believe in keeping that 2 [degree] Celsius target as a goal."* [17]

> President of the United States of America, Barack Obama, June 2014
> (An extract from an interview with the New York Times.)

3.2 "*Shell does not believe that any of its proven reserves will become "stranded" as a result of current or reasonably forseeable future legislation concerning carbon. There is a risk that focusing on "stranded assets" or the concept of the "carbon bubble" distracts attention away from the reality of a growing population, increasing prosperity and growing energy demand. A fundamental transition of the energy system will be needed, but that will take considerably longer than some alarmist interpretations of the unburnable carbon issue would have the public believe. Shell is focused on finding real solutions based on current energy realities to the widely acknowledged and real threat of climate change*." [18]

> Shell, 16th May 2014
> (An extract from the summary of a letter from Shell 'in response to enquiries from shareholders regarding the "carbon bubble" or "stranded assets" issue.'

3.3 Carbon Tracker

In 2011, the Carbon Tracker Initiative set out a "new way of looking at the carbon emissions problem" with a focus on "the fossil fuel reserves held by publicly listed companies and the way they are valued and assessed by markets."

Authored by James Leaton on behalf of Investor Watch and funded by charitable funds and trusts, Carbon Tracker's goal was "to prevent a carbon crash."

"We believe that today's financial architecture is not fit for purpose to manage the transition to a low-carbon economy and serious reforms are required to key aspects of financial regulation and practice, firstly to acknowledge the carbon risks inherent in fossil fuel assets and then take action to reduce these risks on the timeline needed to avoid catastrophic climate change."[19]

3.4 Valuing fossil fuel companies based on their known reserves

The Carbon Tracker Initiative assessed the global warming potential of proven reserves and of listed reserves, concluding that "the top coal and top oil and gas

[17] http://www.nytimes.com/2014/06/08/opinion/sunday/friedman-obama-on-obama-on-climate.html hp&rref=opinion&_r=1

[18] http://s02.static-shell.com/content/dam/shell-new/local/corporate/corporate/downloads/pdf/investor/presentations/2014/sri-web-response-climate-change-may14.pdf

[19] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble

companies have a combined value of $7.42 trillion as at February 2011." Their calculations in 2011 set out that globally, the countries with the largest greenhouse gas potential in reserves on their stock exchanges are Russia (253 Gt CO_2), the United States (156.5 Gt CO_2) and the United Kingdom (105.5 Gt CO_2).

According to their evidence to a House of Common's inquiry, since this report was written, the London stock market has become 7% more exposed to coal.[20]

This has increased as new fossil fuel companies, such as Indian state-owned coal corporations, are listed on the stock exchange. Of course not all fossil fuel reserves are listed. There is much more oil on the financial markets than coal or gas.

In 2012, the Asset Owners Disclosure Project explored who is taking action to reduce their risks of stranded assets.[21] This project is "an independent not-for-profit global organisation whose objective is to protect members' retirement savings from the risks posed by climate change by improving the level of disclosure and industry best practice."

It concluded that:

"*only 5% of world's largest investment funds [are] managing risk in what it considers a responsible manner"* [22]

3.5 UN initiatives

In 2005 former United Nations Secretary-General Kofi Annan invited some of the world's largest institutional investors to establish Principles for Responsible Investment (PRI). The PRI Initiative is now an investor-led coalition in partnership with the United Nations Environmental Programme Finance Initiative and the United Nations Global Compact, "its Reporting Framework ... building a common language and industry standard for reporting responsible investment (RI) activities … to enable signatory transparency on RI activities and facilitate dialogue between investors and their clients, beneficiaries and other stakeholders."[23]

In 2013, the UNEP Finance Initiative said that it was:

"clear from the discussions in Beijing (2013 UNEP FI Global Roundtable) that financial institutions stand ready to do their part, but greater transparency and clearer (and more stable) incentives and regulations are essential if investors are to be encouraged to do what is right for both themselves and the planet."[24]

The PRI Initiative has more than 1,200 signatories, the majority of whom are investment managers, asset owners and professional service partners.

[20] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital p.4 /also at HoC inq. p15
[21] http://aodproject.net/about/about-us.html
[22] **The Price of Doing too little too late, The impact of the carbon bubble on the EU financial system.** Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html
[23] http://www.unpri.org
[24] http://www.unepfi.org/grt/2013/wp-content/uploads/2013/11/Letter-to-the-Financial-Times-We-must-demystify-finance-for-a-low-carbon-path.pdf

3.6 Investor networks on Climate Change

A Global Investor Coalition on Climate Change brings together networks from regions across the world to "provide a global platform for dialogue between and amongst investors and governments on international policy and investment practice related to climate change."[25]

This coalition includes the International Investors Group on Climate Change (IIGCC), a European network, with over 80 members with investments worth something in the order of €7.5 trillion. This includes at least three companies who play a significant role within the Scottish financial sector and economy.

The establishment of these international initiatives demonstrates, as the Chairman of the IIGCC has explained:

"A lot of very heavyweight investors recognise climate change as a risk to their long term portfolios. There is a recognition of the need to understand the risks, share best practice and see how well we can then adjust our portfolios and what investment measures we can take to either adapt or mitigate those risks."[26]

On such initiatives, non-industry body, the Asset Owner Disclosure Project have commented:

"*There are a lot of well-intentioned initiatives aimed at integrating climate change into the investment process - the Carbon Disclosure Project, Principles for Responsible Investment, Investor Network on Climate Risk, Institutional Investors Group on Climate Change - but it is critical that participants in these initiatives, and the broader investing community, convert those good intentions into material actions to manage climate change-related risks within their investment portfolios*."[27]

3.7 Stress testing the carbon budgets

In 2013, Carbon Tracker partnered with the Grantham Research Institute at the London School of Economics and Lord Stern, a leading authority on the economics of climate change, to produce further analysis of the carbon bubble in their report "Wasted Capital and Stranded Assets" to "stress test the carbon budgets."[28] This Carbon Tracker report concluded:

"*The systemic risks threatening the stability of financial markets related to unburnable carbon are growing more entrenched since 2011, not less.*"

Their revised analysis set out a carbon budget of 900 Gt CO2 to allow an 80% probability to stay below 2ºC, on the basis of greater reductions of other greenhouse gases like methane. It observed that from these results there is already less than 80% chance of limiting global warming to 1.5ºC and to achieve that, the budget would be restricted to 525Gt CO_2 between now and 2050.

[25] http://globalinvestorcoalition.org
[26] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Ev 12
[27] http://aodproject.net/about/about-us.html
[28] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital Executive summary

3.8 Carbon supply cost curve

Carbon Tracker's work has now assessed what can be burned and more recently the production costs of what could be burned. In a 2014 report focusing on the oil industry, it drew some conclusions about what is most likely to be burned and what is most exposed or "very exposed" to ending up as wasted capital or stranded assets. [29] Assuming the 40% contribution that oil makes as part of the current fossil fuels mix continues, the Carbon Group highlighted the report's calculation:

"*..that total emissions from the oil sector would be limited to 360 billion tons of CO_2, or the equivalent of 760 billion barrels of oil. Based on currently available global reserves, such a volume can be profitably extracted at a cost of US$75 per barrel or less.*" [30]

Carbon Tracker's work is now being used by banks such as HSBC and Citigroup, as well as by the rating agency Standard and Poor's.

"*This report in particular shines light on the use of oil and shows how drastically and quickly we must switch to efficient transportation and clean power – a need increasingly recognized by security forces, megacities and small-island States across the world...*

And because knowledge is useless unless it is applied, I challenge everyone here today to take what is outlined in Carbon Supply Cost Curves and apply it to your own capital expenditures, to your own investment portfolios and to your own business strategies or consumer choices. I challenge you to be part of the groundswell of momentum that strengthens the new agreement through visible action and vocal support. I challenge you to accelerate your own action and support all other action right now, as governments prepare contributions to the new, universal climate change agreement slated for 2015."[30]

Christiana Figueres, the UN's climate chief as reported by The Climate Group

3.9 European financial system

A European report, 'The Price of Doing Too Little Too Late - The impact of the carbon bubble on the EU financial system' was published in 2014 by The Green European Foundation. It "investigated exposure in high-carbon assets of 43 of the EU's largest banks and investment funds and calculated their losses under a variety of scenarios" with "sobering" results.[31]

With "total estimated exposure to over €1 trillion for these institutions" it assessed that there was serious risk, particularly for some member states and institutions, such as two banks in France and "a number of sizeable pension funds" in the UK and Netherlands.

The report was positive that the risk could be managed with "a determined pursuit of ambitious climate and energy policies leading to a quick and decisive transition to a

[29] **Carbon supply cost curves: Evaluating financial risk to oil capital expenditures** Carbon Tracker Initiative 2014

[30] http://www.theclimategroup.org/what-we-do/news-and-blogs/11-trillion-in-oil-investments-at-risk-if-world-ignores-carbon-bubble/

[31] **The Price of Doing too little too late, The impact of the carbon bubble on the EU financial system.** Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html Page 4

low carbon economy." It concluded that a transition that was "slow and uncertain" would lead to larger losses. Meanwhile no climate action would lead to the "highest financial, social and environmental cost" of all scenarios. It echoed the calls from other groups and reports for clear strong action.

The analysis in the European report shows large exposure to carbon based assets for many UK pension funds, including the Universities Superannuation Scheme and BAE systems Pension Scheme. 'The Price of Doing Too Little Too Late' report noted that "some investors have already begun to withdraw from fossil fuel businesses."

It drew attention to new reports that stated that in Norway, their "$800bn Sovereign Wealth Fund (NBIM) is likely to divest from coal assets":

[Labour Party Spokesman, Jonas Gahr] "*Støre says that the Norwegian Pension Fund's behaviour has a great signal effect, and that the Fund earlier has withdrawn from tobacco and palm oil-companies. He adds that this move is a natural follow-up of the agreement between the Nordic countries and the US made when president Obama visited Stockholm this summer. The Nordic countries and the US then said that they should avoid using government funds for coal investments abroad*."[32]

This European report acknowledged that:

"*Unlike institutional investors, initiatives by banks themselves regarding carbon bubble risks are rather limited. Rabobank, one of the largest EU banks, stands out with a blanket ban on lending for oil sands.*"[33]

3.10 House of Commons Inquiry

At Westminster, the House of Commons Environmental Audit Committee has recently undertaken an inquiry into Green Finance. In the course of the inquiry, the Committee explored whether a carbon bubble presented a risk to the UK economy. It took evidence from financial experts, banks and pension fund managers amongst others. The House of Commons produced the Committee's report and recommendations in March 2014. The Ministerial response to the recommendations within the report were received at the end of June 2014.[34]

In the course of the inquiry the committee heard of "a systemic failure of valuation, an overvaluation of the fossil-related and extractive industries, and various other utilities and some asset classes"[35] from Bloomberg New Energy Finance.

The City of London Corporation told the Committee that [there] "is a very real risk of a carbon bubble." They also said "the policy and legal changes required for it to burst are complex and largely reliant on international agreement."[36]

The Committee took evidence from two of the largest pension schemes in the UK (BT Pension Fund and the Universities Superannuation Scheme); large funds believed to

[32] http://energiogklima.no/nyhetsblogg/bjartnes/norways-swf-to-divest-from-coal/
[33] **The Price of Doing too little too late, T**he impact of the carbon bubble on the EU financial system. Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html
[34] **Green Finance: Government Response to the Committee's Twelfth Report of Session 2013–14** Published 24th June 2014 page 5
[35] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf
[36] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Page 16; Ev w42, para 11

be amongst the most exposed to risk in Europe[37]. Rather than disputing the risks outlined by Carbon Tracker, the spokespeople for these huge pension funds said respectively:

"*For us there is an inescapable logic about the Carbon Tracker, the basic analysis about the possibility of stranded assets, particularly in the light of major policy change"*[38]

and

"*I don't think you can very easily argue with the analysis that they have done.*"[39]

The Environmental Audit Committee:

"*asked the Bank of England whether they considered the carbon bubble to be a risk and whether they were monitoring it. They told us that the Financial Policy Committee met regularly to review risks to UK financial stability and that it had not identified risks to financial stability from a carbon bubble.*"[40]

In 2012 the Bank of England responded to the Committee about carbon bubble risk, saying "there could be such a risk if the impact of policies aimed at reducing returns in high carbon areas were not already being priced into the market."[41]

Despite these reassurances from the Bank of England, the Environmental Audit Committee concluded that the carbon bubble poses a serious threat to the UK economy.

Chair of the Committee, Joan Walley MP said:

"*The UK Government and Bank of England must not be complacent about the risks of carbon exposure in the world economy. Financial stability could be threatened if shares in fossil fuel companies turn out to be over-valued because the bulk of their oil, coal and gas reserves cannot be burnt without further destabilising the climate. The record-breaking extreme weather events causing chaos across the globe should be a wake-up call. The transition to a low carbon economy will be much more painful if we wait until there is a climate crisis before recognising that more than half of the world's fossil fuel reserves will have to remain in the ground."* [42]

[37] **The Price of Doing too little too late, T**he **impact of the carbon bubble on the EU financial system.** Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html

[38] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Q48

[39] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Q51

[40] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Quoted on page 17; Written evidence 47

[41] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf HC 1025 para 70.

[42] http://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/news/green-finance-por-substantive/

The Environmental Audit Committee report recommended that:

"*The Financial Policy Committee of the Bank of England should regularly consult with the Committee on climate change to help it monitor the risks to financial stability associated with a carbon bubble.*"[43]

The Report also recommended that:

"*The Government should work with companies to ensure that reporting requirements provide investors with all of the information they require to assess carbon risk, and develop the standard reporting requirements further*"[44]

3.11 UK Government response

In regard to the Financial Policy Committee recommendation, the UK Government stated that this was an issue for the Bank of England. The UK Government response on reporting was that beyond direct emission reporting (of activities) and voluntary reporting of indirect emissions:

"*The Companies Act 2006 already require [sic] companies to disclose the main risks and uncertainties facing companies. Research carried out by HSBC and Carbon Tracker on unburnable carbon reserves shows that there is information already available on the level of fossil fuel reserves, including from oil and gas companies which already disclose information on proven reserves. In that context, we do not see a need for Government to legislate further in this area.*"[45]

Through the reports, analysis and assessments considered, certain themes for action have emerged. These are explored in the next section.

[43] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Recommendations page 38
[44] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Para 35
[45] **Green Finance: Government Response to the Committee's Twelfth Report of Session 2013–14** Published 24th June 2014 page 5

4. Emerging themes

4.1 Transparency

"*The financial crisis has shown what happens when risks accumulate unnoticed. So it is important that companies and regulators work together to openly declare and quantify these valuation risks associated with carbon, allowing investors and shareholders to consider best how to manage them.*"[46]

Lord Stern, 2013

In the UK some information on carbon emissions is now required and available, but not yet on the carbon potential of assets which would inform investors.

"*While disclosure of carbon flows is becoming established, there is little reporting on the carbon stocks represented by fossil fuel reserves. As a result, arguably the most material climate change risk remains hidden from corporate reports as the future of the business rests on future licenses to emit carbon rather than past emissions.*"[47]

Transparency about carbon based assets will enable all investors, from individuals to major fund managers, and particularly those who invest long term, to manage their risks responsibly.

At the individual level, campaigns such as Shareaction[48] encourage people to seek this information from their pension fund holders to inform themselves about the risks.

4.2 Regulation

In order to ensure transparency, and the inclusion of carbon risk in assets, many believe that regulators need to act and that reporting should be required.

During the House of Commons Inquiry, Aviva Investors suggested that "the Bank of England should investigate the impacts of the UK's exposure to high carbon investment and manage this threat."

They went on to discuss the specific market failure:

"*that governments have failed to sufficiently internalize companies' environmental and social costs. As a result of government's failure to internalize these costs on company balance sheets (through for example, fiscal measures, standards, regulation, market mechanisms and, so forth) the capital market does not incorporate companies' full social and environmental costs.*"

New Economics Foundation also pointed out that "social and ecological environmental externalities are not incorporated into the price mechanism."[49]

[46] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital Lord Stern Comments, Page 7
[47] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital Corporate disclosure page 22
[48] http://www.shareaction.org/carbonbubble
[49] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf Q154

The first report from Carbon Tracker was clear: "[C]limate change poses a great threat to the global economy and it is not unrealistic to expect regulators responsible for assessing new systemic risks to address the carbon bubble."[50]

While the Bank of England have sought to reassure that the Financial Policy Committee (FPC) have not identified risks from a carbon bubble, it seems many groups, including the Environmental Audit Committee, believe that in the UK the Financial Policy Committee must act to address the threat of the carbon bubble.

In a wider context, another report from Generation Foundation ("dedicated to strengthening the field of Sustainable Capitalism") called 'Stranded Carbon Assets', also contends that regulation is key to managing the carbon risk and deflating the bubble. This report suggests regulation could be direct, indirect, through mandates setting policy on renewable energy or energy efficiency, or what they call "impending regulations" that create uncertainty for long lived carbon intensive assets.[51]

4.3 Short term focus

In written evidence to the Environmental Audit Committee, Aviva Investors also raised another issue that raises concern internationally as well - the short term focus on investment. They described their business "from an equity perspective" as "largely long-term and risk-averse."

Their evidence highlighted that:

"*the broader dynamic in the capital markets … the pressures are clearly to the short term, which ultimately affects both investor and company behaviour. This short term focus undermines the ability of capital markets to deliver sustainable economic development and reduces the long term return potential for our clients.*"

They indicated that there has been a focus on short term investments in the markets, particularly since the financial crisis:

"*at every stage in the investment chain, from the pension fund holder up through the investment at institutional level and the advice that the investment consultants make, to the relationship between asset owners and their asset managers, and more broadly the various information flows that help oil that system, actors are incentivised to behave in a short-term manner. This causes the capital markets to discount the future in a way policy makers should not.*"

There were indications that two things could start to reduce this issue of a short term view being taken on investments. Firstly, clear policy signals of future government plans, and secondly, clarity that fiduciary duties should encourage rather than deter consideration of ethical, social and carbon considerations that may be most relevant to the interests of long term investors.

4.4 Fiduciary duties

Internationally and in the UK, a short term focus in relation to investments is not just related to uncertainty and a culture (as outlined by Aviva) within the markets, but is being attributed to the interpretation of fiduciary duties by fund managers too. This

[50] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble Page 4
[51] **Stranded Carbon Assets:** Why and How Carbon Risks Should Be Incorporated in Investment Analysis Generation Foundation October 2013

adds to overvaluation of fossil fuel assets and causes concern for longer term investment, as carbon intensive asset values may not be realised.

Fund managers are legally obliged to act responsibly in relation to their fiduciary duties, and it is suggested that their current interpretation encourages and even enforces investment managers to seek the best return in the short term.

This is causing concern, and even conflict, with those who are managing longer term investments. It has been argued that, even if investors want to consider the long term well-being of their assets for their clients, by factoring in concerns such as exposure to carbon risk, this is compromised by current interpretations of fiduciary duties.

This concern was picked up the Kay Review[52], a report produced in 2012 which considered the functioning of UK equity markets and long term decision making. It identified concerns from stakeholders about the interpretation of fiduciary duties in relation to investments, one of which was:

""fiduciary duties required them to maximise returns over a short-time scale, precluding consideration of long-term factors which might impact on company performance;' [53]

As a result of this report, The Law Commission was asked:

'to review the legal concept of fiduciary duty as applied to investment to address uncertainties and misunderstandings on the part of trustees and their advisers.'[54]

The Environmental Audit Committee summarised in their report:

"The Kay Review (paragraph 37) concluded that 'institutional investors acting in the best interests of their clients should consider the environmental and social impact of companies' activities".[55]

The Law Commission suggested that investors would not have to implement an approach that takes into account environmental, social or governance (ESG) factors, but should at least show that they have considered it.

The House of Common's inquiry acknowledged that fiduciary duties can be interpreted differently but concluded that investors should factor the risks of exposure to carbon into their wider responsibilities.

At the time of writing this report, the Law Commission had just concluded their recommendations to UK Government.

An extract from their summary of recommendations is set out here:

"The report concludes that trustees should take into account factors which are financially material to the performance of an investment. Where trustees think ethical or environmental, social or governance (ESG) issues are financially material they

[52] **Kay review of UK equity markets and long-term decision making** (2012). https://www.gov.uk/government/consultations/the-kay-review-of-uk-equity-markets-and-long-term-decision-making

[53] http://lawcommission.justice.gov.uk/docs/kay-review-of-equity-markets-final-report.pdf

[54] http://lawcommission.justice.gov.uk/areas/fiduciary_duties.htm

[55] J Kay, The Kay Review of UK Equity Markets and Long-Term Decision Making:Final Report (2012), para 10.20.

should take them into account.

However, whilst the pursuit of a financial return should be the predominant concern of pension trustees, the law is sufficiently flexible to allow other, subordinate, concerns to be taken into account. We conclude that the law permits trustees to make investment decisions that are based on non-financial factors, provided that:

- *they have good reason to think that scheme members share the concern; and*
- *there is no risk of significant financial detriment to the fund."*[52]

Christiana Figueres, Executive Secretary of the UN Framework Convention in Climate Change has a firm interpretation of the fiduciary duty companies owe to shareholders:

"..*corporations that continue to invest in new fossil fuels, they are really in blatant breach of their fiduciary duty, as the science [of climate change] is abundantly clear."*[56]

4.5 Clear signals

There is a call especially from pension fund managers and investment companies, at an international and UK level, for clear signals to show the direction of travel of Government policies, into the longer term.

At a European level, the report 'Too Little Too Late' noted:

"*it is generally perceived that financial markets have not yet priced in carbon bubble risks because strong climate policies are considered highly unlikely."*[57]

The assumption that all the carbon in known reserves will be burned, that there will continue to be high prices for fossil fuels and continuing investment in fossil fuels and inflation of the carbon bubble, is based on a policy vacuum and a lack of clear signals that there is indeed a serious intention to head for a low carbon economy.

Strong, clear and certain signals that there is a change of direction towards a low carbon economy would undermine current assumptions that all fossil fuel reserves are going to be burned, and the inflation of a carbon bubble continue.

If governments commit to strong emission reduction plans that are clear, consistent and strong, then investment may shift towards clean energy and energy efficiency, away from intensive carbon based assets, especially those most at risk of becoming stranded. Market forces could ensure this happens, once the policy vacuum is removed. In this regard it is highly indicative that both the private sector Rockfeller Foundations in the United States and the public sector Norwegian Sovereign Wealth Fund have recently significantly re-directed investment towards renewable energy – or completely abandoned fossil fuel investment.

[56] As quoted in www.theguardian.com/environment/2014/mar/06/carbon-bubble-threat-uk-economy-fossil-fuels-mps

[57] **The Price of Doing too little too late, The impact of the carbon bubble on the EU financial system.** Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html page 15

5. The carbon bubble and Scotland

There has been no comprehensive assessment, as far as is known, of the Scottish financial sector's degree of exposure to carbon based assets.

There are however, significant factors to consider in relation as to whether there may be a risk to Scotland and its economy from the carbon bubble.

5.1 The Scottish financial sector:

Scotland has a strong financial sector, which is extremely important to the Scottish economy. At a glance, the Scottish financial sector looks like this:

*"**Financial Services Industry in Scotland:***

- *Employs almost 100,000 people directly and around the same again indirectly*
- *Generates around £7 billion for the Scottish economy*
- *Manages over £800 billion of funds*
- *Accounts for 24 per cent of all UK employment in life assurance, and 13 per cent of all banking employment*
- *Includes Banking; Fund Management; Insurance, Life Assurance and Pensions; Asset Servicing and Professional Services"*[58]

Within that sector, encompassing banking, investment, insurance and pension funds services, there is a good deal of long term investment and heavy reliance on the London stock market, investments in the fossil fuel industry and carbon based assets.

The role of pension funds and long term saving is important, not just for the financial services provided within the sector, but for all investors and savers.

Case study A: Royal Bank of Scotland

Royal Bank of Scotland (RBS**)** is a Scottish bank which plays an important role in Scotland's financial sector, the Scottish and UK economy.

RBS is involved with investment in the kind of projects which are described as "very exposed" in Carbon Tracker's assessments, to becoming stranded assets and wasted capital; these include Arctic explorations and tar sands. In their assessments, HSBC recognise these kinds of risks:

"*In our view, investors should focus primarily on companies with low-cost future projects. Capital- intensive, high-cost projects, such as heavy oil and oil sands, are most at risk under our scenario.*"[59]

The report, 'Banking on Coal'[60] also found RBS to be 8th in the top 20 banks globally in terms of financing coal companies. This is within a context which, as acknowledged earlier and as others report, the "headwinds against the coal industry, in particular, are already intensifying."[61]

[58] Scottish Financial Enterprise, http://www.sfe.org.uk/facts.aspx
[59] Oil & carbon revisited, Value at risk from 'unburnable' reserves HSBC Global Research Page 4
[60]Banking on Coal, Heffa Schücking Published by urgewald, BankTrack, CEE Bankwatch Network and Polska Zielona Sie¬ pg 17-21
[61] Mark Drajem. "Coal at Risk as Global Lenders Drop Financing on Climate." Bloomberg 6 August 2013; as reported in Stranded Carbon Assets, xxxx, page 7

As the 2013 report, 'Stranded Carbon Assets' also acknowledges:

"*Goldman Sachs published a report in 2013 stating that the window for profitable investments in coal mining is closing because of the primary structural drivers that will constrain demand in the long term.*"[62]

5.2 The oil and gas sector

The oil and gas industry plays a significant role in Scotland's economy. Companies such as Cairn Energy are based in Scotland, and a significant number of other companies like BP operate in Scotland and the North Sea, providing jobs and attracting investment.

The oil and gas sector clearly makes a significant contribution to the Scottish economy. Scotland's 'Oil and Gas Strategy' for 2012-20 (a plan supported by industry, public sector and Government) sets out the size of the sector:

"*Over the past four decades £300 billion has been invested in the UKCS, including £8.5 billion of capital investment in 2011. A further £31 billion is committed and in progress at the start of 2012."…. "The industry provides employment for around 440,000 people across the UK with around 200,000 jobs in Scotland."*[63]

This strategy sets out an estimate that 2,000 supply chain companies contribute to the sector, distributed around Scotland, with a cluster in the North East. It has a confident vision that is "based around maximising the recovery of oil and gas reserves and will be at the heart of everything the sector does." Their confidence is based on this outlook:

"*While future oil prices cannot be guaranteed, future high prices are likely which means the North Sea has considerable economic life. The wholesale value of the remaining reserves in the North Sea has been estimated to be up to £1.5 trillion. The University of Aberdeen has calculated that developments in the West of Shetland alone could generate up to $600 billion (£370 billion) in new revenues over the next 40 years.*"

This projected production from the North Sea is based on the assumption that these fossil fuel reserves will be burned, and the investment from the public sector and private sector is obviously based on their value being realised, but as other reports and analysis shows, it may not be burned. HSBC have suggested:

"*Although not directly related to 'unburnable' carbon, a greater risk to the sector would be if lower demand led to lower oil and gas prices. In that case, the potential value at risk could rise to 40-60% of market cap.*"[64]

There is acknowledgement that industry diversification into supporting development of renewables may play a role in the strategy, but "this is not viewed as a replacement for oil and gas activity but as additional long term opportunities."[65] Other future development elements of the strategy involve using extraction experience abroad.

The oil and gas produced by the North Sea may form part of the global carbon budget that is burned, indeed as Carbon Tracker's recent work has shown, oil is expected to

[62] Christian Lelong, Jeffrey Currie, Samantha Dart, and Philipp Koenig. "The Window for thermal coal investment is closing." Goldman Sachs Commodities Research 24 July 2013.
[63] www.**scottish**-enterprise.com/~/.../**Oil-and-Gas-strategy**-2012-2020.pdf
[64] Oil & carbon revisited, Value at risk from 'unburnable' reserves HSBC Global Research
[65] www.**scottish**-enterprise.com/~/.../**Oil-and-Gas-strategy**-2012-2020.pdf page 21

make up 40% of what is burned, but the "International Energy Agency's 450ppm scenario indicates oil consumption could peak and [start to] decline" between 2018 and 2020, Carbon Tracker's latest projections also show that if the 2ºC limit commitment becomes a political reality, oil prices may peak in 2018 then start to decline.[66]

The projections from HSBC are even less optimistic for oil:

"*In a low-carbon world, defined as limiting future CO2 emissions until 2050 to 1,440Gt[67], oil demand would fall post 2010. Gas demand would continue to grow but at a slower rate than currently. This means some potential oil and gas developments would no longer be needed.*"[68]

Their report 'Oil and Gas Revisited', presents a different perspective:

"*Looking at how the carbon in proven reserves is split between fossil fuels, it is clear that oil can only play a modest role in reducing emissions...It is clear that reduced usage of coal is the key to stabilising and eventually reducing annual carbon emissions. However, we believe that reductions in oil demand, although smaller, can be delivered more quickly than coal through improvements in transport fuel efficiency.*" [69]

Scotland's oil and gas industry and its partners even see an emerging market in shale gas and the strategy points to new 'major opportunities' for the industry in unconventional gas and oil.

With such different forecasts for the future of oil and gas, does Scotland's oil and gas industry need to reconsider its strategy, to avoid leaving it and its shareholders exposed to stranded assets and wasted capital?

Case study: BP

"*BP is one of the UK's biggest companies, a global organisation employing 100,000 people in 100 countries...[their] North Sea business is managed from Aberdeen, and BP is one of the largest operators with production of some 350,000 barrels of oil and gas per day and investment of over $3bn annually.*"[70]

BP was third in top 200 listed companies by estimated carbon reserves with 32.68 Gt CO2 (Oil) and 1.92 Gt CO2 (Gas) in 2011 by Carbon Tracker.

It is involved in the type of projects Carbon Tracker describes as "very exposed" in the Arctic, deepwater and ultra-deepwater projects.

In relation to BP and unburnable oil and gas reserves, HSBC assessments consider:

"*The volume of reserves at risk of being undeveloped in a low-carbon world varies markedly between the companies. At the high end, around 25% of BP's proven and probable (2P) reserves would fall into our 'unburnable' category.'....'BP's potentially unburnable oil reserves make up around 12% of its total reserves...Around half of the group's unburnable oil reserves are in the deepwater category with the balance in*

[66] Carbon supply cost curves: Evaluating financial risk to oil capital expenditures Carbon Tracker Initiative 2014
[67] Note: The difference of 1,440 Gt and 900 Gt CO_2 presented by Carbon Tracker is that HSBC is including carbon budget from 2000-2050, some of which has been burned already.
[68] Oil & carbon revisited, Value at risk from 'unburnable' reserves HSBC Global Research
[69] Oil & carbon revisited, Value at risk from 'unburnable' reserves HSBC Global Research
[70] http://www.sfe.org.uk/BP.aspx

heavy oil.'…. '[Including gas] BP's value at risk from unburnable reserves is equivalent to only 7% of its market value."[71]

Case study C: Cairn Energy PLC

Cairn Energy PLC is a Scottish company. It is listed in 67th place in the top 200 listed oil companies by estimated carbon reserves with 0.35 Gt CO2 (Oil)[72] and is investing in projects in the arctic, which are described by Carbon Tracker as "very exposed"[73]. It has just announced a new project development in the Catcher area:

"*All major service contracts have been awarded and the project is now in the execution phase. First oil is targeted for mid-2017*."

The press release issued the following quotes:

"Michael Fallon, Minister of State for Energy, commented: "*The Catcher area development shows that there continues to be an extraordinary level of interest in North Sea oil and gas, which is excellent news for industry and for the whole of the UK. The project represents over £1bn of investment and almost all of the subsea expertise and equipment needed for this development is being supplied by British companies right across the country*."

"Simon Lockett, Chief Executive Officer, commented: "*Having discovered Catcher in 2010, we are extremely pleased to have brought the Catcher area through the development approval process. Once on-stream this project, which has been facilitated by the government's small field allowances, will underpin our growing cash flows.*"'[74]

5.3 Scotland's climate change targets

Both the Scottish financial services and energy sectors are planning for a buoyant market for fossil fuels for decades to come. Scotland also has a clear set of ambitious annual targets to reduce greenhouse gas emissions including CO2, set in Scottish statute providing a strong steer for Government policy and scrutiny by The Scottish Parliament.

There seem to be inconsistencies in these strategies, as identified by the Scottish Parliament Information Centre in April 2014:

"*The Scottish Government is working towards reducing Scotland's carbon emissions by 42% by 2020. As we have seen, it is also committed to the Wood Review's* [75] *aspiration to maximise recovery of hydrocarbons from the North Sea. Minister for Energy, Enterprise and Tourism Fergus Ewing believes "no contradiction exists" (Scottish Parliament, 2014) between these two policies, therefore suggesting that fossil fuels from the UKCS will be extracted, exported and primarily burnt elsewhere (unless carbon capture methods are developed and adopted soon in Scotland).*"[76]

[71] Oil & carbon revisited, Value at risk from 'unburnable' reserves HSBC Global Research
[72] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble
[73] **Carbon supply cost curves: Evaluating financial risk to oil capital expenditures** Carbon Tracker Initiative 2014
[74] http://www.cairnenergy.com/index.asp?pageid=27&newsid=455
[75] Wood Review (2014) UKCS Maximising Recovery Review Final Report. Available at: http://www.woodreview.co.uk/
[76] Scottish North Sea oil and gas industry, The Scottish Parliament Information Centre's Financial Scrutiny Unit Briefing (P. 22) April 2014

This plan to meet Scottish targets and sell fossil fuels to others to burn makes no sense for reducing global emissions in our atmosphere. It also assumes others will not set limits to reduce emissions, perpetuates the assumption that all fossil fuels will be burned and undermines Scottish calls for others to set limits too.

5.4 International engagement

Key people based in Scotland are engaged in international discussions about how to manage the carbon risk. For example, Craig Mackenzie, Head of Sustainability at Scottish Widows Investment Partnership (one of Europe's largest investment management companies) has been involved in a challenge to investors:

"*Companies must plan properly for the risk of falling demand by stress-testing new investments to minimize the risk our clients' capital is wasted on non-performing projects."*[77]

The European network of IIGCC has members key to Scotland's financial sector. Several Scottish companies and funds are signed up to the Principles for Responsible Investment including a public sector pension fund. The North East Scotland Pension Fund is one public sector signatory and participant:

"*one of Scotland's larger Local Government Pension Funds, providing pension benefits for over 50,000 members drawn from over 50 employers.*"[78]

[77] http://www.carbontracker.org/site/investors-challenge-fossil-fuel-companies
[78] http://www.unpri.org

6. Carbon bubble risk: Is Scotland aware, prepared or not concerned?

A snapshot survey of some key players, conducted to inform this report, set out to briefly assess the levels of awareness, concern about and preparedness for the risk presented by the carbon bubble to Scotland. The questions asked are presented in Annexes 2 and 3.

6.1 Public debate

From information that is available, it seems that there is little evidence of public discussion about the issue of the carbon bubble within or in relation to Scotland.

6.2 Key opinions

In pulling together this report, financial and energy sector commentators, companies, government organisations and others were contacted for their views.

There were very few responses. Whether this may indicate a low level of awareness or interest, or a reluctance to engage in the discussion in this assessment, or either of these, it is impossible to know.

6.3 Private sector

Only one of the private sector finance companies responded to the short set of questions asked, and provided comment.

That response came from an investment management company, a well-known and significant player within the Scottish financial sector. Its response was clear.

Yes, they know about the carbon bubble and they consider it may be a risk to Scotland. “We are very aware of the carbon bubble and stranded assets.”

They also indicated that, yes, they have been asked about this issue by clients, primarily in relation to pension funds, and that these issues are being discussed in relation to their investments.

It is not possible to confirm whether other financial institutions and energy companies based in Scotland may also be having an internal discussion about the carbon bubble.

None of the oil and gas companies contacted responded.

6.4 Public sector

Audit Scotland and Scottish Enterprise were asked about their awareness of the carbon bubble and whether they considered it a risk to Scotland.

Audit Scotland was contacted as the public sector organisation that has the key objective to “help the Auditor General and the Accounts Commission to make sure organisations that spend public money in Scotland use it properly, efficiently and effectively.” Audit Scotland did not respond.

Scottish Enterprise, Scotland’s main economic development agency that ‘”aims to deliver a significant lasting effect on the Scottish economy” and for whom “oil and gas continues to be a key sector, both for the Scottish economy as a whole and for

Scottish Enterprise in terms of future growth opportunities" commented by email to explain that:

"*Having carefully considered the questions posed we do not perceive them to be relevant to Scottish Enterprise and wanted to let you know that we will not therefore be completing the survey*."

6.5 Scottish Government

The Office of the Chief Economic Adviser and the Cabinet Secretary for Finance and Sustainable Growth were contacted with the same questions. The response from Scottish Government came from the Electricity Division within the Energy and Climate Change Directorate. There was no mention of the carbon bubble in the response which is copied in the annex in full. This is an extract:

"*In Scotland, we will need a mixed energy portfolio, including hydrocarbons, to provide secure and affordable heat and electricity for decades to come. As we increase our use of renewable energy sources, we also have a duty to minimise carbon emissions in line with our world-leading climate change targets.*"

6.6 The Scottish Parliament

The carbon bubble does not seem to be an issue that has crossed the radar of the Economy, Energy and Tourism Committee of the Scottish Parliament. Convener of the Committee, Murdo Fraser MSP responded promptly to the questions asked for this report stating that the Committee are not aware of the concept of the carbon bubble. They do not know if it presents a risk to Scotland. There has not been any consideration of the risk, and that stakeholders have not raised the issue in relation to [the Committee's] work.

6.7 Across Scotland

Beyond the financial, energy and public sector there seems to be more discussion of this matter. In the time available, this report focused on inviting opinion from the finance and energy sectors and key commentators, however there is more information on discussions within other sectors available online. The following information was gathered from research rather than via the questionnaire.

6.8 Scottish Universities

As in other parts of the world, such as at Stanton University[79], the universities in Scotland have engaged in the related debate around divestment. This is an extract from the Edinburgh [divestment movement] website:

"*Edinburgh University has over £230 million worth of investments. The companies receiving some of this bountiful fund include 3 arms companies. A massive 16% of the University's endowment goes to fossil fuel companies, undermining the goals of the University's 'Climate Action Plan', which aims to reduce the university's carbon footprint by 29% by 2020. On top of all this, numerous companies that the University invests in, including Shell and Monsanto, have been accused of human rights abuses.*

With the 3rd largest endowment fund in the UK, and the largest in Scotland, the University of Edinburgh has the opportunity to lead the way on sustainability and

[79] http://news.stanford.edu/news/2014/may/divest-coal-trustees-050714.html

social responsibility in finance. The University of Edinburgh is a charitable body whose mission it is, amongst others, to 'make a significant, sustainable and socially responsible contribution to Scotland, the UK and the world'. We want this mission to be reflected in the university's investment portfolio."[80]

Glasgow University has been engaged in a similar debate and has recently decided to withdraw from fossil fuel investment.

6.9 Church of Scotland

There is a parallel debate going on within the Church of Scotland community.

"..[a] group of young Christians [...] did some research and despite not being able to access all the data and we found that in 2012, according to the Church's own investment review, the Church of Scotland had £7 million worth of investments in Shell, over £4 million in BP and over £4 million in BHP Billiton. Consider the effect these companies are having on our sisters and brothers across the planet and then consider the fact that we in the Church of Scotland are profiting from this. That's just not neighbourly! It's certainly not loving."[81]

6.10 Evidence from UK Inquiry

Evidence from companies which operate in Scotland that also contributed to the House of Commons inquiry by the Environmental Audit Committee, suggested that there may be wider spread awareness and concern about the risks that the carbon bubble presents to Scotland as well as the rest of the UK.

[80] http://campaigns.gofossilfree.org/pet...
[81] http://brightnow.org.uk/opinion/neighbours-counting-us/..

7. Summary and conclusions

This report has been able to take little more than a snapshot of the current debate around the carbon bubble and the risk it may present to Scotland. This is a summary of some of the conclusions and recommendations that have emerged.

7.1 While there has been an active debate about the value of carbon assets internationally, within Europe and in the UK over the last few years, public discussion of such concerns appears to be limited in Scotland.

7.2 There seems to be quite comprehensive evidence, globally, that the carbon bubble presents a potential risk and is an issue that needs to be addressed.

7.3 That message appears to be strongest from the financial services sector internationally, in the UK and in Scotland – even as reflected in the small amount of responses to the questions asked in the course of research for this report.

7.4 Those who have done analysis on exposure to carbon asset risk cite the UK as particularly vulnerable, whether considered within a European or a global context. This is in part due to the large dependency on fossil fuel assets on the London stock market, the strong role the financial sector plays in the economy and within that, the large pension funds managed in the UK that are linked to that strong fossil fuel, mining and financial index.

7.5 In Scotland, these same ingredients are clear. Big companies reliant on buoyant investment and high values in fossil fuels play a strong role in both the financial and energy sectors, both of which are critical to the Scottish economy.

7.6 Scotland's financial sector, with a particular focus on pension funds and longer term investments, is heavily reliant on the fossil fuel industry and carbon based assets.

7.7 Scotland's oil and gas industry also relies on and is planning for a buoyant market for fossil fuels for the forseeable future. The sector's strategy to 2020 and vision beyond, depends on high prices and demand for fossil fuels being sustained for decades to come. Meanwhile at home and abroad investors are recognising this may be a risky strategy for long term investors and engaging in a dialogue to mitigate the risk. Some are already divesting, especially from coal, such as the Norwegian Sovereign Wealth Fund and the Rockfeller Foundations in the United States.

7.8 Within both the oil and gas, and the financial sector, Scottish companies are dealing with some of the most exposed assets globally, for example investing in the Arctic, deepwater, shale gas and tar sands. Projects highlighted by the Oil & Gas strategy in Scotland as ripe for investment are acknowledged by other mainstream banks as very exposed to becoming stranded assets with the greatest potential for wasted capital.

7.9 Even in a global context, while others start to actively divest from coal, a Scottish bank is in the top ten of all banks in the world in terms of financing coal.

7.10 Globally, it has become clear that the current debate on the existence of and risk from the carbon bubble and discussion about managing that risk is picking up momentum and has been in the last few years. Within the UK, several reports and commentaries have been produced even just over the last few months. The Ministerial response to the Environmental Audit Committee's inquiry has just been

published along with the Law Commission review of fiduciary responsibilities. The carbon bubble is in the media.

7.11 In Scotland, this debate has not reached the same level of public attention and discussion. Even this short assessment suggests that this is an issue that may be extremely relevant to Scotland and a risk to be, at least, assessed.

There may be a role for the Economy, Energy and Tourism Committee of the Scottish Parliament to consider this issue, to complement the work of colleagues in the UK and consider the issues from a Scottish perspective. There are some themes that could be explored in the course of a Parliamentary or other inquiry.

7.12 Regulation: The discussions with the Bank of England about the role of the Financial Policy Committee may be relevant for Scotland to engage in. It would be interesting to hear an opinion from Scottish Government and The Scottish Parliament on their view of the regulator's role.

Within Scotland, there is a role for Audit Scotland to assess and reduce exposure to risk within Scotland's public sector. Should public funds be investing in assets that are assessed as being most exposed for example, is a question that should be asked. Should the public sector be required to give clear signals through their reporting and investment practices, is another.

7.13 Transparency: There is a question as to whether Scotland is well placed to demonstrate how clear reporting of the CO2 potential of investments can strengthen an economy by giving confidence to investors, especially those seeking to invest in the long term. The Scottish Parliament, founded on the principle of transparency, may be able to lead the public sector in establishing this culture and pushing for clarity across the UK.

Here too, regulation is needed, at the UK level; "listing authorities need to take greater responsibility for reviewing provision of information by listed companies and ensuring that systemic risks are addressed."[82]

7.14 Short term focus: It is clear that the wider and UK debate indicated an issue with short term investments in the markets, particularly since the financial crisis. There were indications that two things could start to reduce this issue of a short term view being taken on investments: clear policy signals of future government plans, and clarity that fiduciary duties could screen concerns that may be more relevant to long term investors.

7.15 Clear signals: The rationale set out by some for continued expectation of high prices and therefore investment in fossil fuels is based on a policy vacuum and a lack of clear signals that we are heading for a low carbon economy. Yet Scotland does not lack these clear signals. Where Scotland is heading is clearly set out in statute.

Failure to meet the statutory targets has undermined this certainty, but the value of getting back on track, strengthening the emissions reduction plan and making future market signals certain, must be clear. Of course this needs to be in the context of strong international political agreement, to avoid the impression that profitable markets for fossil fuels will continue to exist elsewhere, but Scotland has a role to play in advocating for that too while demonstrating low carbon route advantages.

[82] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble page 24

7.16 Fiduciary duties: International and UK short term focus (which adds to overvaluation of fossil fuel assets) in relation to investments, is related not just to uncertainty, but is being attributed to interpretation of fiduciary duties by fund managers too. While the Kay Review and now the House of Commons' inquiry have pressed for this to be looked at, to enable more ethical screens to be included and a longer term view taken, and The Law Commission consultation has produced recommendations, this may be an issue to be looked at in a Scottish context too - in terms of whether the Scots law interpretation is any different and whether this something that the Scottish Law Commission should consider or provide opinion on for Scottish based fund managers.

7.17 Why is the role that Scotland plays important? As a global community, if we continue business as usual, then the most vulnerable continue to pay the highest costs of climate change. Scotland has produced world leading climate legislation. It now needs to be seen to enforce it, provide certainty and expect similar from other nations.

If we allow the carbon bubble to inflate, fail to redirect investment into infrastructure needed to mitigate and cope with climate change, then everyone - especially savers and those reliant on their pension funds - is exposed to impacts of a financial shock as well as other devastating effects from climate change.

Yet, if we choose to take steps to deflate the bubble, redirecting investment into energy efficiency, low carbon energy and transport, through strong clear reporting, clear market signals, a fiduciary duty that protects long term investments and supports sustainable developments, then we could be investing in a safer, securer future for us all.

7.18 Recommendations for action: Working across the UK, with international partners, Scotland has clear reasons to consider, assess and take action where necessary to mitigate the risk of exposure to stranded assets. Beyond mitigating risk, there are huge opportunities for Scotland from shifting investment from fossil fuels towards a low carbon economy at home and across the world. It may require transition but this will be necessary at some point in the future. A suite of recommendations for different sectors has emerged in this assessment and these recommendations are set out in the next section.

8. Recommendations

8.1 The Scottish Government should be asked:

- whether the Scottish Government is engaged in, or will become engaged in, the UK debate about regulation, reporting and transparency about carbon intensive assets;
- whether the Scottish Government or its agencies invest in 'very exposed' carbon assets;
- whether the carbon bubble risk to Scotland been assessed by the Council of Economic Advisers and what their advice on reducing the risk to Scotland would be;
- whether Audit Scotland have considered carrying out a performance audit in respect of public sector investments in fossil fuels;
- to ensure the greenhouse gas emission reduction plan will be refreshed and strengthened to ensure no further targets are missed; and
- whether the Scottish Law Commission needs to be asked to confirm interpretation of the fiduciary duties in Scots law meets long-term and ethical considerations.

8.2 The Scottish Parliament should be asked:

- to hold an Inquiry into the risk of a carbon bubble to Scotland - to be led by the Economy, Energy and Tourism Committee which has stated it is not aware of the carbon bubble and has not assessed the risk to Scotland;
- The Economy, Energy and Tourism Committee, the Rural Affairs, Climate Change and Environment Committee, and others, should explore current inconsistencies in Government and public sector supported strategies to achieve a low carbon economy - at the same time as it is giving assistance to fossil fuel production and use.

8.3 Scotland's public sector should be asked;

- to lead on transparency and reporting of the carbon exposure of their assets and investment strategies – which may be a role suited to Audit Scotland, and should address the Oil and Gas Strategy and Scotland's Economic Strategy;
- to follow guidelines to ensure consistency in delivery of government policy and statute to reduce greenhouse gas emissions and reduce the risk of carbon asset exposure; and
- to divest fossil fuel investment assets to reduce or eliminate risk related to carbon.

8.4 Private sector investors and savers in Scotland should be asked to:

- "identify carbon asset risks across portfolios;
- engage corporate boards and Executives on plans to mitigate and disclose carbon;
- diversify investments into companies positioned to succeed in a low carbon economy; and
- divest fossil fuel investment assets to reduce or eliminate risk related to carbon." [83]
- and to re-examine corporate performance of fiduciary duties.

For individuals, Shareaction can support contact with pension fund holders.

8.5 Scotland's civic sector should be asked:

- to identify any carbon based assets in their investments or pension funds;
- diversify investments into companies positioned to succeed in a low carbon economy; and
- divest fossil fuel investment assets to reduce or eliminate risk related to carbon.

[83] As set out in **Stranded Carbon Assets:** Why and How Carbon Risks Should Be Incorporated in Investment Analysis Generation Foundation October 2013

9. Definitions and related issues

Unburnable carbon: Two thirds of known reserves that if burned that would take the global temperature above 2ºC and catastrophic climate change.

Stranded assets: Carbon based assets that could become worthless if and when the carbon bubble bursts.

Global carbon budget: The total budget of carbon dioxide that can be released into the atmosphere in order to stay below a global temperature rise of 2ºC.

Global carbon potential of known reserves: The total amount of CO2 that would be released into the atmosphere if all known reserves of fossil fuels were burned.

There are also other categories of reserve that are not included in this total global carbon potential. These would be additional. Since two thirds of known reserves are unburnable, investments in exploration and exploitation of these are more likely to become stranded.

- **proven reserves:** "at least a 90% chance of being extracted";
- **probable reserves:** "at least a 50% chance of being extracted" (so these are not included within global carbon potential assessment);
- **possible reserves**: "at least a 10% chance of being extracted" (not included within global carbon potential assessment) [84]

Green investment - This report does not go into the issue of green investment in detail, but clearly it is a related issue. While investment and government subsidies internationally go into fossil fuel exploration, extraction and exploitation, this investment is not going into the clean energy revolution and energy efficiency that is required. The recent inquiry in the House of Commons considered the carbon bubble and green investment side by side, and produced recommendations relating to both matters.

Fossil fuel subsidies: This is not a matter for discussion in this report, but part of the wider debate and is connected. There is some disagreement over whether the UK Government provides subsidies. UK Government states that it does not while the UK Environmental Audit Committee claims that Government provides subsidies to the tune of £12 billion a year through tax incentives and support, like 'small field allowances' (as named by Cairn Energy). See https://www.gov.uk/oil-and-gas-taxation and House of Commons Environmental Audit Committee - Energy subsidies: Government Response to the Committee's Ninth Report of Session 2013–14 for more information.

Divestment: The action opposite to investment, in this context often moving investment out of fossil fuel based assets or for other ethical objectives.

Fiduciary duty: Fiduciary obligations exist to ensure that those who manage other people's money act responsibly in the interests of savers (clients or beneficiaries), rather than serving their own interests[85]. It is a relationship of trust, but with different definitions around the world, sometimes it is believed fiduciary duty can be interpreted too narrowly.

[84] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital

[85] http://www.unpri.org/viewer/?file=wp-content/uploads/3.Responsibleinvestmentandfiduciaryduty.pdf

Annex 1: Who was sent the questionnaire

The following groups/organisations/individuals were contacted by email and asked if they would respond (via email or survey monkey) to help inform this assessment:

Private sector: 12 companies were contacted (9 Finance, 3 Oil and Gas);

Public Sector: Scottish Enterprise, Audit Scotland;

Office of the Chief Economic Adviser, Scottish Government;

The Economy, Energy and Tourism Committee, The Scottish Parliament

All contacts above were asked the same questions.

Asking similar questions, views were invited from:

Commentators on business, and the oil and gas industry;

Leaders of all Scotland's political parties in Parliament;

Cabinet Secretary for Finance and Sustainable Growth, Scottish Government.

Annex 2: Questionnaires sent out to industry contacts - version 1

'Carbon bubble' is a term used to describe over-inflation of the value of carbon or fossil fuel based assets, based on the assumption that all fossil fuel reserves can be burned.

In 2011, a 'Carbon Tracker' report "showed that based on current understanding of an allowable carbon budget to keep below two degrees of global warming, there is more fossil fuel listed on the world's capital markets than can be burned." [86] To stay below two degrees of warming, in line with international agreements, the report concluded that 60-80% of current carbon assets cannot be burned. If only 20% can be burned to avoid catastrophic climate change, fossil fuel based assets (such as oil, gas and coal) are said to be overinflated in value - creating a growing carbon bubble.

The 2011 report "quantified for the first time how bad the overshoot is, company by company, and stock exchange by stock exchange." A second report was produced last year, in which Lord Stern warned "serious risks are growing for high-carbon assets."[87] Scientific warnings from the Intergovernmental Panel on Climate Change to limit burning of fossil fuels continue to strengthen.

A House of Commons' Committee report[88] published in March this year warned that the carbon bubble poses a serious threat to the UK economy. A report on the impact of the carbon bubble on the EU financial system was produced in February 2014, suggesting that if the carbon bubble "pops" it could "create a carbon shock with severe consequences for our financial system."[89]

1. Is your company/organisation aware of the concept of the 'carbon bubble'?
a. Unaware of it
b. Heard of it but do not know much about it
c. Know about it but do not consider it a risk to Scotland
d. Know about it and consider it may be a risk to Scotland
e. Don't know

2. Do you consider the carbon bubble a risk to your business, assets and investments?
a. If yes, how has your company/organisation assessed the risk and what measures have you put in place to mitigate this risk to your business, assets and financial investments?

b. If no, can you explain why your company/organisation does not consider the carbon bubble a risk to your business, assets or financial investments?

3. Have any stakeholders raised the issue of a carbon bubble with your company/organisation in relation to your work or their finances/investments/pensions?

4. If a carbon bubble has not been considered as a risk, is there a reason why not?

5. Would you like to make any further comments?

Thank you very much for all your responses. The report considering the risk of a carbon bubble to Scotland, for Scottish Environment LINK, will be published on www.scotlink.org during the summer.

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[86] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble

[87] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital

[88] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf

[89] **The Price of Doing too little too late,** T**he impact of the carbon bubble on the EU financial system.** Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html

Annex 3: Questionnaire sent to other contacts - version 2.

'Carbon bubble' is a term used to describe over-inflation of the value of carbon or fossil fuel based assets, based on the assumption that all fossil fuel reserves can be burned.

In 2011, a 'Carbon Tracker' report "showed that based on current understanding of an allowable carbon budget to keep below two degrees of global warming, there is more fossil fuel listed on the world's capital markets than can be burned." [90] To stay below two degrees of warming, in line with international agreements, the report concluded that 60-80% of current carbon assets cannot be burned. If only 20% can be burned to avoid catastrophic climate change, fossil fuel based assets (such as oil, gas and coal) are said to be overinflated in value - creating a growing carbon bubble.

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A House of Commons' Committee report[92] published in March this year warned that the carbon bubble poses a serious threat to the UK economy. A report on the impact of the carbon bubble on the EU financial system was produced in February 2014, suggesting that if the carbon bubble "pops" it could "create a carbon shock with severe consequences for our financial system."[93]

Please include your name, organisation and contact details.

1. Are you aware of the concept of the 'carbon bubble'?
a. Unaware of it
b. Heard of it but do not know much about it
c. Know about it but do not consider it a risk to Scotland
d. Know about it and consider it may be a risk to Scotland
e. Don't know

2. Do you consider the carbon bubble a risk to Scotland's economy?
a. If yes, how have you assessed the risk and what measures do you think need to be put in place to mitigate the risk?
b. If no, can you explain why you do not consider the carbon bubble a risk?

3. Have any of your contacts or constituents raised the issue of the carbon bubble with you in relation to your work or their finances/investments/pensions?

4. If a carbon bubble has not been considered as a risk, is there a reason why not?

5. Would you like to make any further comments?

Thank you very much for all your responses. The report considering the risk of a carbon bubble to Scotland, for Scottish Environment LINK, will be published on www.scotlink.org during the summer.

[90] **Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?** Carbon Tracker Initiative (2011) http://www.carbontracker.org/site/carbonbubble
[91] **Unburnable Carbon 2013: Wasted capital and stranded assets** Carbon Tracker Initiative 2013 http://www.carbontracker.org/site/wastedcapital
[92] **Green Finance** House of Commons Environmental Audit Committee Report Published March 2014 http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/191/191.pdf
[93] **The Price of Doing too little too late,** T**he impact of the carbon bubble on the EU financial system.** Green European Foundation (2014). http://greennewdeal.eu/green-economy/publications/2011/carbon-bubble-the-price-of-doing-too-little-too-late.html

Annex 4: Response from Scottish Government: 3 July 2014

From the Energy and Climate Change Directorate (Electricity Division)

"Thank you for your email for the attention of the Cabinet Secretary for Finance, Employment and Sustainable Growth, regarding the carbon bubble and Scotland. However it is not appropriate for Scottish Ministers to respond to surveys.

In Scotland, we will need a mixed energy portfolio, including hydrocarbons, to provide secure and affordable heat and electricity for decades to come. As we increase our use of renewable energy sources, we also have a duty to minimise carbon emissions in line with our world-leading climate change targets.

The Scottish Government supports the transition to low carbon and renewables. Scotland already generates 39% of its equivalent electricity needs from renewables and our ambition is to deliver the equivalent of at least 100% of gross electricity from renewables by 2020. Scotland leads the EU-15 on emissions reductions.

Hydrocarbon rich countries such as Scotland, Norway and Denmark certainly have an obligation – both moral and of economic opportunity – to lead the way to a low carbon economy. The skills and expertise that we have in our offshore oil and gas industry is crucial to mobilising low carbon technologies.

Our approach is one of careful stewardship of finite resources. In Scotland we need a diverse and balanced energy portfolio to provide us with secure and affordable heat and electricity for decades to come. We are also championing carbon capture and storage (CCS), CCS is a critical technology and component in the de-carbonisation of Scotland – and Europe's energy supplies.

I hope that this information is helpful to you."

Scottish Environment LINK is the forum for Scotland's voluntary environment community, with over 35 member bodies representing a broad spectrum of environmental interests with the common goal of contributing to a more environmentally sustainable society.

Its member bodies represent a wide community of environmental interest, sharing the common goal of contributing to a more sustainable society. LINK provides a forum for these organizations, enabling informed debate, assisting co-operation within the voluntary sector, and acting as a strong voice for this community in communications with decision-makers in Government and its agencies, Parliaments, the civic sector, the media and with the public.

Acting at local, national and international levels, LINK aims to ensure that the environmental community participates in the development of policy and legislation affecting Scotland.

LINK works mainly through Taskforces – groups of members working together on topics of mutual interest, exploring the issues and developing advocacy to promote sustainable development, respecting environmental limits.

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Froglife Trust (Scotland)

Friends of the Earth Scotland

WWF Scotland

RSPB Scotland

Marine Conservation Society

The names of further members supporting the publication of this report will be added to the LINK website as their internal procedures allow.