Chapter 9
Valuation Challenges in Stranded Asset Scenarios:
A Risk Discourse of Evidence From the UK

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ABSTRACT

This chapter investigates the challenges faced by sell-side analysts in engaging with companies with material stranded assets through the lens of Becksian risk society theory. The research unravels the usefulness of sustainability reports in deriving the intrinsic value of energy companies in the UK, and whether they take Environmental Social and Governance (ESG) factors into consideration in doing so. Qualitative data were collected via dual methods comprising longitudinal participant observation at IR meetings and interview of sell-side analysts and institutional shareholder. Findings indicate dissatisfaction with the existing risk reporting system is a key factor in divestment decisions and asset stranding. The growing Responsible Investment (RI) awareness notwithstanding, the inadequate risk reporting system continues to represent a major source of agitation amongst shareholders and analysts, making the overhaul of the current financial reporting system inevitable.

INTRODUCTION

Some of the world's most valuable and powerful companies, that is energy companies, have a huge problem that may either reduce their intrinsic future value due to the risks and uncertainties attached to their future cash slows, or make the shares to be totally worthless. These companies have substantial billions of dollars' worth of proved reserves made up of coal oil and gas under the heading of 'unsold inventories' in their balance sheets. Owning much of these reserves is the source of massive power and high market

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value[1]. Power derives from the incidence of the existent 'global technological society' where essentials of such as food, commerce, communication, transportation and industry are driven by these energy mix, whilst their value derives from the intrinsic valuation (commonly based on the present value of future cash flows arising from the sale of energy products). In 2018, $2 trillion in global annual revenue was generated by upstream (exploration and drilling activities) energy companies, and the sector generates up to $90 billion in GDP, representing up to 3% of the global economy[2]. In recent times however, the declining value of these companies has become a source of worry to institutional investors because the future returns accruable to the beneficiaries of institutional investments are linked to the ability of the investee companies to generate future cash flows which is reflected in their respective market capitalisation. As at August 2019, market capitalisation of the top 20 of the world's energy companies is worth $1.7 trillion which reflects a 55% cumulative decline when compared with the highest value ever attained (see table 1). Literature reveals that the declining value is traceable to factors such as stigmatization by environmental campaigners, legislative uncertainties multiple compression arising from weakness in corporate governance, and divergence in the basis for valuation in the investment community. Recent empirical evidence has shown that stigmatisation can influence compression in trading volumes whereby a misalignment exists between ability to generate future cash flow and intrinsic value. For instance, Rosneft produces 2.3 million barrels per day, which is slightly more than ExxonMobil. However, Rosneft is valued at roughly 18% of the value of ExxonMobil. The problem of uncertainty about the future, and the problem of environmental risks have called into question, the validity of the Gordons growth model used in estimating over or undervaluation of shares (Cho, 1988). These uncertainties may lead to lower intrinsic valuation of equities in these companies due to greater worries about their ability to generate future cash flows, or in worst case scenario, inability to finance new projects leading and the inability to generate fresh working capital, therefore making it impossible to continue as a going concern.

Two puzzling problems that have arisen therefore, are the challenge of how to access ESG risk information that would assist equity shareholders and their sell-side analysis analysts in making valuation decisions, and how to quantify them in the valuation of equity shares. Traditionally, business valuation methods such as the capitalisation of future income, asset based, and market-based approaches have been used (Pratt, 2008, Damodaran, 2005). Currently ESG risk information are available on historical basis through the annual publication of sustainability reports which the shareholders and analysts find inadequate. This research is therefore interested in investigating the basis for arriving at risk information for decision making when trading in equity shares.

RESEARCH IN CONTEXT

Stranded Assets

Energy derived from fossil fuel have been fingered in various scientific reports as being a chief source of global warming, and that their continual use would make the earth to be susceptible to catastrophic climate change that may cost trillions of dollars in environmental damages. In order to prevent the occurrence of this environmental damages, these reserves would have to be discarded, which means that they would be 'stranded' in the ground, leading to material diminution in the value of these companies. It is estimated that adherence to the Paris Agreement (2015) adopted as a legal framework by the United Nations Framework Convention on Climate Change (UNFCCC) means that half of all known gas reserves,

Table 1. Market capitalisation of the world top 20 energy companies (in billions of dollars)

Company	Aug 2019	Aug 2017	Highest historical value and date	
Exxon Mobil	286.3	342.1	519.3	October 2007
British Petroleum	125.11	113.6	263.3	May 2006
Chevron Corporation	221.79	197.7	256.1	July 2014
CNOOC	63.85	48.9	120.9	April 2011
ConocoPhillips	57.67	54.4	112.6	June 2008
Eni	53.75	54.6	152.4	May 2008
Enterprise Products	61.77	58	77.2	May 2008
EOG Resources	42.12	52.3	64.5	June 2014
Equinor ASA	56.34	53.6	135.3	May 2008
Halliburton	15.77	37.1	63	July 2014
Kinder Morgan	45.86	42.8	96.5	April 2015
Occidental Petroleum Corporation	38.56	45.8	90.3	May 2011
Petrobras	85.31	52.1	329.9	May 2008
PetroChina	87.81	112.2	472.1	October 2007
Phillips 66	43.14	42.7	50	November 2015
Royal Dutch Shell	223.57	218.7	458.6	January 2013
Schlumberger	43.73	91.5	153.4	June 2014
Sinopec	3.048	95.16	131.2	October 2007
Suncor Energy	44.39	48.7	74.9	March 2011
Total	127.47	121.2	201.1	May 2008
Aggregate	**1727.358**	**1883.16**	**3822.6**	

Source: Researcher's findings.

a third of all known oil reserves and 80% of all known coal reserves will have to stay in the ground. This fear has been further exacerbated by the plan by the EU to be carbon-neutral by 2050. If all these reserves have to stay in the ground, then they would become worthless. Worthless inventories mean the companies would also be worthless except they diversify their portfolio of energy products away from these environmentally-damaging products. This is why economists are beginning to call these worthless reserves "stranded assets." It means that the more these companies discover new reserves of oil, coal or gas, the more they are adding to the stranded assets to their books. It is expected that when economic agents eventually realise the intrinsic value of these assets, the market price of these energy companies is expected to be hit, making the value to go up in smoke. If this carbon bubble scenario plays out as expected, then it is likely to cause premature write-off of equities held in investee companies held by institutional investors, with implications for the realisation of future pensions and other attendant social costs.

The latest analyses (IPCC, 2019; IISD, 2018) suggests that in order to meet the global emissions target of not more than 2^{o} rise in atmospheric temperature, emissions need to remain within the carbon budget of 500 – 900 Giga tons CO_2 by 2050, which is far less than what would be emitted if all the all the worlds current oil coal and gas reserves are burned (that is 2,860 Giga tons), resulting in higher

atmospheric temperature. Except there is an accelerate development and deployment of carbon capture technology, the effect would be catastrophic on the environment. New research by carbon tracker shows that just the reserves owned by companies listed on the stock exchanges contain enough carbon to create more than 762 Giga tons of CO_2 and those companies are currently spending $764 billion annually to find yet more reserves. If carbon limits are enforced in the future, then less fuel would be consumed and reserves would become 'stranded assets' which would no longer provide financial returns. If the trend continues, listed companies alone would cause more global warming than all other economic agents.

Another latest research depicts a gory picture. Pfeiffer et al., (2018) took stock of the embodied emissions of all the fleets of power plants installed all over the world (coal, gas, fossil fuel plants). Considering their age, running efficiency, utilisation factor, and anticipated emissions, they are expected to generate 300 $GtCO_2$. This is a problem because in order to achieve the Paris goals of 2°C above the pre-industrial levels, we have a budget 300 $GtCO_2$. This is 60 $GtCO_2$ over budget. In addition to this, there is $7trillion of potential new spent on new plants most of them in Asia, that would be additional 270 $GtCO_2$. That leaves us with a dilemma. Either we build those plants and then we shut down the existing ones, or we install carbon capture storage which is expensive. Or we give up on the climate change goals.

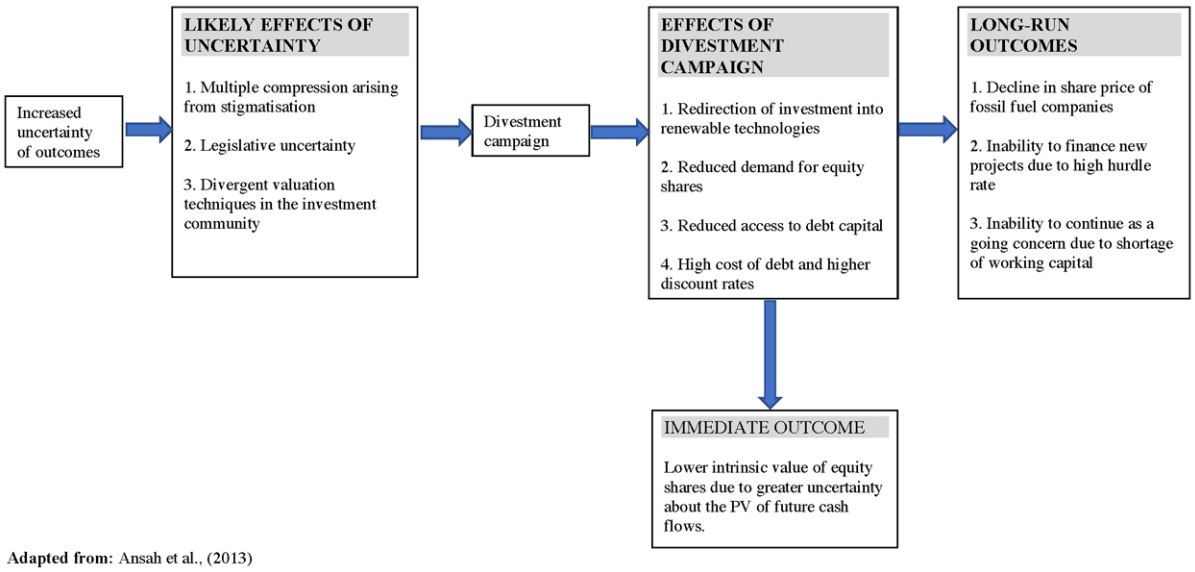
However, in the event of strict adherence to Paris Agreement, it will mean that the amount of gases that we can emit would have to be limited as well as the amount of fossil fuel that we can burn. Therefore, the fossil fuel and coal and gas would have to stay in the ground. All these infrastructures being built to extract them would be stranded. There would be economic and social implications if this happens. There are a few countries that rely on these energy sources as the main means of generating revenue, that is, poor countries like Libya, Venezuela, and Nigeria. These places would have to adapt quickly to reduce social upheavals. Another implication is that it would tear a material hole in public budgets which means that governments would have to do more to compensate for the hole in the overall economy.

Previous evidence from practitioners show that divestment for achieving social purposes is not totally new. History has shown that such trend is not new. For instance, there was a wave of divestment in the 70s and 80s against companies based in South Africa as well as tobacco companies too. However, the current wave of divestment against environmentally damaging companies became rife in 2015 after the Paris Agreement (2015) was signed. For instance, a coalition of institutional investors known as 350.org was formed around the same time to influence institutional investors' freezing of fresh investments in fossil fuel companies in the short term, as well as total divestment from them in the long term (Ansar et al., 2013). In the same vein, Caldecott et al., (2018) have traced the occurrence of stranded asset problem to the natural consequence of the creative destruction which usually typify capitalism. For instance, Metcalfe (2002) demonstrated that the underlying impulse that keeps the engine of capitalism rolling comes from continuous innovation which invariably leads to the demise of the old ones.

Theory of Risk in Valuation

A significant role was played by Beck (1992, 1997) and Giddens (1990, 1991) in deepening our understanding of the sociology of risk in the post-industrial era, especially as it relates to the risks pertaining to environmental risks pertaining to the holding of long-term investment through the concepts of manufactured risks and trusts, which are subsets of the risk society theory. The risk society theory holds that modern society would be preoccupied with the future which generates the notion of risks and how they would be managed (Giddens and Pierson 1998, p209). According to Giddens, risk society springs from the growth of science and technology which is consequences of modernisation. Giddens carefully

Figure 1. Potential impact of stranded assets divestment campaign
Adapted from: *Ansah et al., (2013)*



Adapted from: Ansah et al., (2013)

Table 2. Typology of Environmental-related risk

SET	SUBSET
Environmental change	Climate change; natural capital depletion, degradation; biodiversity loss and decreasing species richness; air, land and water contamination; habitat loss; freshwater availability.
Resource landscapes	Price and availability of different resources such as oil and gas, coal and other minerals and metals; e.g. shale gas revolution, phosphate availability, and rate earth metals.
Government regulations	Carbon pricing (via taxes and trading schemes) subsidy regimes (e.g. for fuels and renewables); air pollution regulation; voluntary and compulsory disclosure requirements; changing liability regimes and stricter licence conditions for operation; the 'carbon bubble' and international climate policy.
Technological change	Falling clean technology costs (e.g. solar PV, onshore wind); disruptive technologies; GMO; and electric vehicles.
Social norms and consumer behaviour	Fossil fuel divestment campaign; product labelling and certification schemes; and changing consumer preferences.
Litigation and statutory interpretations	Carbon liability; litigation; damages; and changes in the way existing laws are applied or interpreted.

Source: Researcher's findings

distinguished between 'external risks' which are insurable traditional risks that typified the Middle Ages, and the 'manufactured uninsurable risks' of the modern era. Giddens opined that in the middle ages, social actors fear the losses that the environment could exact on them, whereas in the modern era, social entities are known to exact damages on the environment (1990). The features of the risk society environment include rapid changes in society whereby reforms would almost always lag behind these changes in what Giddens refer to as the juggernaut of modernity (1990). Risk society is characterised by organised irresponsibility (Beck 1994) whereby the social actors who created societal risks are not penalised or held to account due to misalignment in social structures and inability of the law and social

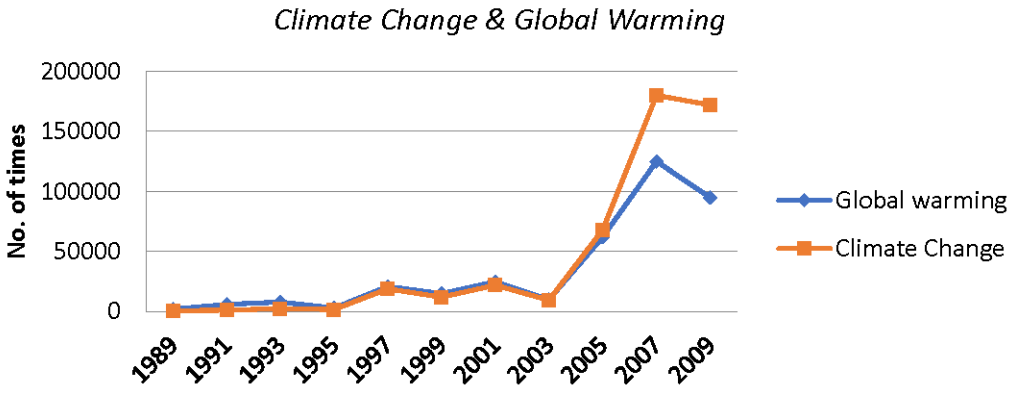
order to quickly capture and effect changes. These rapid changes would therefore influence the development of responsibility culture to reduce the incidence of manufactured risk whereby social actors try to differentiate between products or services that carry low elements of uninsurable risks and the others which do not (Giddens 1998, p8). The prevalence of science and technology and the media also increases reflexive risk thinking attitude whereby social agents think about risk reduction or avoidance, and even when all risks have been reduced, attention would be paid to the existence of residual risks (Beck, 1992). In risk society new scientific discoveries will not solve risk problems, but rather exacerbate it because, the more new scientific products are developed, the more society is enmeshed in reflexive risk orientation. The reflexive attitude to risks leads to politics of risks whereby more politics would originate from non-political actors. For instance, each time a product or service is developed, it is backed up politically through effective debate mechanism (Bernstein, 1996). Becks noted that social entities that adopts a 'precautionary principle' as a means of avoiding the politics of risks is likely to burin its fingers when the risk results into actual losses (Beck, 1994). Unfortunately, the risk society is a direct changeover to a new modernity, which means that there is no prior experience for social entities to leverage on.

The above concept of manufactured risks partly explains the reason behind the multiple compression and the stigmatization phenomena that had triggered divestment in the investment community. Unlike the 'external risks', the 'uninsurable manufactured risks' are dynamic, unpredictable and unquantifiable, thereby necessitating the clarification of the concept of trust in a risk society. Trust is central to the issue of valuation of equities as it functions based on the interplay of market forces which social entities rely on without questioning. There is a negative correlation between risk and trust, such that trust reduces when risk increases and vice versa (see Giddens 1990; Ekberg, 2007). There is proliferation of knowledge in risk society. The more new knowledge which invalidates the old ones become available, the more social entities are put on enquiry thereby weakening the level of trust in the system. Since there are no insurance against 'manufactured risks', re-embedding mechanism was suggested by Giddens (1991) as a means of restoring trust in abstract systems which may fail as a result of proliferation of knowledge in risk society. One of such re-embedding mechanisms that had evolved in recent times is the growth of the responsible investment (RI) logic which is premised on long-term ownership, stakeholder perspective, and the consideration of Environmental Social and Governance in appraising institutional investment. Some of the RI embedding mechanisms include divestment from environmentally damaging companies (negative screening), publication of sustainability reports (SR) which is enables shareholders to appraise risks inherent in their investment, and the use of investors' relations (IR) meetings which is an engagement method whereby shareholders are able to meet with management to discuss issues affecting future profits, liquidity and strategy of the company.

Risk Reporting

Conventionally, the published financial report serves as a useful source for the valuation decision-making for analysts and shareholders alike (Gniewosz, 1990). However, they suffer from the inherent limitation of being historical in nature thereby making them limited for projecting into the future, especially when the business operates in a dynamic environment. Nevertheless, many researchers have argued for a radical rethinking of the stewardship perspective upon which the periodic financial reporting is based, so that a new accountability reporting system that takes the views of stakeholders into consideration can become the mainstream (Adam, 2006, Gray et al, 2004). This call has become pertinent due to the awareness of the need to price environmental damages and potential risks emanating therefrom, into

Figure 2. Increasing incidence of environmentalism in reporting (1989-2009)
SOURCE: *Eccles and Krzuz, 2010*



long-term decision-making. This need to ensure *financialisation* of environmental costs in estimating future cash flows has been intensified by researchers who have taken philosophical views which is either deep ecocentric (Rimmel and Jonall, 2013) or anthropocentric (Jones and Solomon, 2013) views on how such accountability reports should look like, especially as the effect of climate change which has cascaded into the consideration of biodiversity, health and going concern fears (Atkins and Maroun, 2018). Figure 2 below shows the increasing importance of environmental risks through the frequency in the use if 'climate change' and 'global warming' from 1989 to 2009, based on publications contained in the Dow Jones Factiva database. These inadequacies in financial reporting have influenced analysts and shareholders to evolve new ways of appraising risks by users of such financial information.

The above inadequacies in financial reporting have influenced analysts and shareholders to evolve new ways of appraising risks by users of such financial information. This research attempts to document the methods used by analysts and shareholders alike in appraising ESG risks in investment. These noticed inadequacies in stewardship have been heightened in the energy and extractive sectors that rely on the use of natural resources for its survival. Since the establishment of the 'Triple Bottom Line' concept (see Elkington, 1997), there has been a noticeable growth in the reporting of the environmental issues to shareholders under various names such as 'CSR' report, 'sustainability reports' and so on, with academic community paying attention to how climate change is reported (Solomon and Darby, 2005), appropriateness of the reporting framework (Gray *et al.,*1996), and their effectiveness (Thomson, 2007) and their usefulness for valuation of stranded assets (Caldecott, 2014). Scientific reports (see IPCC, 2018; IEA2018, World Energy Outlook, 2018) have increased the awareness of the possibility of global warming having negative effect on the ability of extractive companies to generate future cash flows, leading to material diminution in the value of the companies' equity shares.

RESEARCH METHODOLOGY

What are the challenges being faced by sell-side analysts in engaging with companies with stranded assets? What are the bases for arriving at the risk information that they take into consideration in valuing equity shares? How can the existing sustainability reporting system be improved to provide the necessary

risk information useful for decision-making? Qualitative data were gathered from longitudinal participant observation at IR meetings and interview of institutional and individual shareholders. This is because valuation is not an exact science which is influenced by access to information and perception (Qu and Dumay, 2011). This work is rooted in interpretive philosophy with the risk society theory (See section 2 above) arrived at based on an inductive approach, and an epistemological premise that realism can be both learnt and self-created.

Longitudinal participant observation was obtained from Investors' Relations (IR) meetings attended in the UK over a 4 year period (2014 – 2017). The attendance at those meetings helped in developing a holistic understanding of the issues involved in issues driving valuation and how it affects shareholders, given that these shareholders are interested in information that would aid them in arriving at buy, sell or hold decisions (DeWalt and DeWalt, 2002). Thirty-three persons were interviewed in total, made up of 20 Individual shareholders and 13 institutional shareholders comprising of 7 pension Funds trustees, 2 hedge funds owners, 2 Sovereign Wealth Funds trustees, and 2 faith-based investors. The interview was both and phenomenological in nature as it helped in confirming or refuting already

These two sources provided us with rich data that helped us to arrive at a balanced picture of the issues involved in risk affecting valuation of shares. This also helped us in cross-checking the authenticity of data coming from diverse sources. This is because a shareholder may say something and do another not related to what had been said (see Arnould and Wallendorf, 1994). All the interviews took place on telephone between 2014 and 2018, and the interview duration was average of 15 minutes each. All the interviewees' anonymity was guaranteed in order to ensure that they are free from bias. The interview was recorded, transcribed and coded via 'NVIVO', before the themes were generated (see Guest *et al,* 2012; and Braun and Clark, 2006).

Table 3. List of interviewees (institutional investors)

Code	Interviewee's position in Pension Fund	Interview duration (minutes)
PF1	Investor Relations Manager	18
PF2	Chief Executive	19
PF3	Head of Finance & Investment	27
PF4	Compliance Manager	29
PF5	Governance Manager	23
PF6	Finance Manager	23
PF7	Head of Finance	23
SWF1	Governance Manager	16
SWF2	Compliance Manager	25
HF1	Managing Director	12
HF2	Managing Director	8
FB1	Head of Investment	27
FB2	Head of Corporate Governance	32

Analysis of IR Meetings

As a member of a shareholders association based in the UK, this analysis is based on participatory observation of investors' relations meetings that took place in extractive companies meetings over a 4 year period, and the analysis of the questions put forward to senior management. The meeting duration is usually for 1.5 hours, made up of 30 minutes presentation by management and an hour for questions and answers. Table 4 shows the cumulative changes over time (CCOT) of shareholders' concerns in the extractive industries between 2014 and 2017. The need to develop new business strategy with reduced emphasis on fossil fuel was a major concern of the shareholders based on the number of questions asked at the IR meetings. However, there was a noticeable decline in the number of questions bothering on strategy from 2017 because the respective companies have started issuing 'Global Outlook' reports showing planned diversification from fossil fuel. For instance, BP plans to achieve 25% revenue from non-oil and gas sources from 2025. This is acceptable to many of the institutional investors, although the social activists and faith-based investors prefer an accelerated diversification.

Aside executive pay, the main ESG concern by shareholders based on questions raised at investors meetings are centred on the need for alternative business strategy and transparency. Traditionally the oil and gas companies in particular have expectations of future cash flows on the expectation that future demand for energy will continue to grow into the foreseeable future. In 2014, the quest for energy companies to diversify was based on the need to avoid disasters similar to the oil spillage which occurred in the Gulf of Mexico in April 2010, which negatively affected share prices and prevented dividend payment. In April 2000, some activist investors had filed a failed shareholder proposal at BP, calling for the stoppage of its planned offshore operations, and asking the company to divert the investment to renewable energy sources. This call was being re-echoed in every meeting, and then dominated questions being asked at investors meetings in 2015 and 2016. However, from 2017, there is a noticeable decline in the ESG concerns arising from business strategy as most of the corporations publish global outlook and sustainability reports indicating material diversification into renewables. For instance, BP plc plans to achieve 25% revenue from non-oil and gas sources from 2025. Nevertheless, the global outlook published by oil majors indicate that the oil and gas business model will remain strong till 2050 as fossil fuel demand will remain strong. Some shareholders believe that enough is not being done to limit temperatures to 2 degrees in fulfilment of the Paris Accord, and move away from low-carbon economy as new technologies in renewables may make their investment in oil and gas redundant sooner than 2040. This arrangement is acceptable to many of the institutional investors, although the social activists and faith-based investors prefer an accelerated diversification.

Questions bothering on transparency in reporting payments to foreign governments and communities was quite high in 2014, which was the time of passing the Act. Since then there has been a decline in the number of questions or concerns perhaps due to the satisfaction of the level of transparency resulting from the publication. Shareholders concerns bothered on the level of compliance expected, the level of inclusion of foreign operations, and the penalties for false declaration or non-compliance. Shareholders also demanded to know the level of compliance of the governments of the countries in which they operate, especially the ones where inadequate progress are being made with a view to divest from them. The ESG concerns of shareholders are now shifting to concerns around unreported embezzlements and bribes paid to government officials, undocumented payments to political parties, non-disclosure of the true beneficial owners, anti-money laundering activities, and the increasing poverty reported in oil producing countries, thereby threatening the 'social licence' or legitimacy of the companies. However,

directors are quick to point to the substantial CSR activities that they are engaged in within the local communities where they operate

Fears that anthropogenic rise in GHG attributed to fossil fuel is causing responsible investors to consider negative screening of their oil and gas portfolio. There were claims that almost 600 institutions companies with $3.4 trillion AUM have fully or partially negatively-screened away investments in oil and gas from their portfolios. Neo-Schumpeterian argument that investments are likely to follow the *kondratiev* wave as a result of the coming of age of an existing technological revolution partly explains the gradual stranding of oil and gas assets. There is a suggestion from published financial news, that the process is being accelerated by the planned governmental ban on fossil fuel vehicles between 2040 and 2050. As a direct consequence of the governmental action, all the major oil and gas companies are now projecting a decline in oil exploration and drilling after 2040, although they still project to continue oil exploration in developing jurisdictions thereafter because of expected surge in energy needs which is unlikely to be met via available energy supplies. After 2040, renewables are projected to represent on average, 25% of the world total energy mix which is considered insignificant to accelerate material stranding of oil and gas companies.

Justifications for Risk Reporting

Interview demonstrated growing need for the replacement of the existing reporting system. Based on the observation of the investors' relations meetings, it is clear that investors are dissatisfied with the existing sustainability reports, and they prefer to get a report which captures the risks on a real time, rather than historical basis.

…the sustainability reports are prepared on a boiler plate basis and therefore I waste my time reading it. Mind you, I am not saying that the concept of sustainability reporting is wrong. What I am saying is that the information that I need for active share ownership isn't present, and that is the reason why I come to this meeting, basically to plug the gap…. PF7

Table 4. Shareholders concerns in extractive industries based on the number of questions asked at IR meetings

Shareholder's concerns	2014	2015	2016	2017	CCOT	Typical management's response
Human rights abuse and combating poverty in the local host communities	8	8	4	4	-4	We invest in CSR including training the locals. We partner with civil societies for citizen engagement. We comply with all local laws.
Developing low carbon energy sources and change of business strategy	12	16	18	7	-5	Being addressed, albeit slower than shareholders expected.
Transparency in dealing with governments	8	6	6	5	-3	We support EITI initiative as it is the best way of achieving transparency in the industry.
Excessive pay, and non-linkage of executive pay to carbon emission and allied matters	4	6	7	14	+10	Reporting is sometimes in excess of governments requirements. Pay is linked to performance. We are significantly transforming the business risk, so specialist carbon expert at board level is unnecessary.

Source: researchers' findings

Table 5. Indicators to help assess a company's risk exposure to climate change

Metric	*Proxy for Climate Change Risk*	*Risk Type*	*Level of Exposure*
Proved oil and gas reserves as a proportion of total assets	Exposure to stranded assets	Business strategy risk	Company exposure
Fossil fuel business as a proportion of the total business	Exposure to stranded assets	Business strategy risk	Company exposure
Vulnerability to climate change of the countries in which the company operates	Exposure to acute and chronic weather	Physical exposure	Country exposure
Revenue arising from fossil fuel sales as a proportion of total revenue	Revenue vulnerability risks		Company exposure
Capital requirements from insurance exposure to weather-related catastrophic events as a percentage of total available capital	Insurance exposure to acute weather		
Exploration and drilling (non-current) assets as a proportion of total assets	Present value of assets exposed to the risk of diminution in value of proved oil/gas reserves		
Target for reducing CO_2 emissions in the countries where the oil and gas company operates	Risk of adverse of environmental tax or regulations	Regulatory and legal	Country exposure
Company's carbon footprint	Risk of adverse additional taxes or increased governmental scrutiny or regulations		Company exposure
Local litigation and governance activism culture	Compliance and reputational risk		Country exposure
Material non-compliance with major industry decarbonisation/sustainability initiatives	Reputational damage	Reputational risks	Company exposure
History of bad "green" publicity	Reputational damage		
Size (by assets)	Reputational damage (the bigger the company, the more likely it could be targeted by activists)		
Quality of disclosure	Transparency of climate change exposure	Regulatory and legal	

Source: Adapted from Petkov et al, (2016).

The above statement clearly shows that the investors are interested in SRs but the current reporting system does not meet their requirements. Preparing a real time SR will be expensive, but this demand is understandable in an age where technology has made it possible for reports to be available for viewing online.

….unfortunately it seems like management is not alive to their responsibility as far as adaptive strategy is concerned. I am not proposing that the close shop, but where is the evidence that this company would be around in 25-year time? We need hard evidence but it is shameful that despite the massive capital at their disposal, they are just playing ostrich like everyone else.

From interviews as well as meeting observations, it is obvious that investors are concerned with profits generated now, but more importantly, how future strategies are adapting to new business realities. However, such expectations are not being met as the report is lacks focus on strategy. For instance, a shareholder may be willing to hold equity if there are evidence of diversification thus:

I am delighted to hear today that BP is actively diversifying into renewable such that a quarter of annual profits earned in 7 years' time would be derived from renewables.

Some shareholders believe that SR are inadequate but then, because they are institutional shareholders, they can always obtain the information that guides them for decision-making from other sources from within or outside of the company, whilst others believe that the current reporting system is outdated:

...we do not need such reports (SR) since we can obtain information relating to strategy from other sources. HF2

….information that guides us on whether to buy or sell these shares are no longer available from annual reports, but from newspapers and social media. That ought to be addressed otherwise the accounting and auditing profession would lose their credibility. FB1

Generally, it was noted from these meetings and interviews, that individual shareholders and faith based activist investors desire SR more that the institutional shareholders because they see it as the only way by which they could gauge the strategy and value of the investee company. The desire for more information is indicative of the reduced reliance on historical information which may not be indicative of future performance due to the prevalence of heightened manufactured risks and reduced risks. This view is re-echoed by King and Atkins (2016) thus:

By focusing only on the financial statements, the CFO and the user are ignoring important information about the business of the company. Without the company's long-term strategy being disclosed and showing that the sustainability issues material to the business of the company have been embedded into its strategy, the decision of investing in the equity of that company by just relying on earnings is an uninformed one. (p97)

Three distinct issues became clear from the above. Firstly, there is a dissatisfaction with the existing reporting system. Some shareholders are wary of the sustainability report which is not certified by the auditors, and its 'boiler plate' nature. This calls for the rethinking of the existing reporting system and the training being offered to accountants that prepare and certifies these reports. Arising from the inadequacy of the sustainability is the drive to access risk information by shareholders. Interview data suggests that individual, faith based and social activist shareholders can access relevant risk information from IR meetings from questions asked at such meetings. However, the other institutional investors believe that they can access such information from their representatives on the board. Thirdly is that the shareholders desire a risk reporting system which meets today's requirement of being available online and real time.

Interview data confirms the Giddens (1990) hypothesis on the inverse relationship existing between risk and trust, especially in an environment typified by proliferation of risk knowledge. The narrative nature of the sustainability report makes shareholders to directly juxtapose the information supplied to them via sustainability reports with what they obtain from other sources especially on biodiversity and climate change. As climate change is an uncharted territory for humanity, seeming "organised irresponsibility" and the use of "precautionary principle" of doing nothing is likely to be prevalent (Beck, 1994), making shareholders themselves to develop re-embedding mechanisms such as responsible investment behaviour, which includes divestment from stranded assets.

Discounting Future Cash Flows

Given the concerns of shareholders for diversification from stranded assets based on evidence from IR meetings (see section 6.1), and the growing urge for risk reporting (see section 6.2), it is pertinent that we discuss the effects of the options of the various applicable discount rates on the capitalisation of future projected income from stranded assets. Should we set zero discount rate, constant discount rate or variable rate? From existing literature, setting zero discount rates rate is applicable where economic agents postpone their immediate benefits for the use of future generations by making sacrifices now, which increases future cash flows. For instance engaging in afforestation or developing technology to absorb atmospheric carbon. Under such scenario, zero discounting may be applicable to future economic benefits due to the expectations that they would yield higher PV than the current cash flows (see Maddison, 2001; Lopez et al, 2006). Setting such discount rate is unacceptable as the empirical evidence (see table 1) shows a downward trend in market capitalisation, which evidences decline in underlying future cash flows, and there are no strong evidence of oil and gas companies developing carbon-capture technology. Setting a constant discount rate is equally objectionable in the valuation of income from stranded assets due to the uncertainties attached to the future income.

As a result of the non-plausibility of the discount rate mentioned above, we considered upward discounting of future cash flows whereby higher rates are applied to the cash flows as they approach the set date of the EU-wide ban 2050 and beyond. Since there is growing uncertainty about the future cash flows, some researchers (see Dasgupta, 2001; Pearce et al, 2003) have argued that decreasing weight ought to be attached to the cash flows as they approach 2050, indicating the need to increasing the applicable discount rates. These cash flows would accrue the future benefits minus the expected future payments which may include the *financialisation* of the effects of environmental degradation ($GtCO_2$ and other externalities such as health hazards) together with projected fines and penalties. This may also be applied side-by-side with alternative recommendations (see Gravelle and Smith, 2001; and Brouwer et al., 2005) that benefits accruing from such companies should be segmented and capitalised at different discount rates based on the vulnerability of such earnings to environmental damage. All these shows the effect of factoring the unmitigated 'manufactured risks' on negative outlook in the future of oil and gas industry. Estimating the environmental costs may be particularly problematic as there are no generally accepted metrics for the *financialisation* of ESG costs despite the noticeable rise in the number of ESG rating agencies such as Thompson Reuters, FTSE4GOOD, FTSE Russel, Sustainalytics.

The concept of stranded asset is challenging the traditional basis of valuation due to the availability of new knowledge about the existence of manufactured risks which is putting question mark on streams of future cash flows as well as the existence of material environmental costs which must now be taken into consideration. The misalignment of the risks and benefits on one hand, and the continuous application of previously known cash flow discounting model where the predictability of future cash flows have been altered, is likely to further push back the likelihood of finding a quick solution to the valuation problem, bearing in mind, the "juggernaut nature of modernity" (Giddens, 1990) which we continually experience.

DISCUSSION

The existing financial and sustainability reporting systems are inadequate in helping shareholders to play their actively. This inadequate reporting could be traced to misalignments in the social system which continually evolves, which Giddens (1990) compares to a "runaway engine of enormous power" (p. 139). It is expected that as society continues to evolve, there are likely to be even more changes in the social and financial systems, which makes the development of re-embedding mechanisms such as RI logic imperative. Some (Ramus and Montiel, 2005; KPMG, 2017) have suggested that the existing stewardship system as not supporting proper valuation because it is grounded in the short-termism philosophy, whilst Solomon et al (2013) and Bowen (2014) have noted that these short-term thinking are have egged on greenwashing and impression management rather that RI logic. Some Shareholder view attendance at IR meetings as conferring advantage on attendees as they are able to discuss strategy matters which are not available to the general public. The concern is that by so doing, they can use the information acquired to engage in insider dealings. It is also expected that the same level of detailed attention being paid to quarterly analysis of financial performance ought to be paid to the strategy issues being deliberated at IR meetings in order to generate more useful market information in the spirit of transparency and accountability.

Based on the above, there is a growing desire for risk reporting to replace the existing historical reporting system which places emphasis on past performance and profits rather than the ability of a business to generate future cash flows. Concerns for future expectations are much more now than in the past due to uncertainties attached to the future of the companies in the extractive sector. If this need is sustained, it means that the future of financial and sustainability report is uncertain, as this would also have implications for the training of professional accountants. King and Solomon (2016) have therefore called for the restructuring of the training education being offered to accountants in view of the changing environment. IR meetings showed a divergence between the need of the shareholder and those of the directors. Whilst the directors are interested in stewardship, the shareholders are forward-looking, interested in appraising the effect of the environment on the future value of the firm. This agrees with some views (Adam, 2004; Gray, 2006) stressing the need for an overhaul of the existing reporting system, and the need for new innovative and imaginative ideas where ESG reporting can serve as a proxy for risk management. For instance, biodiversity reporting is a relatively new development, calls are being made to include material biodiversity costs in the annual reports of companies (see Rimmel and Jonall, 2013; Atkins *et al.,* 2015). The usual response from directors of these companies is that there are no accounting standards on this, and that it imposes additional costs on the reporting entity. Nevertheless, the quest for going concern information in this area may quickly transform the reporting landscape in the near future.

Some of the recent developments, like the TCFD has put forward some recommendations for improving climate related disclosures in sustainability reports, whether they be quantitative or qualitative. Again, these disclosures are meant to be voluntary, and they cover issuance of two core disclosures: climate related financial disclosures and climate related scenarios. The climate related financial disclosures cover elements of core ESG issues namely risk management, strategy, governance and KPIs, whilst the scenario report addresses the organisation's climate resilience strategies. They are also recommending scenario analysis that enables companies to think about the future as per climate change with range of outcomes since the effect of climate change is uncertain. The TCFD scenario analysis is similar in concept to the 'what if' model developed by Petkov *et al,* (2016) to report climate change risks indicators. These reports are meant to help investors understand how the organisation assess risks and opportuni-

ties relating to climate change. This is likely to help investors to appraise the resilience build into their portfolio. These two reports are also in tandem with Integrated Reporting <IR> which views capital from an accountability rather than a stewardship point of view. In addition, <IR> do not adequately connect financial reporting and environmental risks (Atkins *et al.,* 2015; Carels *et al.,* 2014; Solomon and Maroun, 2012) as there is no incentives for the monetisation of environmental costs. Comparatively, the UK fares better than other jurisdictions in the quest to meet the TCFD requirements, although only four out of seven requirements have been met to date (see table 10.2). However, again these does not meet all the four requirements listed above, especially the need to certify these reports independently by an auditor. In the IR meetings, investors have raised concerns over the non-certification of SRs, and this is confirmed via interviews of UKSA members in chapter 5. The accounting profession and the financial reporting regulators are sluggish in making narrative reporting or <IR> compulsory, which may frustrate any gains made through the TCFD initiative.

With climate change persistently appearing on the agenda of investors, information on the quality of income and assets based on the environmental risks is likely to continue to increase. Unfortunately, the existing accounting standards either on valuation, or the systematic writing off of assets over their economic useful lives, are inadequate as they do not foresee effects of climate change which is able to alter the value income or assets disproportionately. In recent times however, some organisations such as S&P Global Ratings have developed "management and Global" criteria for measuring ESG risks, although such universal criteria capturing income and assets exposure to ESG risks are yet to be applied in reporting by companies. All these are evidences of the transition that the accounting profession is in right now, and climate change is playing an important role.

This paper sets out to investigate the challenges being faced by sell-side analysts in engaging with companies with material stranded assets through the lens of *Becksian* risk society theory. The research seeks to unravel the usefulness of sustainability reports in deriving the intrinsic value of energy companies in the UK, and whether they take Environmental Social and Governance (ESG) factors into consideration in doing so. Qualitative data were collected via dual methods comprising longitudinal participant observation at IR meetings and interview of sell-side analysts. Findings indicate dissatisfaction with the existing risk reporting system is a key factor in divestment decisions and asset stranding. The growing Responsible Investment (RI) awareness notwithstanding, the inadequate risk reporting system continues to represent a major source of agitation amongst shareholders and analysts, making the overhaul of the current financial reporting system inevitable

RESEARCH IMPLICATIONS

This paper sets out to investigate the challenges being faced by sell-side analysts in engaging with companies with material stranded assets through the lens of *Becksian* risk society theory. We found that as the existing financial reporting system is found inadequate, investors are exhibiting adaptive tendencies by placing less reliance on the financial reports, and attending IR meetings in order to get the necessary information which are not disclosed in the financial and sustainability reports. The IR meetings are originally designed to discuss financial reports. However, an evolving trend whereby the issues being discussed in such meeting are much more of strategy and how to reduce going concern risks, have necessitated a proper documentation of the minutes of such meetings, and making them available to all shareholders in order to deepen the risk information available in the market place.

New developments in the field of financial reporting such as the integrated reporting system <IR> are not encompassing a very important information need for valuation, which is risk reporting, and sensitivity to environmental risks in an interactive basis. This will have implications for the future training of professional accounting professionals as well as the auditors. These are manifestations of a risk society where the issue of risk brings about reflexive modernisation. This research focused on the attitude of shareholders and sell-side analysts in the UK. However in order to develop this work further, it is proposed that future research may take a quantitative approach to measuring the effectiveness of the information gathered at IR meetings. Also, future researchers may underpin their work through another theory other than the risk society theory, and they may also apply other methodology other that participant observation at IR meetings as well as semi-structured interviews.

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ENDNOTES

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