CAPEX DEEP DIVE

INTEGRATING SOCIAL AND ENVIRONMENTAL FACTORS INTO CAPITAL INVESTMENT DECISION MAKING

A4S ACCOUNTING FOR SUSTAINABILITY

THE PRINCE OF WALES'S CHARITABLE FUND

CONTENTS

EXECUTIVE SUMMARY

Context

Current sustainability related trends are rendering traditional corporate finance techniques used for capital expenditure (capex) decisions at risk of no longer being fit for purpose. Capex decisions have a strategic role to play in the long term viability and competitive position of companies, given their generally long lifespan. But the world around those assets is changing: businesses are increasingly exposed to a variety of political, social, environmental and regulatory factors that can both create risk and opportunity. Traditional corporate finance techniques are increasingly insufficient, and new ways are evolving to capture and analyse the greater information needs of business to make effective capex decisions.

Purpose and approach

We have undertaken this study to examine these evolving methods, which integrate social and environmental factors into capex appraisals and decisions. We have also analysed the relevant drivers, barriers and outcomes associated with doing so. Eight companies were interviewed, two in each of the following sectors: power, property and construction, retail and consumer, and water. To protect commercial sensitivities, responses have all been anonymized.

Findings

The key drivers we identified relate primarily to financial factors, regulatory influence and market pressures. We found the combination of these external factors resonated with internal stakeholders in differing ways and inspired some of them to act, creating additional internal drivers and gaining momentum for change. These were evident through a mixture of leadership, personal passion and aligned company values.

We identified a wide variety of approaches. All analysed methods incorporated and built on traditional techniques, using Net Present Value (NPV), Internal Rate of Return (IRR) and/or payback in one way or another, with the most significant and common addition being the monetization of non financial factors into cost benefit analyses. Notably, there was general consensus that the methodologies developed are to inform decision making rather than to make decisions outright, that there is benefit to involving cross functional perspectives in these decisions and that the methodologies facilitate making the right decision.

Conclusion

The companies we interviewed have done much to incorporate social and environmental factors into their capex appraisals and decisions, reflecting the business case for them to do so. What has emerged within this, is that there seems to be a direction of travel. Companies which feel the drivers most acutely tend to have more sophisticated, integrated methodologies, and these are increasingly including monetization of non financial capitals and the use of technology.

Others are also starting to engage with both monetization and supporting technology, and we propose a case for them to incorporate further. This will allow capex decision making to reflect more holistically the environment in which the assets must operate, the impact they have and the capitals upon which they depend. However, for this to be successfully achieved, a level of standardization is needed to reduce the amount of time and resources required.

INTRODUCTION

Background

Capital expenditure (capex) decisions are generally ones with medium to long term implications. Assets can have useful economic life exceeding 20 years, and need to remain commercially viable as operating context changes.

Current sustainability related trends are receiving increasing social, economic and political focus which is putting the business environment under pressure. The risk and regulatory landscapes are changing, meaning the traditional corporate finance techniques used to support capex investment decisions are becoming outdated and at risk of no longer being fit for purpose.

The study seeks to provide insight into evolving methods which integrate social and environmental factors into capex appraisals and decisions as a means to address this.

This research was undertaken as an extension to the A4S Essential Guide to Capex, to consider how organizations are implementing the concepts contained in the original guide.

Research question

"How do relevant social and environmental factors get integrated into capital investment decision making processes in an effective way?"

Key objectives:

1. Identify if there are different methods used in practice and to analyse their differences and similarities.

2. Analyse what internal/external drivers have led to these methods being used, and why, considering a variety of situational and causal factors.

3. Analyse what barriers there have been and whether these have been overcome.

4. Analyse what outcomes are delivered through the different approaches.

5. Analyse how effective the different methods are, and why.

The A4S Essential Guide to Capex:
www.accountingforsutainability/capex

Report Structure

Methodology
This provides a description and explanation of the research approach, the selection of interviewees and areas of focus. This also describes the sample of companies and interviewees selected.

Results and analysis
This starts with findings from a word cloud analysis to give an initial context free view of the interview findings. Further analysis and discussion looks deeper into the drivers that companies are experiencing, the integrated methodologies they have developed, and how these are reflected in decision making. Challenges and barriers are analysed and discussed, as are the outcomes companies are achieving. There is reflection back to the methodologies noted in the literature review, with analysis of similarities and differences within the sample. Finally, there is a discussion on the trends noted, the likely reasons for these and the direction of travel for integrated capex appraisals and decisions.

Summary and conclusion
The research findings are summarised and concluded upon, with a discussion on limitations of the study and potential areas for future research.

The Author

This study was initially undertaken by **Helen Slinger**, Executive Director, A4S, as a submission in fulfilment of the dissertation requirements for the degree of Executive Masters of Business Administration at the University of Leeds. The original submission has been amended here to make it more accessible to a wider, non academic, finance audience.

METHODOLOGY

METHODOLOGY

Literature review

Initially, we performed a literature review to identify and analyse previous relevant research. This considered the business case for integrated capex appraisals, the key drivers involved, and reflected on traditional corporate finance techniques, reviewed evolving integrated methodologies and considered potential barriers to effective implementation.

Our review identified instances where traditional corporate finance techniques had been inadequate, leading to costly negative outcomes. We also found examples of several integrated capex appraisal methodologies, of which the following were most relevant to our research:

- Social and/or environmental impact assessments; or regional human rights assessments prior to investment approval (Epstein, 2008)
- A standard NPV method which incorporates monetary values for wider societal impacts (McDermott et al., 2002; Sartori et al., 2015)
- Multi criteria decision analysis (MCDA), using techniques such as the weighted sum method and the weighted product method (Pohekar and Ramachandran, 2004)
- Stakeholder consultation, strengthened by other techniques to support decision making in this arena such as interviews, qualitative and quantitative surveys, Q methodology (a method to study people's viewpoints) and SWOT analyses (Ribeiro et al., 2011)
- An extended cost benefit analysis approach that keeps each of the four capitals: economic, human, natural and social capital separate and measures each in a distinct non monetary unit. NPV is then calculated using a consistent discount rate across the capitals (Maack and Davidsdottir, 2015)
- An approach termed Net Present Sustainable Value (NPSV) which links the use of social and environmental resources back to a corporate's sustainability strategy and targets by extending the opportunity cost principle to both financial and non financial resources. This method requires a defined minimum rate of return for all relevant resources, based on the corporate's targets (Liesen et al., 2013)

There was no clear consensus on the 'best' method for decision making; judgement arises in all methods. In making these judgements though, McDermott et al. (2002) advised consulting cross functional teams.

We concluded that there is a business case for integrating social and environmental factors into capex appraisals and decisions, but noted that some barriers currently exist which may limit implementation, including access to capital to support the required investment.

The full literature review is available in Appendix 1.

Primary research

Following the literature review, the main research activities were to analyse a sample of capex appraisals and interview those who are responsible for them.

The population of companies that the sample was drawn from are those that can reasonably be expected to have integrated social and/or environmental factors into their capex appraisals, i.e. large, visibly sustainability conscious companies. This is because these are the companies that are most likely to recognize the benefits of doing so and have the resources to develop and implement appropriate methodologies.

Overview of sample

The sample of companies that were interviewed and analysed were drawn from this population to achieve a balanced mix of sectors (sufficient to allow a level of sector analysis).

Eight companies were selected for analysis in this study, with annual property, plant and equipment (PPE) capex spend ranging from £300m to £4.1bn, on a collective PPE asset base of over £90bn. All have significant operations in the UK, five of which operate almost exclusively in the UK. Five are listed on the London Stock Exchange, two have their primary listings on overseas stock exchanges and one is privately owned.

There are two companies from each of the following sectors: power, property and construction, retail and consumer, and water.

Interviewees

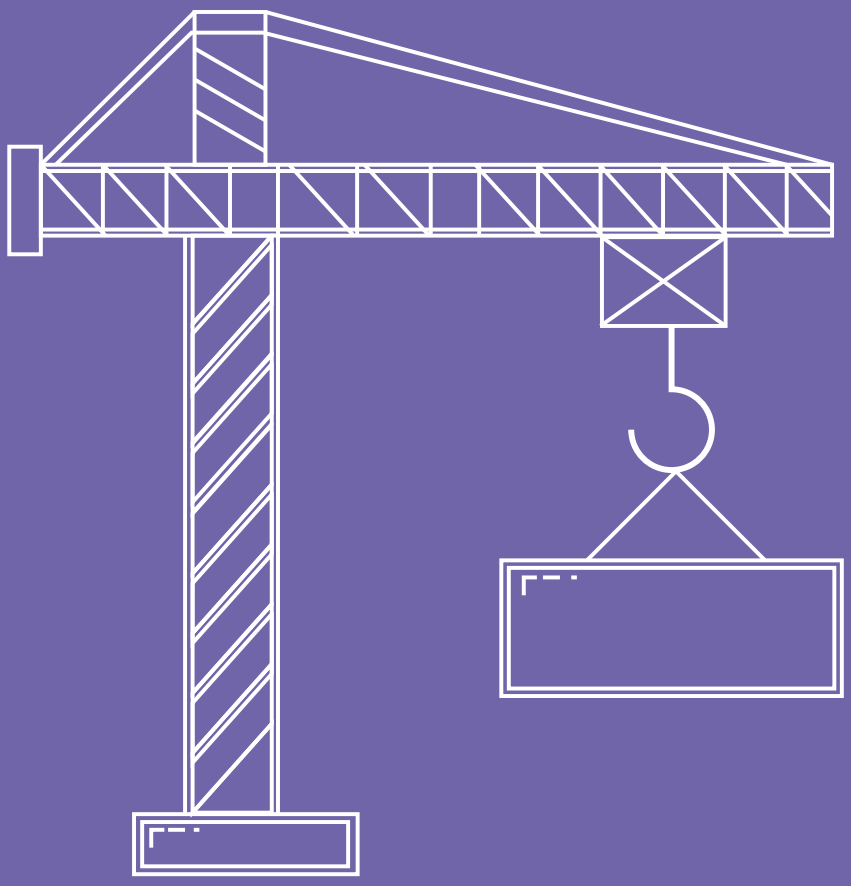
Each company was asked to provide the best person or people to speak to about how social and environmental factors are incorporated into capex appraisals and decisions, with an expectation that these would predominantly be finance professionals.

An initial point of note is the role of the interviewee(s) this approach presented. Two companies provided two interviewees to cover this description, the rest one interviewee, with the range of functional responsibility being finance, sustainability, asset management, operations and strategy. Despite capex appraisals historically being within the realm of the finance team, only four of the ten interviewed were finance professionals including one who is a “sustainability accountant”. Five had a sustainability element to their job title.

This functional variety reflects the range of skills that are required when social and environmental factors are incorporated into capex decisions, consistent with McDermott et al.’s (2002) recommendations. It also indicates that finance teams are not necessarily the driving force in the decision making process or in the analysis to support decisions. The role “sustainability accountant” suggests there is recognition that both professional level technical finance skills and sustainability knowledge and experience are necessary if sustainability factors are going to be adequately accounted for, and reflect the concept of wider stakeholder value.

Further details on the primary research approach can be found in Appendix 2.

RESULTS AND ANALYSIS



HIGH LEVEL RESULTS

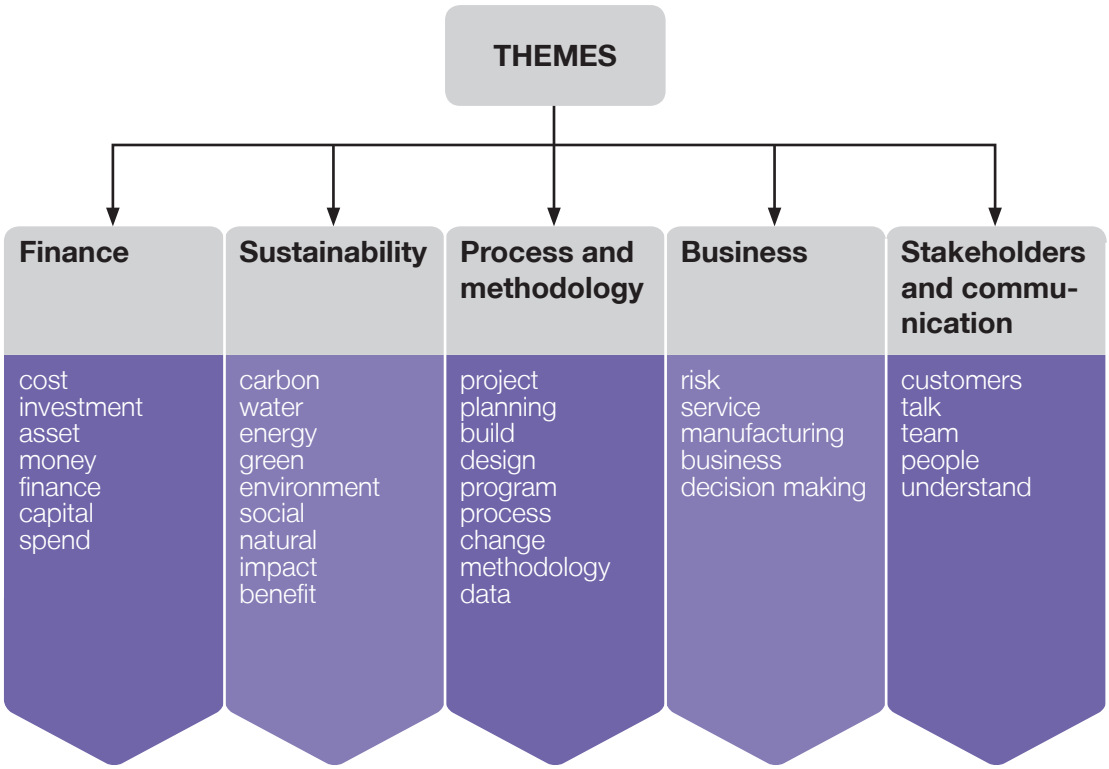
As anticipated, all companies interviewed incorporated some social and/or environmental factors into their capex appraisals and corresponding decisions. These varied significantly in terms of level of complexity, the factors that were considered and how and why they were incorporated. Similarities and differences in the methodologies, along with themes arising from analysis of drivers, influencing factors, barriers and outcomes are discussed here.

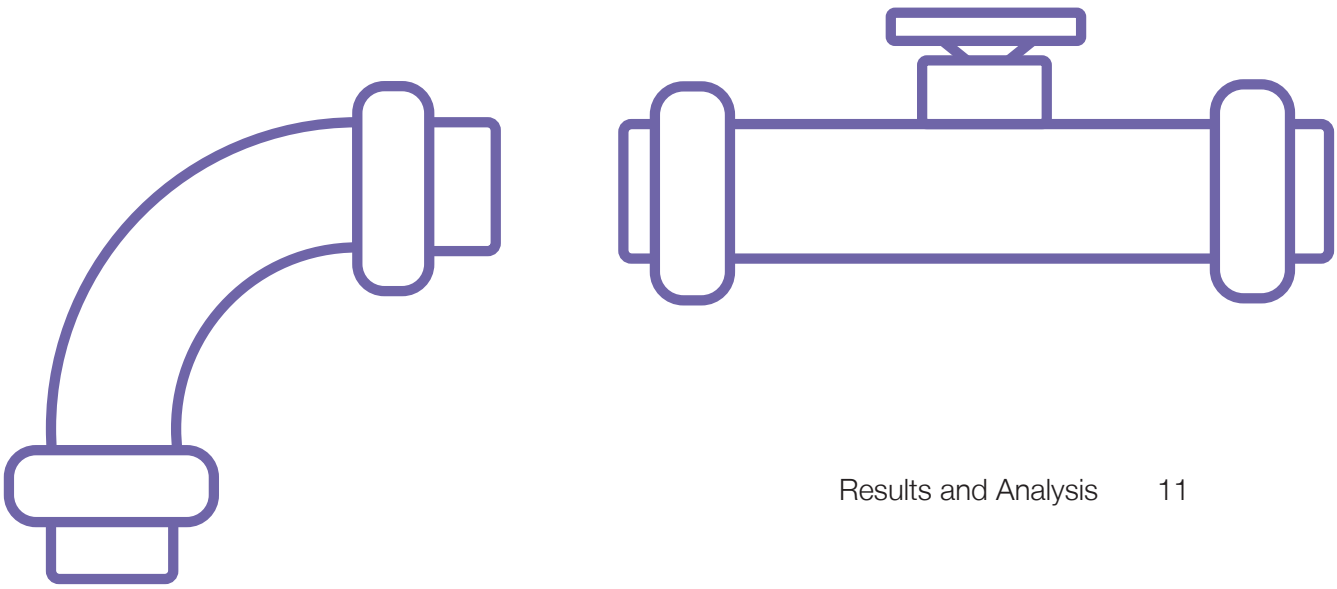
WORD CLOUD ANALYSIS

In order to give a high level indication of arising themes, a preliminary analysis was performed on the interviewees' responses – on the specific words they used to describe their approach. The word cloud constructed from all eight interviews is presented below. This gives a context free view of the interview responses. 'Cost' and 'project' have particular prominence, with 'carbon' and 'water' being the most widely discussed sustainability factors.

Word cloud from all interviews

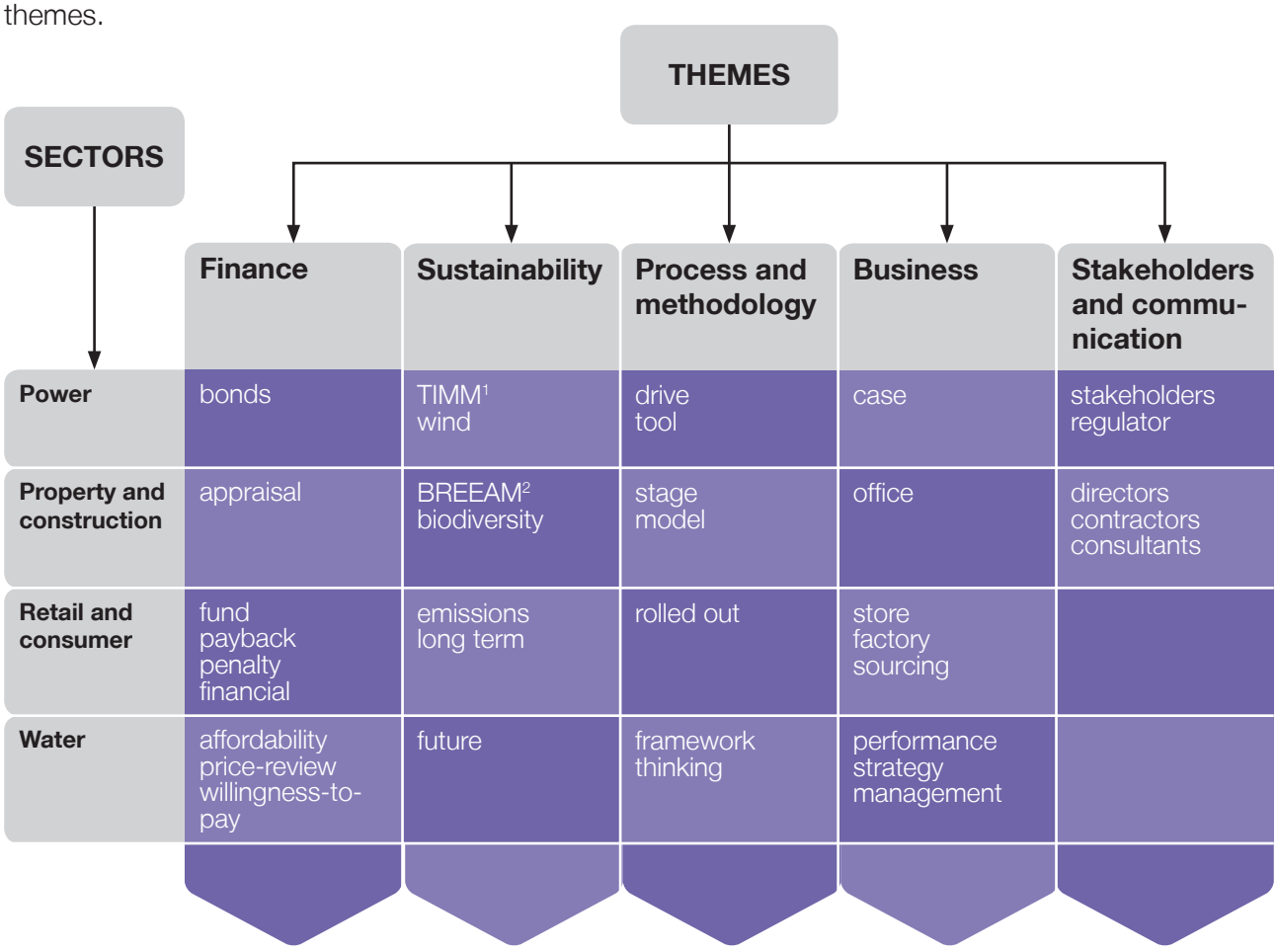
There appears to be five broad themes suggested by the word cloud, with the following words sitting within each theme.





Sector interviews

Word clouds for each of the four sectors interviewed are presented overleaf. The five themes continue to be evident for each of the sectors, with the addition/substitution of other words also linked to these themes.



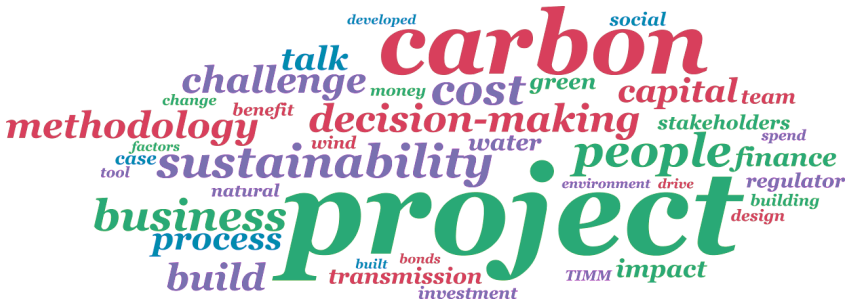
Several key observations were made in the analysis of these word clouds:

- There are several sector specific words arising, e.g. 'store', 'factory' and 'sourcing' in retail and consumer, and 'BREEAM' in property and construction that each have sector relevance for integrated capex appraisals.
- The terms currently categorized under finance in the water sector are all driven by regulator interventions and could arguably be categorised under stakeholders and communication. This potentially serves to indicate the need for finance skills in addressing regulatory needs. The relevance of the regulator is also evident in the power sector.
- The prominence of 'water' in the word clouds is partly due to two water companies being interviewed. However, 'water' also appears in all sector word clouds so has cross sector relevance.
- 'Risk' is prominent in the water sector interviews and consequently appears in the cross sector cloud. 'Opportunity' does not arise in any, suggesting perhaps that the focus is more on managing downside risk and strengthening resilience rather than capitalizing on opportunity.

[1] Total Impact Measurement and Management (TIMM) – a methodology to help decision makers consider the wider impact of their decisions (PwC, 2015)
[2] A sustainability assessment method for buildings (BRE, 2017)

Retail and consumer sector

Power sector

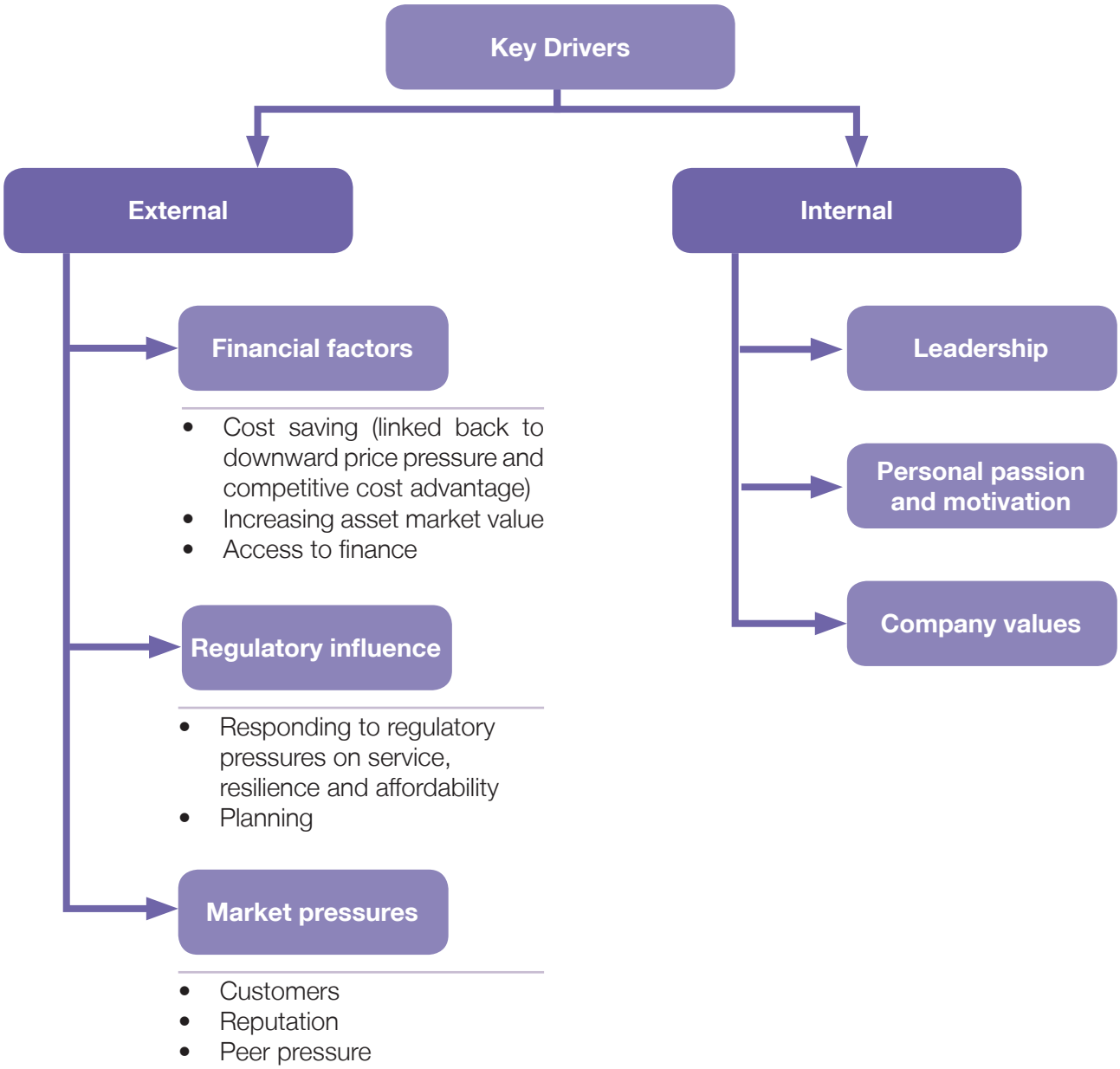


Water sector

Property and construction sector

DRIVERS AND INFLUENCE

Each company has been subject to a number of drivers of varying prominence that have led them to develop their approach to capex in a certain way. These have been analysed between external drivers and internal drivers.



External drivers

The key external drivers identified can broadly be categorized into:

Financial factors

- Cost saving (linked back to downward price pressure and competitive cost advantage),
- Increasing asset market value
- Access to finance

Cost saving

For two companies, the primary driver was very strongly presented as cost saving due to downward price pressure. This was not to say that other drivers weren't present or that other factors weren't considered, but cost saving was vital and thus a clear demonstration of the business case for investment:

> "We've absolutely demonstrated that there's a strong link between lowering the carbon content of a project and lowering the cost…and even the natural capital stuff, we've found ways of using it and deploying it to drive down costs…if ever we entered a period of capital rationing, fine, it will just be the cheapest project. You just do it as cheap as you can. Forget about everything else."
> **Head of Sustainability**

And for inclusion of environmentally beneficial features within the capex:

> "As a minimum it wouldn't want to be dilutive to the total asset that we were putting down. But you would expect it to also payback in its own right as an investment."
> **Finance Director**

This reflects the real commercial operating environment where companies cannot generally afford to invest in social and environmental benefits unless it makes business sense to do so. When finance is tight, investing sustainably may not be a priority. The argument to do so weakens, being replaced by a focus on short term cash flow. The economic reality is that investing for the long term can diminish in importance in tough financial times.

The link from cost to competitive advantage was also made, looking ahead to when the cost of carbon may more significantly impact pricing:

> "At worst we've got a competitive advantage for at least a short term period of time where we don't necessarily have to pass carbon price taxes onto consumers, and that becomes a competitive advantage very quickly."
> **Finance Director**

This indicates an additional financial benefit over and above the cash (and margin) benefit from a reduction in energy costs.

Increasing asset value

Another clear business case is where a more sustainable asset increases the asset value.

> "The BREEAM ratings and EPC[1] ratings are starting to affect the long term investment value of property… that's why we push quite hard on a lot of it."
> **Head of Sustainability**

This enhanced asset value, of course, needs assessing alongside any increased cost associated with the sustainability features, which is where the traditional financial tools such as payback, NPV and IRR are needed. As technology evolves though, demand increases and costs reduce, there may not be a significant difference on cost.

> "So we can deliver a BREEAM excellent office space every time and not really add to the capital cost of a traditional construction."
> **Sustainability Director**

This gives an even clearer business case.

Access to finance

Four companies interviewed are benefiting from, or plan to benefit from, finance that would not otherwise have been available to them. Green bonds are being used to build new sustainable buildings, add sustainable features to current buildings and to refinance green projects. One company has accessed a Regional Growth Fund[2].

> "There was a lot of work to satisfy the Regional Growth Fund and that was based on local investment, employment, apprenticeship skills in order to release that capital."
> **Sustainability Director**

This access to alternate or additional finance can be a key driver. In this instance, the access to and influence of the Regional Growth Fund was a key driver for investing in the particular site and in how sustainability, particularly socioeconomic factors, were embedded and accounted for in the project.

However, in order for green bonds to be a significant mainstream driver, the "age old debate of 'is there a cost saving for doing it?'" (Sustainability Accountant) would have to be solved.

1 Energy Performance Certificate (EPC) – a mechanism for measuring and communicating the energy efficiency of a building (MHC&LG, [no date])
2 Regional Growth Fund programmes offer grants and/or loans to eligible businesses (UK Government, 2012)

Regulatory influence

- Responding to regulatory pressures on service, resilience and affordability
- Planning

Sector regulation

For the water and power companies, the regulators have a significant amount of influence, which can impact the way social and environmental factors are considered in capex appraisals. For example:

> "Our ability to delivery in an economic and efficient manner is tested with our regulator…to ensure that the prices and the bill impacts associated with our programmes of work are delivering economic and efficient value for customers… and therefore we're incentivized to deliver those social and environmental outcomes through the work that we do."
> **Director of Asset Management**

However, this regulatory pressure on cost can bring conflicting priorities, with short term affordability and the social impact of rising utility bills often having to be balanced against long term supply security, infrastructure resilience and decarbonization. This study identified several examples of the regulators challenging on this:

> "We could say, 'Well, we've got the land. We could put a wind turbine on it. We'll payback in five years, customers would then start saving' they would be like, 'But why should the customer take that risk?...you – the investor should be paying for that.'"
> **Sustainability Manager**

> "We'd received a challenge from the regulator to say 'You're looking at a [more expensive, lower environmental impact] option for this project. We need more evidence' because they were very much looking at affordability…and they said… 'We believe that you could actually build [the asset] for ten per cent cheaper, so convince us that you're doing the right thing."
> **Sustainability Accountant**

Therefore, in developing their methodologies these companies need to ensure they can demonstrate how they have assessed and balanced conflicting priorities; and that they are building evidence and presenting the case for investment not only to meet their own business case but also to satisfy their regulator.

Planning permission

There are also examples of where methodologies have been influenced by the relative ease of passage through planning processes when social and environmental factors are given due consideration:

> "More than anything it's about smoothness of process and about… going in for… planning which does help with speed."
> **Head of Sustainability**

> "Sometimes we provide community facilities alongside our [buildings] as well, because a planning requirement will say so, but that's not a judgement on finance's behalf to say whether you should or you shouldn't do it…you have a requirement and you have to build in the costs."
> **Finance Director**

Companies therefore need to be conscious of planning requirements early in their capex planning process to enable the relevant socioeconomic and environmental factors for the local planning authorities to be identified, measured and incorporated.

Market pressures

- Customers
- Reputation
- Peer pressure

Customers

It's not just the regulatory environment where customer needs and desires are having an impact on methodologies. Customers can drive an increase in focus on sustainable capex:

> "We've always got customer demands, which can basically be summarised as BREEAM... it affects…the long term sale of the building…we are seeing more and more interest…in the relationship between built form and human health, mental health, productivity, those sorts of things."
> **Head of Sustainability**

Or a decrease:

> "If you had LED lighting that came in, but actually it didn't provide a good customer environment, even if it provided an energy benefit through your bottom line…it wouldn't happen. So it's got to be ultimately…is it the right thing from a customer perspective?"
> **Finance Director**

Customers can also be a useful source of data for the valuation of social and environmental benefits:

> "The cost benefit we're doing in the majority of the capital programme is based upon willingness-to-pay surveys we have done with customers…[it] gives us how much customers are prepared to pay to see a unit improvement in service, or an environmental improvement;…we've done surveys with customers…and monetized the value of those."
> **Director of Asset Management**

These examples collectively draw parallels with the concept of Customer Lifetime Value (CLV)[1] and the value customers bring when they share their data, collaborate and are loyal to the brand (Schrage, 2017). Engaging with customers on sustainability, demonstrating that the company places value on what their customers' value, has the potential to be quite powerful. This, in turn, links with reputation as a potential driver.

Reputation

Though reputation arose in the interviews, it was portrayed more as a secondary benefit rather than as a primary driver.

> "So our ability to be consistent in the way that we think about social impact and environmental impact, and improve on that as we go along, does have a big impact on our reputation."
> **Head of Sustainability**

Interviewees recognized that their capex approach had reputational benefit but it wasn't the main reason they incorporated social and environmental factors into their capex appraisals.

Peer pressure

Several interviewees referred to the increasing pressure to act imposed by the activity of others, placing greater emphasis on sustainability and on developing methodologies to account for sustainability. These pressures come from competitors, other corporates, industry groups, multi stakeholder groups, government bodies and consultants.

> "[The industry body] does one voice research on behalf of the industry…on a whole host of issues… it has just completed a project on natural capital and how to account for it, and so there is now a best practice guideline that all of the companies are looking at for application."
> **Director of Asset Management**

[1] CLV is a marketing concept that turns the customer from a passive actor within a company's sphere of influence to be at the heart of its focus as a strategic company asset (Rožek and Karlíek, 2014).

"Growing swell of sustainability in the last three or four years… working with the big four has been really good and just their knowledge of the industry, what's going on, what's working well, I think has certainly really pushed us forward."
Sustainability Accountant

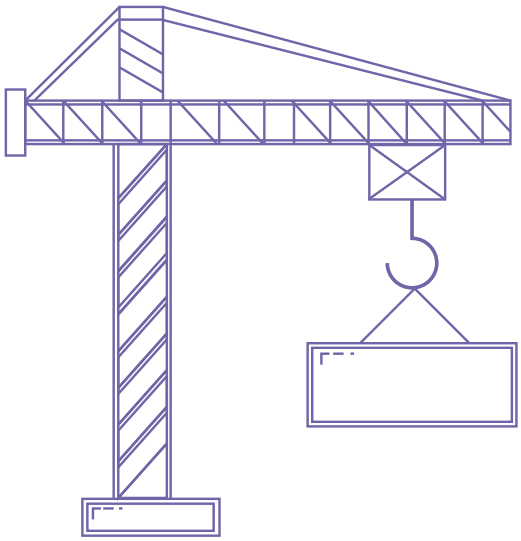
"Government and [regulators] started talking about it very overtly …Natural capital at DEFRA[1] has become the big focus...plus all the sort of debates on the Natural Capital Coalition and A4S developing and publishing the guides and so on, I think a lot of those external things have aligned."
Sustainability Manager

Each company is subject to pressure from different organizations and how they respond to those pressures depends on their specific circumstances.

Combination of external factors

For the most part though, it was not one single factor that acted as a driver. Companies are increasingly finding that there are multiple factors influencing them to incorporate sustainability into their capex appraisals and on how they go about doing so.

"We've…got customer demands…We've got local council requirements, we've got shareholder requirements and we've…got other civic expectations…the broader stakeholders that influence us, and all of them tell us that we need to, at the very least, have a net benefit to society."
Head of Sustainability



1 UK Department for Environment, Food and Rural Affairs (DEFRA)

Internal drivers

The combination of these external factors resonate with different internal stakeholders in differing ways and inspire some of them to act, creating additional internal drivers and gaining momentum for change. The most evident of these were: leadership, personal passion and motivation, and company values.

Leadership

There was clear evidence from interviews that leadership buy in and advocacy was a significant driver in the development and roll out of integrated capex methodologies. For support of the vision, for being accountable and for motivational communications:

> "[We had] very strong support from [the CFO] to do something about it and a big push from [the CEO]…So it's that senior support and having a vision for what we're trying to do that's quite useful." **Finance Director**

Even where leadership communications were not strictly accurate for example "our [former] CEO, would stand up and tell everybody we do carbon pricing. And I went, 'Show me an example.' We couldn't." (Head of Sustainability) this has provided an impetus to act and embed carbon pricing into capex projects.

Personal passion and motivation

Several examples arose where personal passion and motivation played a role in driving the development of methodologies, using colleagues with "a very similar view of the world" (Asset Manager) to gain momentum.

> "What's interesting me is trying to change hearts and minds with this…hopefully pushing other companies in our sector, companies we work with, our peers, to be better at this as well." **Sustainability Accountant**

Where this personal passion exists at a leadership level, then these two factors can combine to create a corporate sustainable business ethos.

Company values

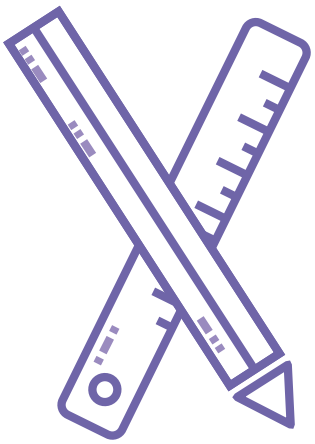
Where company values reflect an ethos of investing in employees, their communities and the environment, then this can be a driver for how socioeconomic and environmental factors are identified and accounted for. For investing in communities:

> "We want to be a responsible developer. We want to have a responsible supply chain and procurement. We want to invest in the communities that we work in and, again, not just for the three, four years we're there. It's about having sustainable jobs for these local communities because that's what we need."
> **Sustainability Accountant**

For protecting the environment and investing in employees:

> "We wanted to make the office a healthy, happy work environment, a good place to be…on the basis...[of] health and wellbeing of staff… we have a really efficient, effective office… low energy, low carbon…sustainable materials and low water use. But if it's not a good place to work, then you lose all that benefit because the staff aren't happy."
> **Sustainability Director**

In approaching capex (and their business operations) in this way, these companies are signifying that the value they create isn't just reflected in short term financial returns, but also in the economic viability of their communities, the wellbeing and productivity of their employees and their sustainable use of environmental resources. They are engaging with a wider business case for integrated capex appraisals that reflects on long term value and societal licence to operate, consistent with Jones (1995).



Futher guidence on changing culture to be more embracing of sustainability can be found in the A4S Essential Guide to Finance Culture:
www.accountingforsustainability.org/finance-culture

METHODOLOGIES

The methodologies presented within the interviews focused primarily on those that are currently operating, but also included those in development where these reflected the companies' latest strategic thinking, response to recognized drivers and imminent planned application. Whilst for some companies the methodologies discussed covered their whole portfolio, others were restricted to those above a certain value threshold, relating to a certain division or where specific project(s) warranted additional sustainability focus. Within the methodologies, there is generally a dominance of environmental factors, in particular energy and carbon, with incorporation of socioeconomic factors being more of an emerging trend.

Historical methods

Several interviewees referred back to their historical methods and some of the issues that arose with those less mature approaches. For example, where there was an awareness that there were inherent weaknesses in the decision making approach:

> "We're still making decisions that are short sighted because we're not saying, 'Well, our insurance premiums are going up.' We should invest in making these assets more resilient."
> **Asset Manager**

And a specific project where the realisation of a problem came too late:

> "'Wow, these have got a huge carbon footprint. How did we not see this coming?' Because nobody asked the question…if we'd had a more inclusive or more holistic decision making approach [would we have built them differently?]"
> **Head of Sustainability**

Emerging appraisal techniques

Of the methodologies assessed, four are based on NPV, two on IRR, one on payback and one on a combination of NPV and payback (see page 27 for a summary of the methods). However, the methodologies used have mostly moved away from basic NPV, IRR and payback, with varying degrees of sophistication. At the high end of the scale, one company has developed an NPV appraisal of the whole of life cost benefit across financial, natural, social, human and manufactured capitals, all monetized. The approach drives decisions across the whole asset management portfolio and is a live, fully configurable system which optimizes interventions to manage risk and deliver affordable service.

Only one method uses MCDA to any extent, and only in simplistic form, where capex investment proposals are selected based on a combination of carbon savings and financial payback.

There is some reliance on traditional corporate finance concepts (discounting, scenario and sensitivity analyses) though tailored to the integrated approach. There is also use of more evolving practices (monetization). These are considered in turn below.

Discounting

Where discounting is used, all but one are using a constant discount value. This is despite a horizon of appraisals of generally 25-40 years. Although some interviewees had considered declining discount rates, the concept was rejected on the basis that this wasn't considered a significant factor for decision making.

The exception to this is where a 45 year horizon was being used and different discount rates were selected depending on the nature of impacts. For example, the discount rate for health and safety impacts was constant and much lower, to reflect the relative importance of health and safety over the whole life of the asset. Declining discount rates were used for the remainder of the impact categories, with one rate for the first 30 years and a lower rate for 30-45 years.

Scenario and sensitivity analyses

Scenario and sensitivity analyses were commonly used within the methodologies, but to varying degrees. For example, scenarios were used to test options under different pressures such as climate change and economic conditions, to look at the potential impact of these pressures in context of the assets' purpose and associated cost, and for optimization purposes. Sensitivity analysis is used, for example, in relation to operational factors and to carbon price, "What if the price of carbon went from £57 to £100, would we do anything different?" (Head of Sustainability). The influence that findings from scenario and sensitivity analyses had on decision making varied, sometimes core to the methodology, other times to gain a broader perspective "because we're just interested to know the answer" (Head of Sustainability).

Monetization

Monetization arose in five of the methods, with carbon being the most commonly monetized factor, with reasons for this being cited as ease of conversion and understandability.

> "Trying to get the…exec's heads around [numerous factors] was just [too hard] and carbon is something, you know, most people feel has a value. You can argue whether it's a traded or non traded type value and where on that spectrum it is, but most people sort of get that there is something and it has a value."
> **Head of Sustainability**

The price used varied with both the 'non traded cost of carbon' and the 'social cost of carbon' being used, although interviewees differed in their views of what these values were in financial terms. Company bespoke carbon prices were also used, determined by a:

"Scan of what we thought was in the marketplace and what governments were trying to do and proposing."
Finance Director

The 'traded cost of carbon' was specifically not used by one company because their analysis showed it wouldn't change investment decisions.

The carbon prices used ranged from £26 - £60 per tonne of CO_2 equivalent, with one company committing to raising the price every year. Factors that influenced the carbon price decision were cited as precedent set by the Department of Energy and Climate Change (DECC) or by regulators, with these sometimes being adjusted for specific company circumstances.

Natural capital assets and/or impacts on natural resources were measured in three of the methods.

"We worked with [consultants] to develop a tool for…valuing the ecosystem services…that nature provides. So if you have…a natural capital asset like a tree… it's a screening, it's a carbon sequester, it's a flood protection barrier, so the tool says, 'What's the value of that carbon sequestration? What's the value of that screening? What's the value of that flood barrier?"
Sustainability Manager

The work led by the Natural Capital Coalition was cited as a driver for inclusion; the Coalition also provide guidance on valuation.

Social impact/benefit was measured in four of the methods, and some insight was gained into the valuation methods used. 'Willingness-to-pay' is used widely in the water sector and is well understood.

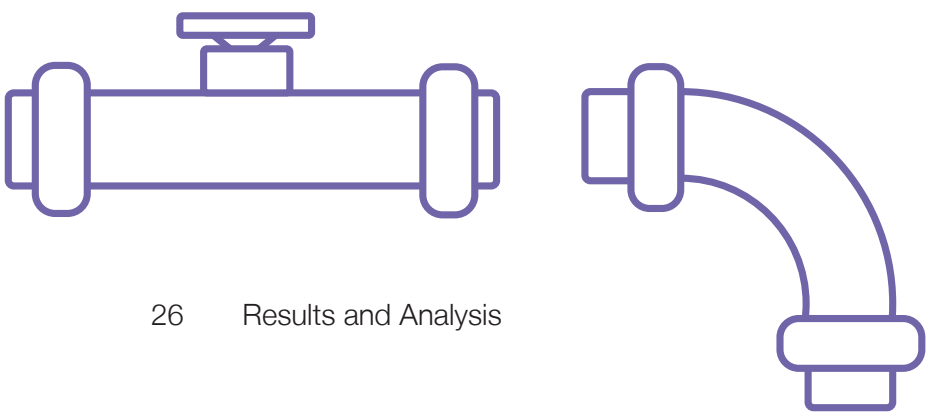
"In terms of 'willingness-to-pay' I would say that process is very effective because it's well understood, it's well applied…it doesn't seem that difficult to do…I feel that element is very mature, very well trodden…and is well understood by the decision makers within the business."
Director of Asset Management

An example was also provided by an interviewee about the Social Return on Investment methodology they are applying, demonstrating the projects they deliver create social value as well as financial value.

"So we are starting to see our projects now…in terms of the social benefits of investment …we have just done a study on our [development project] which shows for every £1 we have invested, or the customer has invested, we are able to demonstrate an additional return [on] investment of £3.66."
Sustainability Director

A key advantage of monetization is that, by measuring everything in one unit, it allows different factors to be compared directly with one another. This can be a useful way to analyse conflicting factors and to communicate the reasons for decisions to stakeholders.

"We tend to do it in pounds because that is the…universal figure… It just allows [stakeholders] to go okay, 'so my impact is X, I'm happy with how you've quantified it. I'm happy with the data you've used, so that must be the impact', and then when you show that you have done a similar approach with other stakeholders and, therefore, what you're saying is 'I'm trading off a pound of this for a pound of that', then the discussions often become more rational."
Sustainability Accountant



CAPEX APPRAISAL METHODOLOGIES

At a high level, the eight different approaches are described below:

1. An annualised NPV appraisal incorporating monetized embodied and operating carbon. Natural and social impact are also monetized and used alongside the NPV appraisal to inform decision making.
2. An NPV appraisal of the whole-of-life cost-benefit across financial, natural, social, human and manufactured capitals, all monetized. The approach drives decisions across the whole asset management portfolio and is a live, fully configurable system which optimizes interventions to manage risk and deliver affordable service.
3. An IRR appraisal incorporating extensive company policy defined environmentally and socially beneficial features, at cost.
4. An NPV appraisal of the cost benefit associated with monetized socio-economic and environmental factors, where valuation data are available. The cost benefit approach considers the need for investment, alongside associated risk and service requirements, providing a range of solutions which are then ranked to facilitate decision making.
5. A project by project bespoke NPV appraisal of the cost-benefit associated with monetized socio-economic and environmental factors. The factors considered are identified and valued through extensive stakeholder engagement.
6. An NPV appraisal, with minimum payback threshold, incorporating the environmental features, at cost, needed to deliver on specified ambitious environmental outcomes. The environmental features are iteratively modelled to determine the most cost effective solution to deliver the required outcomes. Social outcomes are incorporated with secondary importance, again at cost.
7. A capital allocation mechanism which transparently deducts an amount equivalent to each division's monetized operational carbon from their strategic capex budget. The deducted money is pooled and reinvested back into divisions prioritized by the effectiveness of their capex investment proposals. Effectiveness is determined primarily by carbon savings, and also financial payback.
8. An IRR appraisal incorporating cost saving environmentally beneficial features at cost. A minimum returns rate applies to the environmental features, in addition to meeting the standard investment hurdle rate. Community related interventions are incorporated at cost.

APPLICATION IN DECISION MAKING

There was general consensus from the interviewees that the methodologies used are there to inform decision making, rather than to make the decisions outright.

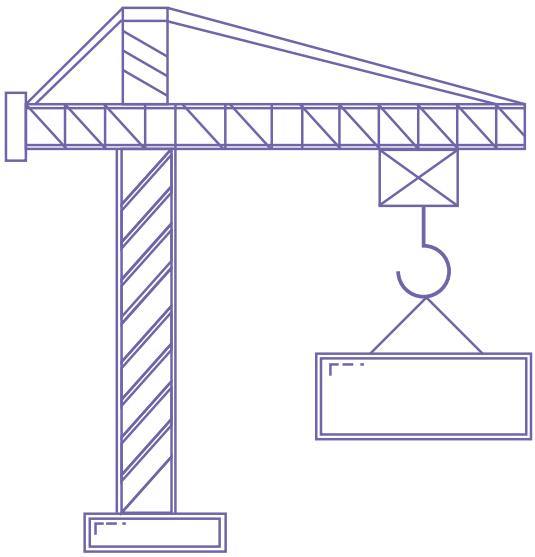
"It informs judgements…I'd be disappointed if we delivered a fully automated mechanical tool that took decision making away from people. That would frighten me…Maybe that's what some people want, but it's about making informed, sustainable decisions."
Asset Manager

The numbers and diverse disciplines of those making decisions can also be high, each bringing a different perspective and leading to valuable debate as part of decision making.

"It will be directors of finance, directors of engineering,…senior project managers will get involved at these debates... So yes, there's a good bit of debate in terms of what…would work in practice."
Sustainability Accountant

Most felt that the decision reached is generally right for the organization and circumstances.

"It builds confidence in what we're investing in…[in] an evidence based, systematic, repeatable way, so actually when we look at all the trade offs, this is the best value for money."
Sustainability Manager



CHALLENGES AND BARRIERS

For several companies, getting buy in to the business case for integration has been difficult.

"Even at senior level, people just sometimes don't get it, and so it's been part of…our challenge, to try and educate them into some of those areas."
Head of Sustainability

This may be partly due to status quo, optimism or sunk cost bias (Hammond et al., 1999; Kahneman, 2012) or a combination of these.

The selection of methodology can also make this harder, with the problem being particularly evident where a penalty system was introduced (method 7).

"There was definitely resistance on the way in which [we] pitched it… there's a resistance because there's still a feeling that we're taking this money away."
Finance Director

One factor in this can be the use of language. Communicating in words that people understand is vital.

"Language needs to be simple. Consultants are great, you know, ecometrics, that's equations. It needs to be simple, particularly around sustainability. There's so many language issues."
Sustainability Accountant

"The understanding of capital thinking has definitely helped…and it's put it in language that non sustainability people will understand."
Asset Manager

Often, it just takes time for people to understand; time which can be difficult to find.

"How you unlock busy people that don't get it quickly and easily… People do get it when you spend time with them, but it takes a lot of time, and it's how you speed that up."
Sustainability Manager

From a technical perspective, monetizing non financial capital is difficult, as noted by Epstein (2008).

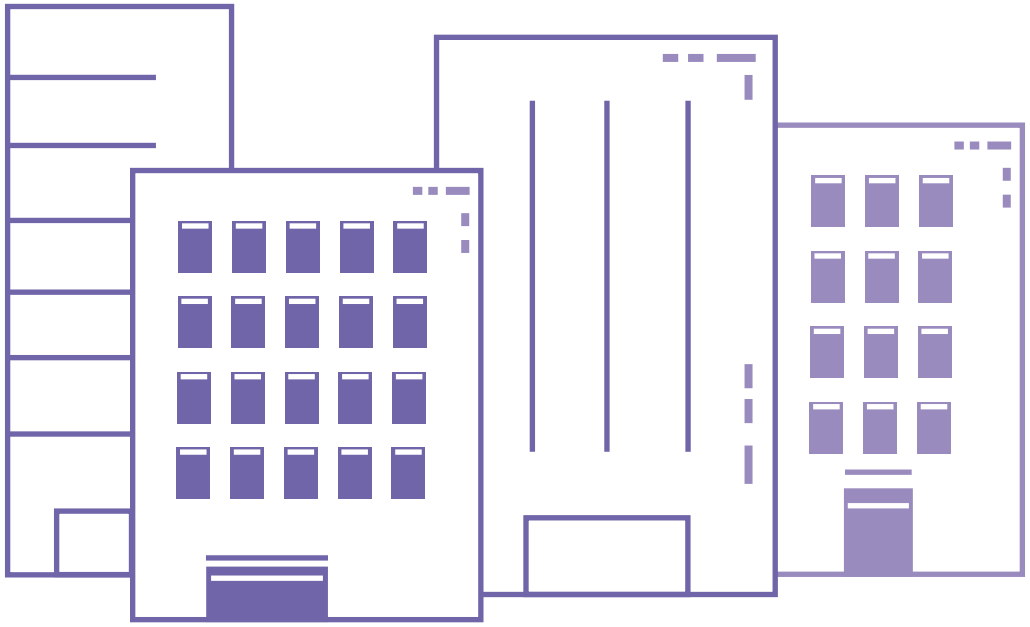
"There's a technical difficulty…to populate each one of these is difficult. Some are more mature than others but a lot are like right back to basics, how on earth do we do that in a simple way and put numbers on things?"
Sustainability Manager

All who use monetization have chosen to use consultants or academics, in the first instance, to support with this.

> "We're testing…other social factors to try and establish them, we're trying to get whatever academic information we can to try and build those in. They're a bit more difficult to quantify and get accurate values against."
> **Director of Asset Management**

However, as the concept of monetization evolves and matures, obtaining valuations is expected to be easier.

> "We can populate these cells through different means…we can talk to our customers…We can look at what other companies are doing... if it's established somewhere else…we [can] use the same valuation figure, so for me this is just the first stage and we can get so much more."
> **Asset Manager**



OUTCOMES

The interviewees' expected outcomes that had initially driven them to develop their current approach (as discussed earlier) were generally achieved; such as cost savings, smoother planning consent and reputational benefits. For many though, the most notable outcomes were where their approach had changed people's perspectives, achieved buy in, advanced their thinking and created trust.

"For me it's about getting people to have the conversation…all we hear now is people talking about the five capitals…they are thinking much more broadly and recognizing that there's more than just money… the conversations we have at a finance level, at an asset management level, it's changing that at the moment, so that's really exciting."
Asset Manager

"It's helped our regulators…[they] are moving more towards seeing this as a sort of recognized process…I think we've won some hearts and minds."
Sustainability Accountant

"Our…relationship with those parties meant we were able to…make those objections go away, because they trusted us."
Head of Sustainability

There were some planned sustainable outcomes:

"Of all the projects on site this year, ninety percent are on track to achieve a net improvement on site on biodiversity."
Head of Sustainability

And some better than expected:

"We have got some really good data back that shows the energy and everything else is better than expected and there is a 20% improvement in people's happiness."
Director of Sustainability

Crucially, there was general consensus that an integrated approach to capex investment decisions led to enhanced shareholder value.

"I find time and time again it pays back quickly, if we start to look at the right things and I think that's a 'now' benefit to shareholders, I don't think that's ten years from now, this is a better model."
Finance Director

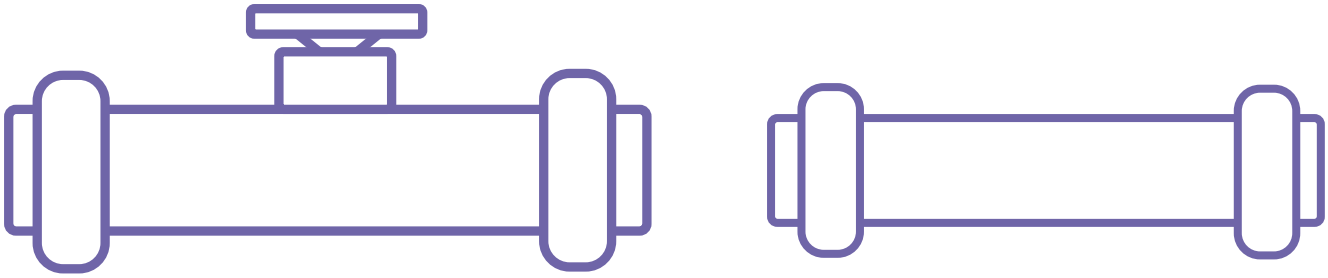
COMPARISON OF METHODOLOGIES WITH LITERATURE

The literature identified some potential ways to integrate social and environmental factors into capex investment appraisals. Some of the techniques noted in the literature were evident in the sample interviewed, but there were also some notable differences.

Three of the companies relied on traditional capex techniques, measuring purely financial cash flows using NPV, IRR and payback (as per Watson and Head, 2004; and Hillier et al., 2010). The incorporation of 'additional' sustainability factors, at cost, were justified on the grounds of cost saving, enhancing asset value and/or responding to planning requirements, with one company also requiring a minimum financial return on the 'additional' environmental investment itself.

One method identified was arguably a hybrid between Liesen et al.'s (2013) Net Present Sustainable Value (NPSV) approach and a simple form of the MCDA techniques presented by Pohekar and Ramachandran (2004). The similarity to the NPSV was that it defined minimum rates of return for financial resources and carbon savings, with the carbon savings threshold based on strategic sustainability targets. However, in this example, unlike NPSV, the technique was not NPV based. Instead the prioritization of projects which achieved both the minimum financial payback and carbon savings threshold follows a simple form of MCDA.

The rest used an extended NPV analysis, such as that proposed by Sartori et al. (2015), which incorporates monetized values for factors without a standard market value. These were all the water and power sector companies in the sample. The application of this approach varied across all four in terms of which factors were monetized, which were included directly into the NPV versus sitting alongside it, the level of sophistication, and the level of supporting analysis used to inform the final decisions. The benefit cited by Sartori et al. (2015) of the use of a common currency, particularly where conflicting factors arise, was clearly evidenced in the study.



Examples were noted of investment outside of Steger's (2006) "Smart Zone", where additional justification over and above financial returns was required, and achieved, to support the investments.

Only one company used declining discount rates, despite arguments for, made by Gollier et al. (2008).

Certainly the more sophisticated methodologies identified in this study are more advanced than those currently arising from academia. This suggests market actors are further ahead than academics in developing integrated capex methodologies, with research in some instances lagging behind.

The reasons for this may be the external factors that companies face, for example: economic downturn, with regulatory, NGO and consumer pressures, as well as the recent development of accessible tools, guidance and measurement frameworks on how to value sustainability. These factors make integrated capex appraisals commercially attractive, or in some instances a commercial imperative.

"A lot of those external things have aligned just to give us a very clear 'actually you don't have much choice. You cannot carry on as you are. It is financially unsustainable and unaffordable. It is environmentally unsustainable and unaffordable. What are you going to do differently?'"
Sustainability Manager

DIRECTION OF TRAVEL

Utilities

From a sector perspective, what is most interesting to note is that the heavily regulated sectors of water and power are leading the way on monetization. This is arguably because they all have extensive infrastructure and an inherent responsibility to the communities to which they (either directly or indirectly) supply utilities. Their interaction with the natural environment is thus significant, and they have a high potential environmental impact. There is also a high dependency on natural capital, particularly the water companies, and for all where renewable energy is concerned.

They each must take responsibility for their part in providing safe, clean water, sanitation and energy into the homes and workplaces of their customers, and must do so at a price that is both socially and politically acceptable. They must do all this in an environment where security of supply is socially and economically vital, yet anthropogenic climate change is contributing to an increase in the strength and frequency of extreme weather events. These events and trends are affecting the reliability of the natural capital upon which they rely. By reducing reliability, climate change is testing the resilience of their infrastructure and driving the agenda on decarbonization of that same infrastructure.

The role the regulators play in this is to provide frameworks whereby water and power companies can strive to balance these complex, often conflicting, elements and to oversee their efforts to do so. Therefore, the observation that the water and power companies in this study are all using monetization of social and environmental factors in their capex appraisals should come as no surprise. After all, it is a methodology that allows them to compare the cost benefit of their capex decisions across financial, natural and social capital in a single unit and thus informs their decisions in a much more comprehensive way than traditional, solely financial based methods. That said, the valuation approaches being used are still evolving and are not yet standardized, though some consistency is being driven by multi stakeholder organizations such as the Natural Capital Coalition (2017) and industry bodies such as UK Water Industry Research (UKWIR) (2016).

The use of technology has the potential to support this standardization, as well as to revolutionize the speed and level of sophistication of analysis that companies can perform to inform their capex decision making. Indeed, some of this was evident from the interviews performed. What was also evident, however, was a question mark over whether standardization was felt to be the right way forward by everyone.

> "I think standardization comes with a complacency and that really worries me… if people become complacent…they don't think about the process each time."
> **Sustainability Accountant**

On balance, however, the various bodies that are striving towards standardization seem to be gaining sufficient corporate support to indicate standardization is generally a common desire. Indeed, the more standardized methodologies become, the more accessible and understandable they become to stakeholders, following the same argument as the historical drivers for the development of accounting standards.

But what of the other sectors in the study? Should they also be striving to more sophisticated capex decision making techniques such as monetization? Potentially, yes.

Property and Construction Sector

Considering first the property and construction sector. Both companies interviewed are already incorporating extensive environmental and socially beneficial features into their buildings, driven by a combination of enhanced asset value and increasing recognition of the relationship between buildings, occupant wellbeing and productivity. These companies have confidence that by building more sustainable buildings the extra money spent will payback, both directly through savings on utilities, but also indirectly through enhanced occupant wellbeing and productivity; both of which should ultimately lead to enhanced shareholder value.

What these companies don't yet incorporate into their capex decision making is a single measure for the cost benefit of their decisions across financial, natural, social (and human) capital. To do so would permit measurement of the extent to which the different options for sustainable features and interventions have impact and create benefit, relative to each other. For example, what is the most cost beneficial location for a new mixed use development, the best configuration for a combination of natural light and LEDs, or the right staffing mix to balance social inclusion and productivity; all analysed across financial, natural, social and human capital?

Though the implementation of this type of approach sounds complex (and potentially expensive), it may not be all that far off. Both companies interviewed have taken steps, albeit on a case study basis, to consider, measure and monetize the socioeconomic impact their buildings have. One is already using technology to model iteratively the most cost effective solution to deliver ambitious environmental outcomes. They are already increasing their knowledge base of how investment decisions made at the design and construction phase can impact wider stakeholders. Add in a strengthening argument on business case and advancements in technology, and it's not as inconceivable as it may first appear. It could, perhaps, be a reality within the lifetimes of the buildings currently being designed and built.

Retail and Consumer Sector

Where retail and customer organizations include significant factory, warehouse and/or store portfolios then a similar argument can be made as in the property sector. In factory and warehouse environments (where absenteeism can be high and morale low) what impact could a greener, healthier building have on productivity? In retail

stores, an increase in wellbeing and productivity of staff can reasonably be expected to have a positive impact on their interactions with customers, and thus a knock on effect on the resultant customer experience.

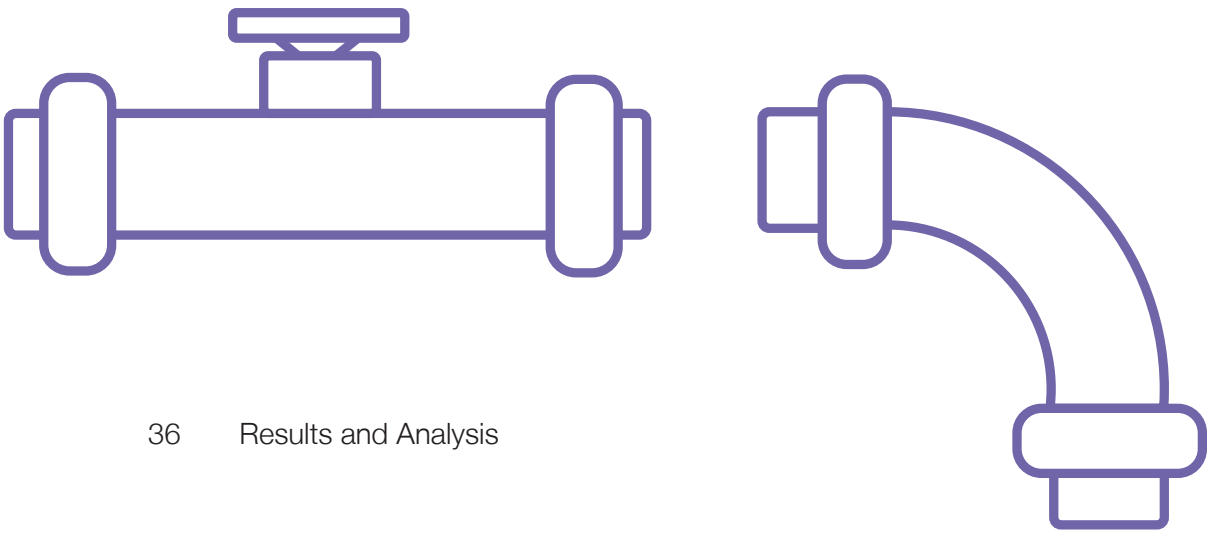
In a retail environment, the question when measuring human capital becomes 'which humans to measure?' Though generally restricted to employees, from a CLV perspective, the value of a retailers' human capital could arguably include the customer too (Schrage, 2017). However one choses to define them, perceiving human capital/CLV in this way takes the more traditional measurements of footfall and customer promotor score to the next level.

What this line of argument proposes is that CLV and capex investment are inextricably linked. Schrage (2017) suggests that "serious customer lifetime value metrics should measure how effectively innovation investment increases customer health and wealth" and in doing so successfully, makes customers more valuable.

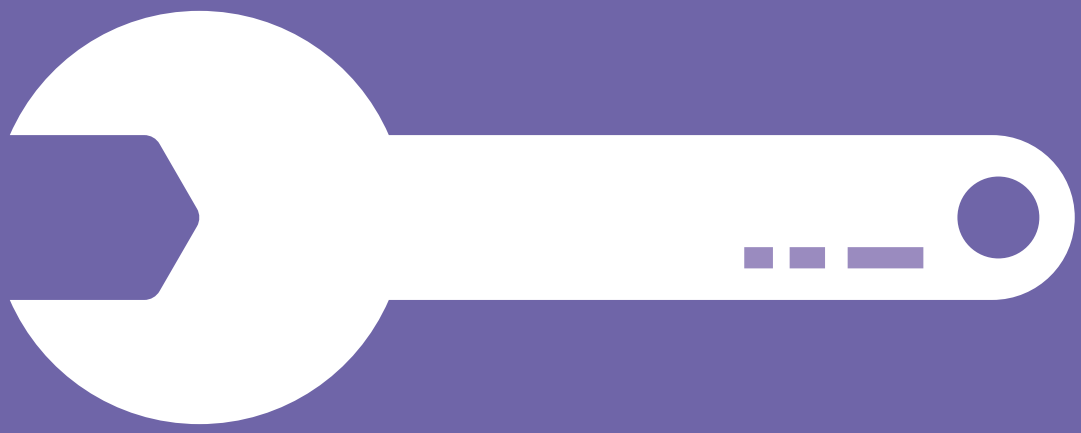
At a basic level, providing a healthier shopping environment and/or one where the shopping experience is more enjoyable and more engaging has a role to play in strengthening customer loyalty and thus their value to the retailer. It also requires innovation and investment, which in turn require investment appraisals.

At a more sophisticated level, there is an opportunity for retailers to further develop the measurement metrics around CLV, to better understand the links with sustainability and to apply these to inform their capex decision making.

Monetization may well be part of the answer to this, providing a single unit to compare and account for cost benefit across financial and non financial capitals in capex decisions. This would allow capex decision making to reflect their changing operating environment, the impact they have and the capitals upon which they depend in a more holistic way.



SUMMARY AND CONCLUSION



SUMMARY

This study set out to consider how and why companies are starting to integrate social and environmental factors into capital investment appraisals and decisions. Through interviewing eight companies, across four sectors, some valuable insights have been obtained and some common themes identified, in particular into the drivers for integration and the methods used.

The key external drivers identified can broadly be categorized into: financial factors, regulatory influence and market pressures, which are acknowledged and converted into internal action, driven by leadership, personal passion and company values.

Through analysis of these drivers, a clear business case has emerged. A business has a duty to its investors, to generate, enhance and sustain shareholder value. Capex decisions have a strategic role to play in the long term viability and competitive position of companies, given their generally long lifespan. But, the world around those assets is changing: businesses are increasingly exposed to a variety of political, social, environmental and regulatory factors that can both create risk and opportunity. Traditional corporate finance techniques are increasingly insufficient, and new ways are evolving to capture and analyse the greater information needs of business to make effective capex decisions.

All those studied incorporated cash flows using NPV, IRR and/or payback in one way or another. What was apparent though, was the level of ambition to incorporate significant social and environmental features into the investments, to engage in cross functional collaboration and to drive value from the assets. With this sense of common purpose, companies have been able to innovate and develop methodologies that balance these aspects in a way that is right for them.

There was a wide variety in the approaches used. Discounting is generally at a flat rate, though examples of differentiation between impacts and over time were noted. Scenario and sensitivity analysis were commonly used, including to test options under different pressures, to optimize and in relation to operational factors and to carbon price.

Most notably, the water and power companies all incorporated monetization of social and environmental factors, to varying degrees. Whilst the property and construction, and retail and consumer sectors are also engaging with monetization, this is often on a case study basis, and not necessarily at the pre investment stage.

These methods are demonstrating that the business case for capital investment is no longer solely dependent on direct cash flow returns. Justification for investment can and should reflect a wider perspective.

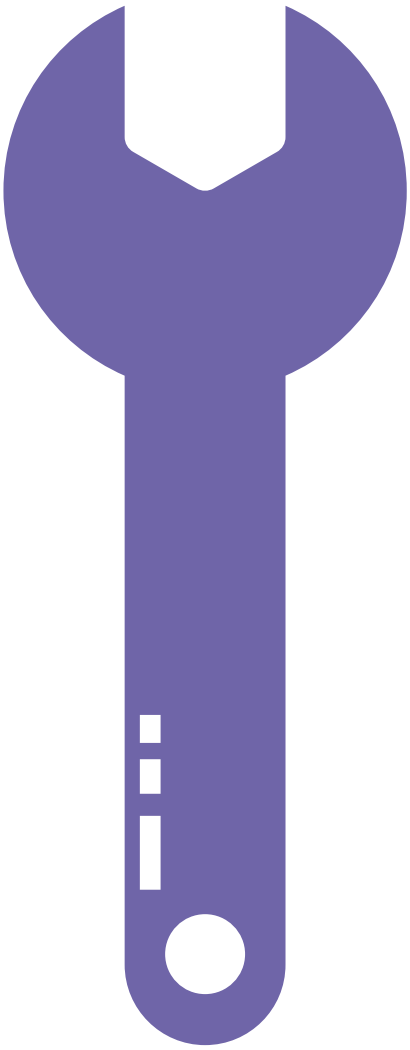
There was general consensus that the methodologies developed are to inform decision making rather than to make decisions outright, that there is benefit to involving cross functional perspectives in these decisions and that the methodologies facilitate making the right decision.

However, a number of barriers and challenges were identified, creating difficulties for companies in developing and implementing their methodologies. Many have either found ways to remove those barriers, or have identified paths to reduce them over time. A challenge that remains though, is that this all takes time; and, though it didn't arise in the interviews, there is inevitably a cost associated with the time and resources to make these changes.

CONCLUSION

The companies in the study have done much to incorporate social and environmental factors into their capex appraisals and decisions, reflecting the business case for them to do so. What has emerged within this, is that there seems to be a direction of travel. Companies which feel the drivers most acutely tend to have more sophisticated, integrated methodologies, and these are increasingly including monetization of non financial capitals and the use of technology.

Others are also starting to engage with both monetization and supporting technology, and an argument has been presented for them to incorporate further. This will allow capex decision making to reflect more holistically the environment in which the assets must operate, the impact they have and the capitals upon which they depend. However, for this to be successfully achieved, a level of standardization is needed to reduce the amount of time and resources required.



APPENDICES

APPENDIX 1
Literature review

Building the business case for integrated capex appraisals

The Brundtland Report defined sustainable development as seeking "to meet the needs and aspirations of the present without compromising the ability to meet those of the future" (Brundtland Commission, 1987).

Scarcity of resources and the impact of climate change are just two of the current sustainability related trends which may cause this compromise and which are of growing economic concern (WEF, 2012). Demand for energy is increasing dramatically (IEA, 2016), and climate change impacts arising from extreme weather, rising sea levels and policy changes are already being felt (EEA, 2017). Other significant challenges such as widespread environmental damage, poverty and growing inequality are having a detrimental impact (United Nations General Assembly, 2015).

Business is not only exposed to the risks and potential turbulence from these issues, but is also well positioned to capitalise on the many arising opportunities. To be successful, businesses will have to take a long term strategic view of sustainability and build it into the key value creation enablers that drive returns on capital, support growth and mitigate risk (PwC, 2017). This transformational change is only possible if sustainability factors are incorporated into the allocation of capital that drives innovation, invests in new ventures and builds resilience.

It is commonly, and legally, accepted that directors' primary responsibility is to their shareholders (Smith, 2004). Should, therefore, this concept of sustainable development, of corporate social responsibility (CSR), even be on their agenda? Milton Friedman (1970) argued that it shouldn't. His view was that meeting this primary responsibility generally means making as much money as possible (within the bounds of law) but that acting in a socially responsible way costs money and thus contravenes the directors' duty. He also argued that a conscience of social responsibility can only be held by individuals, not by businesses. Thus, by acting in a socially responsible way, a director is acting in line with his own beliefs and must therefore be spending shareholders' money in a way that is not in line with their wishes (Friedman, 1970).

His argument can be countered in a number of ways, not least by noting that directors' duty to shareholders is to deliver on the corporate mission, vision and strategy and that, by investing in the company, shareholders have demonstrated their belief that these will bring them their desired financial returns (Mulligan, 1986). Thus where corporate strategy incorporates social responsibility, and the directors' act on it, then they are meeting their obligations to shareholders. Also, Friedman (1970) makes the assumption that acting responsibly costs money; and yes, it may do – particularly in the short term. However, the argument here is that the business case for investing in sustainability is gaining momentum, that this will bring greater financial returns, and that techniques are evolving to account for this.

Clearly, the directors' responsibility to shareholders holds regardless of whether they are short term or long term holders, now or in the future. Therefore, company directors should arguably position their business to achieve long term earnings and growth (Schmidheiny and Zorraquín, 1998). Few corporate decisions impact companies' long term viability and capabilities as much as capex decisions (Epstein, 2008). The associated assets can have a 20, 30 or even 50 year life, and will need to remain commercially viable as operating context changes: as we transition to a net zero carbon economy, as resources deplete, as social and environmental factors play an increasing role in legislation.

Other stakeholders and drivers

Beyond the basic business case, which implicitly links back to shareholders, other stakeholders can act as drivers towards implementing integrated capex appraisals. Two of these groups have been considered in more detail here: regulators and customers.

Regulators

Regulators provide constraints to how companies can operate. For example, within the UK water and power are highly regulated sectors. Water and wastewater companies are bound by rules and guidelines laid down by the Office of Water Services (Ofwat), DEFRA, the Environment Agency, the Consumer Council for Water and Natural England, as well as other parties. They are held to account on a wide range of outcomes including in relation to sustainable development, environmental protection, supply resilience, sustainable resource management and fair pricing (UK Government, 2015; Ofwat, 2016; Ofwat, 2017). Similarly, the power sector must meet regulatory obligations ensuring, amongst other things, value for money for the consumer, protecting security of supply and promoting sustainability (Ofgem[1], 2017). Both sectors are heavily impacted by national and international greenhouse gas emissions reductions and renewable energy targets.

Operating within this environment, water and power companies are strongly incentivized to take account of social and environmental factors in their decision making, particularly where this involves capex investment into their extensive infrastructure.

Customers

Customer pressure can also influence how much a company integrates sustainability. One relevant emerging area of study is Customer Lifetime Value (CLV). One perspective on this is that "CLV helps you think about how to optimize your acquisition spending for maximum value rather than minimum cost" (Schrage, 2017). Though in this quote Schrage is most likely referring to acquisition of customers, through marketing strategy investment perhaps, the concept could arguably also be applied to acquisition of capital assets. Thus, a company's capex spend should be optimized for maximum customer value, not minimum cost.

Schrage (2017) also argues that customer value is enhanced when a company's investments reflect what customers value. So, where customers value their health and wellbeing, investment in their community and the ability of their descendants to meet their resource needs, then it follows that companies should incorporate these factors into their capex decision methodologies. This is

1 Office of Gas and Electricity Markets (Ofgem)

consistent with stakeholder theory, in that "those who adopt a stakeholder perspective expect that organizations will actively pursue measures which result in a net welfare gain to the environment and society" (Henry, 2011, pp.404-405).

Moving on from the traditional approach

Traditionally, capex appraisals have been performed, and associated decisions made, based on an entirely financial basis (Hillier et al., 2010). Watson and Head (2004) and Hillier et al. (2010) lay out the traditional (financial) approaches to capex appraisal. These are generally: net present value (NPV), the internal rate of return (IRR), payback period (PBP) and the use of hurdle rates. Some businesses have concluded that a purely financial approach is no longer sufficient (A4S, 2015); indeed there are examples where it has led to material stranded assets, for example unanticipated emissions regulation forcing Tilbury Power Station's closure (RWE, 2015).

In considering the business case for investing in sustainability, Steger (2006:416) refers to what he calls the "Smart Zone" where investment options which improve environmental and social performance also have the best NPV (or certainly one greater than the weighted average cost of capital (WACC)). He argues that investment options outside of this "Smart Zone", i.e. where NPV is less than the WACC, or is even negative, then there needs to be some additional justification as to why a company would select this investment. This could arise, for example, if there was a non financial or indirect benefit to investing in sustainability such as business resilience, employee wellbeing or reputation benefit. Of course, if these benefits can be valued and incorporated into the capex appraisal, then management have a more holistic and useful decision tool.

This notion is captured by Gregor Alexander, Financial Director, SSE plc:

> Our financial models may have brought us success in the past and we should not abandon them now, but we should think about how new information can better inform our capital investment decisions…Measures and metrics exist, which are wider in scope and encompass more societal and environmental risks and impacts which can be incorporated alongside traditional cost of capital and risk premiums. (A4S, 2015)

Methodologies for integrated capex appraisals

As long ago as 1992, academics were considering whether sustainability could be accounted for (Gray, 1992; Rubenstein, 1992). Recent academic literature yields several methodologies that can be used to integrate social and environmental factors into capex appraisals. An introduction to these is presented below for consideration through this study.

Epstein (2008) provides some straightforward ways to incorporate social and environmental factors into capex decisions. For example, performing social and/or environmental impact assessments; or performing regional human rights assessments prior to investment approval. Though valid methods, these are fairly immature approaches and are at the regulatory or planning compliance level (or slightly above) and do not tend to capture relative benefits of different investment options.

Sartori et al. (2015) who consider major EU funded infrastructure capex, promote that a standard NPV method should incorporate impacts "which are relevant for society, but for which a market value is not available" (Sartori et al., 2015, p.61), and provide guidance on determining monetary values for these impacts. An advantage of this approach is that it converts all factors into a commonly understood financial currency which is useful for comparing projects, although the conversion can be complex and subjective.

McDermott et al. (2002) support Satori et al.'s approach and call it 'adjusted present value', though they suggest it is only necessary if the investment would otherwise sit outside of Steger's (2006) "Smart Zone". Maack and Davidsdottir (2015) note that in practice, only purely financial returns are generally considered in a standard NPV approach.

Erhemjamts et al. (2013) look at the inclusion of social and environmental factors in capital investment policies from the theory of the firm perspective. This assumes management of listed companies seek profit maximization (originally applied to investment in CSR by McWilliams and Siegel (2001)). McWilliams and Siegel propose that corporates are influenced by demand from customers, employees, investors and wider stakeholders to act responsibly, and thus are compelled to devote resources to sustainability to respond to this demand, i.e. to invest in sustainability as a route to maximize profits. Erhemjamts et al. (2013) reflect on this and express their support for this theory in that it brings together resource based theory (that competitive advantage arises from utilizing a firm's assets and capabilities in the external environment (Russo and Fouts, 1997); and stakeholder theory (that ethical principles can bring notable competitive advantage (Jones, 1995) with this simple demand and supply explanation.

In terms of practical application of these policies, one option is to use multi criteria decision analysis (MCDA). Pohekar and Ramachandran (2004) present a number of different MCDA techniques, such as the weighted sum method and the weighted product method, and analyse their use in energy sector capex projects. A study by Ribeiro et al. (2011) notes that social factors in the sector can be less quantifiable than environmental factors and are often assessed in a more subjective way. They explore methods for stakeholder consultation on significant energy capex projects such as wind farms and dam construction, and identify other techniques to support decision making in this arena such as interviews, qualitative and quantitative surveys, Q methodology (a method to study people's viewpoints) and SWOT analyses. Pohekar and Ramachandran (2004) conclude that MCDA techniques are widely used where there are conflicting criteria, with the most popular being the Analytical Hierarchy Process.

Maack and Davidsdottir (2015) propose an extended cost benefit analysis approach that uses the theory of hybrid capital. This relies on Kulig et al. (2010) who argue that the four capitals: economic, human, natural and social should be kept separate and each be measured in a distinct non monetary unit. NPV is then calculated using a consistent discount rate across the capitals.

Liesen et al. (2013:175) propose their Net Present Sustainable Value (NPSV) approach, as a "new strategic tool for managerial decision making in the context of sustainable investment appraisal". This approach links the use of social and environmental resources back to a corporate's sustainability strategy and targets by extending the opportunity cost principle to both financial and non financial resources. This method requires a defined minimum rate of return for all relevant resources, based on the corporate's targets.

Where NPV is used as a base for capex appraisal, a key judgement factor is the discount rate used. A constant discount rate will mean that negative impacts arising in the long term will be discounted to negligible levels; conversely, benefits to future generations at a cost to current generations will be viewed as an inefficient use of capital. This is particularly relevant for climate change, as noted by Stern (2007) in his economic study of climate change. Gollier et al. (2008) analyse and justify the use of declining discount rates to counteract this issue.

There does not appear to be clear consensus on the 'best' method for decision making. Those that monetize costs and benefits have the advantage of a common comparable measure, but conversion can be subjective and complex. Judgement arises in all methods and effectiveness will differ. In making these judgements though, McDermott et al. (2002) advise consulting cross functional teams.

Access to cheaper finance

In performing this study, a valid question to ask is whether approaching capex decision making in a sustainable way will give companies access to cheaper capital.

El Ghoul et al. (2011) examined the effect of CSR on the cost of equity capital for over 2,800 US companies. They found that those that performed well on a wide range of CSR related metrics had a cheaper cost of equity, particularly where companies exhibited responsible actions in relation to the environment, product strategy and employees. They argue this reflects the notion that socially responsible businesses have a higher valuation and lower risk.

From a debt perspective, recent financial market literature indicates that whilst there are examples of companies gaining lower cost debt reflecting their sustainable credentials, that evidence is currently limited, and as yet, inconclusive (Wilkins et al., 2017).

Barriers to integration

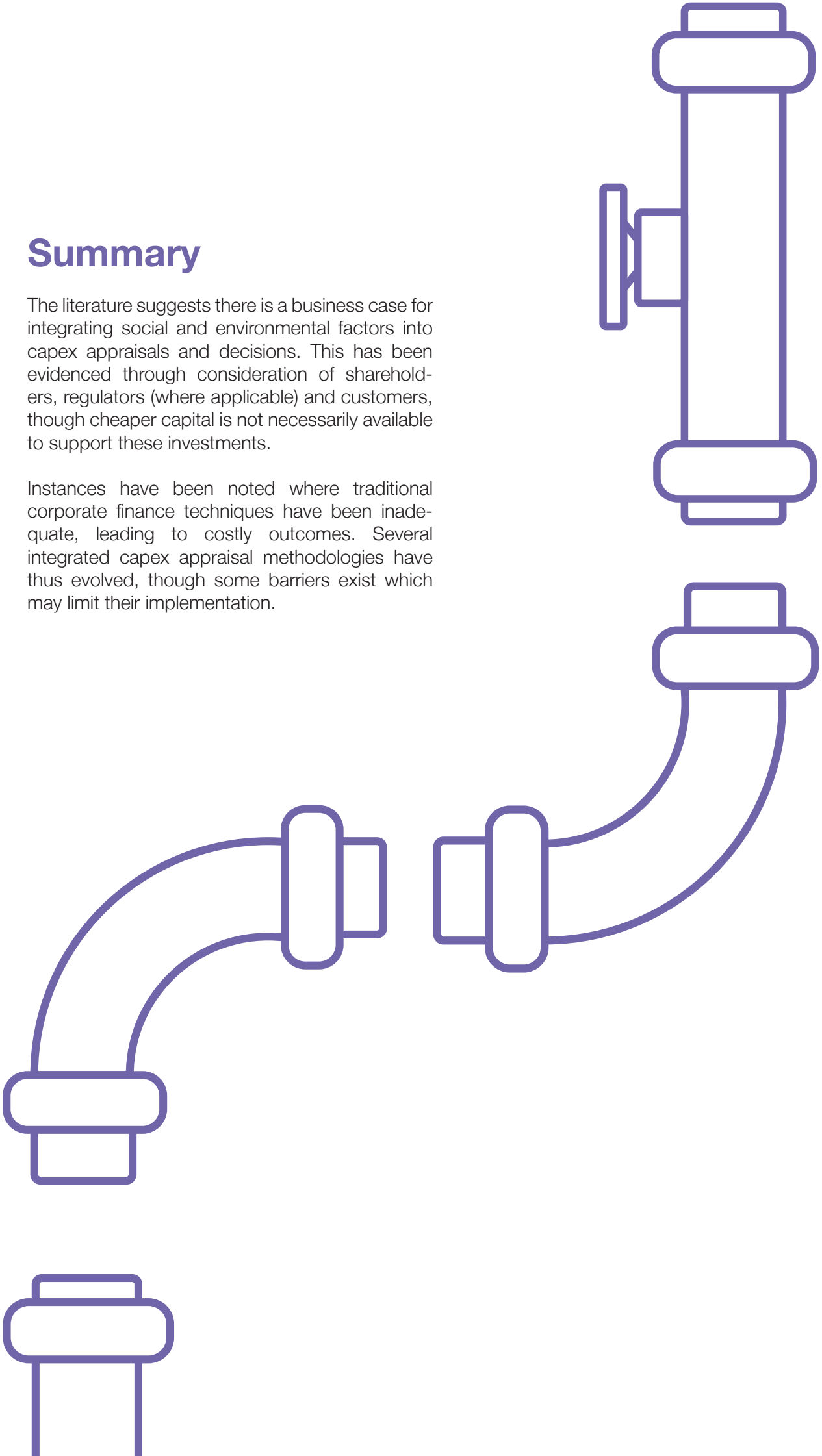
Epstein (2008) suggests two potential reasons why sustainability may not be integrated into capex decisions in an effective way. Firstly, where the sustainability factors are compliance driven and the organization is only compelled to achieve (rather than exceed) compliance then they are unlikely to perform full analyses on the potential options, often selecting on the basis of cost. Secondly, the inherent difficultly in evaluating social and environmental factors within a capex decision creates a barrier. For example, the complexities of valuing social and environmental impact and benefits.

Some widely recognized psychological biases also have the potential to act as barriers to integrating sustainability into capex decision making, for example, status quo bias, optimism bias or sunk cost bias (Hammond et al., 1999; Kahneman, 2012; Goodwin and Wright, 2014).

Summary

The literature suggests there is a business case for integrating social and environmental factors into capex appraisals and decisions. This has been evidenced through consideration of shareholders, regulators (where applicable) and customers, though cheaper capital is not necessarily available to support these investments.

Instances have been noted where traditional corporate finance techniques have been inadequate, leading to costly outcomes. Several integrated capex appraisal methodologies have thus evolved, though some barriers exist which may limit their implementation.



APPENDIX 2

Further details on the primary research methodology

Questions were designed to investigate the following themes:

- Relevant situational factors.
- What drivers have led them to this methodology.
- Any barriers/trade offs identified with this/other methodologies.
- The extent to which this methodology is embedded/evolving.
- The buy in by decision makers for the selected methodology.
- What outcomes this methodology has led to.
- How effective the methodology is.
- Any interplay with financing approach, e.g. do financing options influence the methodology? Has the methodology opened up new financing options?

The research analysis was designed to consider the:

- Methodologies themselves – use of qualitative/quantitative criteria, how different sustainability factors are accounted for/prioritized, discounting approach, etc.
- Situational factors – e.g. industry, capex cost, regulatory impact, etc.
- Causal and resultant factors – drivers, challenges, barriers, evolution, buy in, outcomes and effectiveness.

Specifically, the data were analysed in three key ways, allowing common themes arising from the interviews to be identified, and structured analysis to be performed effectively:

1. Word cloud analysis
2. Coding
3. Question analysis

Themes arising from these three approaches were categorized, analysed, 'tested' for counterexamples, contextualised and evaluated.

Interviewees were all UK based, but with distinct differences in the organizational cultures of the companies interviewed. Predominant differences noted from the outset were:

- A quasi public sector culture within the regulated industries, which can perhaps be described as a collective sense of public responsibility and common purpose;
- Two companies were pioneers of philanthropic paternalism, still retaining those corporate values today.
- One company followed a cost leadership strategy, a factor reflected in the culture, and view sustainability as a long term low cost driver.

These organizational cultural differences, though acknowledged, are not felt to reduce the value of the study, more to add a rich diversity to the findings, reflecting that a sustainable business approach can cut across a variety of business types.

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