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Valuing Natural Capital in the Construction Industry

Szilvia Zakar

ABSTRACT

This paper explores the applicability of Natural Capital Accounting to the construction industry by first placing Natural Capital thinking into a theoretical framework in order to show how it differs from other approaches to environmental preservation. It then goes on to elaborate on the key financial and accounting concepts involved and looks at some objections from within the wider environmental movement. Having defined and explained the principles involved, a number of practical examples are examined, by way of case studies and interviews, both within and beyond the construction industry with a view to illustrating the practical benefits of implementation, as well as some of the obstacles and shortcomings emerging from concrete experience. The results of a limited awareness survey of construction industry sustainability professionals are presented before the above strands are pulled together into a set of both practical recommendations and areas for further study.

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LIST OF ABBREVIATIONS

CHP - Combined Heat and Power

CIRIA - Construction Industry Research and Information Association

CRC - Carbon Reduction Commitment

Eftec - Economics for the Environment Consultancy

eKPIs - Environmental Key Performance Indicators

ELF - Environmental Life Force

E P&L - Environmental Profit and Loss Account

GDP - Gross Domestic Product

GHG - Green House Gas

GHGPP - Greenhouse Gas Project Protocol

GIS - Geographic Information System

LWEC - Living with Environmental Change

NCA - Natural Capital Accounting

NCC - Natural Capital Committee

NCP - Natural Capital Protocol

P&L - Profit and Loss

PV - Photo-voltaic

PWC - Price Waterhouse Cooper

RSPB - Royal Society for the Protection of Birds

SEEA - UN Statistical Commission of the System for Environmental and Economic Accounts

SPERI - Sheffield Political Economy Research Institute

SRM - Sir Robert McAlpine

UK NEA - UK National Ecosystem Assessment

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1. Introduction

The stubborn belief persists that the natural environment is profoundly related to people's physical, psychological and moral well-being.

(Stephen R Kellert, 2005)

Natural Capital Accounting i.e. accounting in financial terms for our use of natural capital is a new and increasingly popular idea. As resources become scarcer and climate change impacts on global supply chains it is increasingly important that the use of natural capital is fully recognised as a key strategic concern for businesses in all sectors. This is particularly true for the construction industry which is wholly dependent on natural capital for its operation. Natural Capital Accounting provides both a set of mechanisms and a theoretical framework by which the relationship between the use of natural resources and services can be linked to financial performance at a national, company or project level and it is increasingly important that this link is made explicit, both for the preservation of the natural environment and for the future prosperity of the construction industry. The forthcoming launch in the UK of the Natural Capital Protocol (NCP) scheduled for July 2016 (Draft NCP, 2015) makes it even more important to raise awareness of the concepts involved within the construction industry. Growing government interest is evidenced by the recent reinstatement by Defra of funding for the Natural Capital Committee (NCC) which will spearhead the implementation of the Department's 25 year environmental plan.

Guidance contained within the Draft Natural Capital Protocol has not yet seen widespread implementation although, as will be outlined, it is beginning to make inroads in some industry sectors. The construction industry has only begun its exploration and it is hoped that this paper will contribute to the acceptance of Natural Capital Accounting within the industry by illuminating its importance and benefits as well as making a realistic assessment of some of its shortcomings and obstacles to adoption. As will be seen, a non-idealistic examination of the concepts involved also brings into focus a number of areas in need of further study.

As Natural Capital Accounting is in its infancy as an approach to environmental protection, and this is particularly true in the construction industry, this paper focusses on contextualising the ideas involved and exploring some of the ways in which they have been put into practice rather than being a classic quantitative/qualitative type study.

1.1 Aims

This study aims to outline to construction industry companies, including clients, consultants, main contractors and the wider supply chain, how Natural Capital Accounting can be used to understand reliance on natural capital and how this understanding can be brought into strategic planning with the identification of key natural capital related metrics becoming comparable to the well-established metrics used to measure the effective of use of, for example, financial and human capital.

1.2 Objectives

Based on the above aims, the objectives of the research are as follows;

- Explain the concept of natural capital accounting.

- Case study review of natural capital accounting schemes in both the construction and wider industry, with one case study focussing on Natural Capital Accounting that is being trialled by Sir Robert McAlpine and Hammerson at a systems level.
- Analysis of companies who have undertaken natural capital accounting and outline of lessons learnt.
- A comparison between the theoretical natural capital accounting framework and actual practice in industry.
- Output conclusion of how this applies to Industry.

It is not unusual to contrast the hard-headed practicality of the business person with the idealistic and woolly-mindedness of the environmental activist. A clear understanding of Natural Capital Accounting and how it emerges out of an equally rigorous environmental and economic analysis will clearly demonstrate the extent to which such thinking is flawed. With that aim in mind we can now turn to an examination of the origins and detail of Natural Capital Accounting.

1.3 Methodology: how the research was undertaken

This paper is based on an initial literature review in order to contextualise Natural Capital Accounting as a new and distinct approach to environmental protection and to show how it fits within the wider area of environmental thinking. This is followed by a qualitative review of a range of case studies where aspects of Natural Capital Accounting practice have been used within a number of industrial sectors including apparel and energy. A number of interviews were also conducted with organisations that participated in the Natural Capital Committee's work and who piloted the framework of Natural Capital Accounting in the UK. The findings of an independent study commissioned by Hammersons PLC and Sir Robert McAlpine, and undertaken by Trucost, that detailing the environmental benefits of renewable and energy efficient design features of a building using natural capital accounting is also explored. Quantitative research methods were then used to conduct an online survey of sustainability professionals working in the construction industry to gauge their awareness of natural capital accounting within the sector.

2. Introducing Natural Capital Accounting

To ensure that we maintain nature's capacity to provide its essential services, we need to look above all to economics to achieve large-scale change.

(Tony Juniper, 2013)

Natural Capital is not a new idea. Understood as the goods and services provided by nature, Natural Capital, has long been recognised as an essential input, alongside human, financial, manufactured and other forms of capital, into economic output and growth. What is new is the idea of Natural Capital Accounting (NCA), i.e. placing a monetary value on and accounting for our use of nature's contribution, as espoused by thinkers such as Tony Juniper (Juniper, 2013) and Dieter Helm (Helm, 2015). NCA is gaining acceptance at the national and international level as demonstrated, for example, by the UK's national Natural Capital Committee¹ (Natural Capital Committee, 2015) or the adoption in 2012 by the UN Statistical Commission of the System for Environmental and Economic Accounts (SEEA) (SEEA, 2015). Helm argues that, 'the failure to preserve and protect many of our natural assets can be turned around by thinking about the problem in terms of natural capital.' (Helm, 2015, p.4) NCA can be viewed from the global, national (or intra-national, e.g. EU), regional, company or project level.

2.1 Classification of Environmental Thinking

Before exploring the ways in which NCA is used in the construction industry, it will be helpful to develop a clearer understanding of the ideas involved. In particular we need to understand in what ways NCA differs from other approaches to environmental preservation. To fully grasp the importance of NCA, a short digression into the development of environmental thinking will be useful. Though more detailed and stratified categorisation schemes have been devised (Hay, 2002) it is helpful for the purpose of this paper to simplify the development of environmental thought into three broad categories:

- 1) utopian or rejectionist
- 2) conservationist or restraint-based
- 3) realist or market-based

NCA fits firmly into the realist/market-based strain of thought. While these three varieties of environmental thinking in some ways succeed one another; they also overlap and all three have adherents today. The early utopian phase is analogous to a revolutionary movement, while the conservation strain is an attempt to mitigate or limit humanity's impact on nature and the realist strain attempts to reconcile human nature with limited natural resources. NCA shares with other strains the aim of preserving natural resources but rejects the utopian strain of thought as impractical and ineffectual, and the general conservationist position is rejected as imprecise and failing to recognise economic reality. Instead the NCA approach outlines a set of practical steps and policy prescriptions.

Questions of the relationship between human beings and nature are at least as old as human civilisation. The earliest religious and philosophical scholars, such as Hippocrates (Independent Publishers 2015) or St Francis of Assisi (the patron saint of ecology) (Scharper, 1998, p.26) pondered as to whether nature should be seen as a bountiful resource granted by God for the benefit of humanity, "let us make man in our image, according to our

likeness; and let them rule over the fish of the sea and over the birds of the sky and over the cattle and over all the earth, and over every creeping thing that creeps on the earth.” (Genesis, 1-26). Others, mostly outside the Western tradition (E Johnson, 2011), expound a bio or eco-centric view assigning neither special rights nor responsibilities to humanity. An intermediate position, as taken for example by Pope Francis (Pope Francis, May 22, 2014), sees mankind standing somewhere between God and nature in a stewardship role. These views are echoed, albeit in more specific formulations, in today’s debates between the proponents of NCA and their opponents such as George Monbiot (Monbiot, 2014).

2.2 Early Modern Environmental Thinking

Thinkers such as Anna Bramwell (Bramwell, 1989), trace the roots of the modern environmentalism movement back to 19th Century theorists such as John Ruskin and William Morris. For our purposes we can view the modern environmental or Green movement as emerging from the unprecedented growth in living standards and consumerism in the United States after the Second World War, spreading first to Western Europe and gradually to most of the rest of the world. The early Green movement had much in common with the counter culturalism of the 1960s and 1970s: in many ways hostile to economic growth, consumerism and, as some such as Anne Applebaum have argued (Wroth, 2009), humanity itself. The great consumer boom of the 1960s and early 70s was enjoyed against an ever more apparent backdrop of pollution and despoliation of nature on a scale unimaginable to previous generations. The effective death of mighty rivers such, as London’s Thames (Cavenagh, 2012), alongside visible air pollution and obvious damage to resources such as beaches, were starting to ring alarm bells well beyond the environmentally aware.

Early environmentalism tended towards apocalyptic predictions, most notably in Paul Ehrlich’s, ‘The Population Bomb’ (Ehrlich, 1971) early editions of which opened by stating, “The battle to feed all of humanity is over. In the 1970s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now. At this date nothing can prevent a substantial increase in the world death rate.” (Ehrlich, 1971). The seminal book of early environmentalism, *Small is Beautiful* by E F Schumacher (Schumacher, 1973), though only partly concerned with questions of environmentalism, makes extensive use of the concept of Natural Capital in the sense of nature as an essential input, or even prerequisite, of economic output, though draws different conclusions to today’s NCA movement. Whether this was his intention or not Schumacher was taken up by a neo-luddite strain of the counter cultural movement, idealising primitive or less complex societies and viewing contemporary society as in conflict with nature. As Bramwell puts it, “their hope of regeneration presupposes a return to primitivism, and thus, whether they wish to enunciate it or not, concomitant anarchy, the burning before the replanting, the cutting down of the dead tree. The principle of the movement is an utter rejection of all that is, and for at least three millennia all that was” (Bramwell, 2015).

Though the term only later became popular, the archetypal utopian environmental position is the ‘peak oil’ prediction based on M King Hubbert’s work on peak production (Peak Theory, Wikipedia, 2015). And it wasn’t only oil that was running out, much theorising, such as that by Fairfield Osborn dating back to 1948, saw humanity and nature as being on a collision course (Osborn, 1948). Radical utopian environmentalists, such as John Hanna’s Environmental Life Force (ELF) group (ELF, 2015), advanced a position that was not only more favourable towards

nature but actively hostile towards humanity. The failure of the apocalypse to materialise provided (as it still does), ammunition to opponents of environmentalism, and weakens the case of the utopian strain. The environmental pioneers may not have been hugely successful in changing behaviour but they did succeed in impressing their concerns on public consciousness and, as post-war economic growth began to falter in the 1970s under the pressure of events such as the tripling of oil prices, governments too began to take note.

2.3 Sustainability

Radical environmentalism still flourishes at the political extremes, for example amongst such movements as Occupy, but a more pragmatic school, which can be described as the sustainability approach, has since emerged. Theorists including Paul Hawken (Hawken, 2010), John Elkington (Elkington, 1999) and Jonathan Porritt (Porritt, 2013) advance a line of reasoning that seeks to soften and reduce the impact of human development on nature rather than seeking to reverse human progress. The sustainability agenda seeks to influence business decision makers essentially through an appeal to corporate citizenship and social responsibility.

Elkington (Elkington, 1999), for example, explores the three linked human goals of economic prosperity, environmental protection and social equality. Porritt, through the charity he chairs, Forum for the Future, seeks to engage with business to enable positive changes, focussing on food and energy production and arguing, in the context of sustainability that, “doing nothing presents real risks, acting now opens exciting opportunities” (Forum for the Future, 2015) Hawken lays out a road map towards what he describes as a “restorative economy”. (Hawken, 2010). All three theorists, as well as others in the field, seek to influence behaviour, of business in particular, through an appeal to enlightened self-interest.

As Porritt puts it on his website, “it is important for organisations to pay attention to the future to remain successful.” (Forum for the Future, 2015). Sustainability has been widely embraced by business and, in particular, the construction industry. The sustainability agenda has also found success in influencing legislation with, for example, the UK’s Carbon Reduction Commitment Energy Efficiency Scheme (CRC Energy Efficiency Scheme Order, 2013), which places a requirement on businesses to reduce carbon emissions and Part L of Building Regulation (The Building Regulation, 2010) requiring the conservation of fuel and power in dwellings, both clearly drawing heavily on sustainability thinking.

2.4 Tragedy of the Commons

The sustainability position offers a set of powerful arguments and an equally compelling set of solutions. However, as persuasively argued by Garrett Hardin (Hardin, 1977), rationality and appeals to enlightened self-interest are not enough. In his influential concept of The Tragedy of the Commons, Hardin illustrates how the common interest is defeated by self-interest. Taking the example of a piece of common grazing land,

... when the carrying capacity of the commons was fully reached, a herdsman might ask himself, ‘Should I add another animal to my herd?’ Because the herdsman owned his animals, the gain of so doing would come solely to him. But the loss incurred by overloading the pasture would be “commonized” among all the herdsman. Because the privatized gain would exceed his share of the

commonized loss, a self-seeking herdsman would add another animal to his herd - And another - And reasoning in the same way, so would all the other herdsman. Ultimately, the common property would be ruined. Even when herdsman understand the long-run consequences of their actions, they generally are powerless to prevent such damage without some coercive means of controlling the actions of each individual.

(Hardin, 2015)

The Tragedy of the Commons provides a compelling explanation for the human tendency to operate against its own collective best interests by, for example, over-fishing to the point where species are driven to extinction, excessive rain forest destruction and rampant depletion of non-renewable resources. Most importantly, Hardin's idea makes clear why the appeal to reason just doesn't work.

2.5 The Natural Capitalists

Is coercion then the only answer? Coercion, in this context, means legislative and regulatory pressure whereby companies and individuals are required by law to address issues of sustainability or where tax or trading systems are designed to influence behaviour. The Natural Capitalists, most notably Dieter Helm (Helm, 2015) and Tony Juniper (Juniper, 2015) argue that there is a very important place for coercion but that a comprehensive NCA approach is a more effective route to the same ends. Juniper (Juniper, 2015) puts forward, and illustrates through extensive examples, a straightforward argument: Nature can be viewed as a set of interconnecting eco-system services providing for and underpinning not only economic growth but human existence. Ecosystem services range from the precise and essential such as pollination, water purification, soil formation, nutrient recycling, climate regulation, carbon sequestration and pest control through to the more abstract such as enjoyment of landscapes, outdoor recreation and the spiritual value that some find in nature. Having identified a range of ecosystem services, Juniper goes on to argue that, by putting a financial value on these services, politicians and business leaders will be persuaded to protect and preserve them. In fact, with values assigned, landowners can be paid for the provision of these services and market forces will determine their continued availability. For Juniper then, identification and assignment of value to ecosystem services that have previously been considered 'free' is the key to their preservation rather than a coercive or legislative approach.

2.6 The natural Capital Aggregate Rules

Dieter Helm (Helm, 2015) approaches the same questions more from the perspective of an economist than an environmentalist. Helm extrapolates from current economic and population growth rates to outline a near future in which the global economy is sixteen times its present size and the human population is approaching 12 billion. While he does not see the situation he presents as necessarily catastrophic he does argue that, if we continue on our present path, the world bequeathed to the next generations is not one in which we would wish to live. There is nothing wrong, argues Helm, with economic growth and even with a global economy sixteen times its current size. But, for such a world to be bearable, he posits two versions of what he calls, the aggregate natural capital rule:

[The] weak aggregate natural capital rule: the aggregate level of renewable natural capital should be kept at least constant and there should be general capital compensation for the depletion of non-

renewables” and; the “strong aggregate natural capital rule: the aggregate level of renewable natural capital should be kept at least constant and the value of the economic rents from the depletion of non-renewable natural capital should be invested in renewable natural capital.

(Helm, 2015, p.64)

Without a clear understanding of the two aggregate rules, NCA is susceptible to the criticism that it is little more than a collection of new names for old ideas.

However, a full grasp of the aggregate rules makes it clear that, in fact, NCA is proposing something new. The utilisation of capital is a key business concept. The success of an enterprise is not measured solely with reference to the Profit & Loss (P&L) statement. To fully understand the performance of an organisation it is also essential to assess return on capital by examining the balance sheet. A thriving company will not only generate a healthy return on capital employed but will usually increase the level of capital available to fuel future growth. In the case of a company, capital is measured in terms of financial resources (cash in the bank) and assets (property, plant and machinery). Large profits at the cost of severe capital depletion are a recipe for bankruptcy. Helm argues that a focus on Gross Domestic Product (GDP) as the key metric for economic success is very much like focussing exclusively on a company's P&L Statement. He makes the critical point that, when we examine national GDP accounts, there is nothing analogous to a company balance sheet to allow an assessment of the availability of all forms of capital (including natural). Is an impressive rate of GDP growth of, say 5% pa, really quite so impressive, he asks, if it is achieved by depletion of non-renewable resources and conversion of renewable into non-renewable by, for example, overfishing.

Complete adherence to Helm's aggregate rules would require an initial 'stock take' of existing capital resources at a national level, though we can start with a less than complete stock taking exercise focussing in the first instance on critical resources and those where fast results can be achieved. For the UK, as well as assigning value to the country's natural capital resources, this would involve valuing, for example, Heathrow Airport, the port of Dover, the M1 motorway and the hospital estate of the NHS. Identifying and valuing the components of the entire national stock of natural capital is not a trivial task. Helm proposes a variety of methods, for example, we might place a value on a particular landscape by looking at the price premium achieved by houses enjoying a view of that landscape. The key point though is not whether the assigned values are somehow a 'real' reflection of absolute value; but simply that a measurable and commensurable valuing system is applied so that it becomes possible and meaningful to compare separate elements of Natural Capital such as, fresh water fish stocks and forests. Helm makes clear that he is not in fact attempting to put a price on nature rather he is using financial measurement as a well-established method of comparing value. Crucially, from the point of view of industry, the methods used to assign value are not important, what matters is simply that the valuation is done.

On the weak aggregate rule, then, we are asked to pay:

1) for the use of renewable resources by ensuring either their replenishment or a compensating increase in other commensurable (by value) renewable resources and; 2) for the use of non-renewable resources through a

compensating increase in the overall stock of capital including national infrastructure. The strong rule requires compensation for the use of non-renewable resources to be applied to renewables. Rather than the imprecise idea of inter-generational responsibilities (when does one generation end and a new one begin?) NCA uses defined annual accounting periods for measurement against the aggregate rules. Considering the question posed above as to the need for coercion, it is worth noting that it is not necessary to pass laws or introduce financial penalties or incentives to compel accountants and boards of directors to pay attention to balance sheets, or for economists to review GDP figures: NCA, as outlined by Helm, brings the real numbers underlying economic growth to the surface. He is particularly impressed by the Norwegian sovereign wealth fund in which, in stark contrast to the UK, the proceeds of North Sea Oil have been invested and is forecast to reach \$1 Trillion by 2020 (Price, 2013). Norway meets most of its domestic electricity needs through hydro-power, keeping down demand for oil and allowing the export of most of its North Sea oil production the proceeds from which are invested in foreign stocks and bonds.

Norway, in many ways the poster child for the prudent management of natural capital wealth, has a legislated commitment to reporting annually on its national capital and to increasing that national capital year-to-year. That process, tellingly managed by its Ministry of Finance, results in a report that shows how various forms of capital in Norway (human, built, financial, and natural – split into renewable and non-renewable) are changing over time, and whether they are (in the aggregate) increasing.

(Sustainable Prosperity, 2014)

Helm suggests that the Norwegian model should be adopted worldwide for the investment of the proceeds from non-renewable depletion.

2.7 Opposition to Natural Capital Accounting

While NCA would seem to be a practical advance on the simple sustainability model and to provide a cogent road map by which some of the more dire predictions for the future can be avoided, it is not without its critics. Perhaps most scathing amongst these is the activist and writer George Monbiot. In a lecture to the Sheffield Political Economy Research Institute (SPERI) in 2014 (Monbiot, 2014) Monbiot argues that the NCA stance essentially adopts the, discredited, according to Monbiot, neoliberal economic doctrine whereby the market knows best

Just at this moment, this perfect moment of the total moral and ideological collapse of the neoliberal capitalist system, some environmentalists stumble across it and say, 'This is the answer to saving the natural world.' And they devise a series of ideas and theories and mechanisms which are supposed to do what we've been unable to do by other means: to protect the world from the despoliation and degradation which have done it so much harm.

(Monbiot, 2014)

Monbiot presents three arguments against NCA:

1. He attacks the aggregate rule on the grounds that non-commensurable values are being compared, it is simply nonsense (“marmalade”) to compare, for example, arbitrary values assigned to a fresh water ecosystem to equally arbitrary values assigned to the plants that thrive on protected grasslands.
2. He objects to the “economisation” of nature arguing that the NCA agenda is, “pushing the natural world even further into the system that is eating it alive.” (Monbiot, 2014) How, he asks, can the system which produced the banking crisis and economic crash of 2008 be trusted with the natural world?
3. The uneven distribution of power between regulators and regulated is his final objection. He holds that even if the valuing system of NCA was meaningful, regulators in the form of, e.g. national governments do not have the power or will to compel markets to behave accordingly. To illustrate this, he points to the European Emissions Trading System (Directive, 2003) which prices carbon emissions at around £3.50 per tonne rather than the £30 a tonne he holds necessary to provide a disincentive to fossil fuel use. He sees this artificially low price as resulting from the lobbying power of industry.

“What we are talking about”, he concludes, “is giving the natural world to the City of London, the financial centre, to look after. What could possibly go wrong?” (Monbiot, 2014).

2.8 Response to Criticism

Monbiot’s argument doesn’t actually amount to a great deal more than a plea to accept a duty towards nature and/or future generations without financial incentives. But, one of the key contentions of NCA is precisely that such moral appeals have not worked. Lynn Crowe, Professor of Environmental Management at Sheffield Hallam University, points out that the NCA approach provides a mechanism by which scientists, “can explain to society what will happen if they ignore the inter-relationships within ecosystems”, while accepting that, “our decision-making systems (neoliberal or otherwise) are created by other means.” (Guardian, 2014). Tony Juniper responds to Monbiot by arguing that, ‘we need a new kind of economic system ... whereby the natural systems that sustain us are fully integrated with economic policy.’ (Guardian, 2014).

Other opponents of NCA, such as Joss Tantram, Corporate Sustainability Partner at Terrafiniti LLP, tend to caricature NCA as simply putting a price on nature: “if you could achieve a price that you were happy to receive in order to sell your mother, could you use that money to buy yourself another.” (Guardian, 2014). But, this *reductio ad absurdum* attack on NCA fails to address the reason why it is gaining acceptance, i.e., it provides a practical means by which the human interest in environmental preservation can be reconciled with the equally pressing human concern to lift the world out of poverty and continue improving the living conditions, life expectancy, health and economic wellbeing of all. NCA does not hold all the answers and its proponents make no such claim but its adoption does provide a more compelling starting point than either the fundamentalist or strong sustainability approaches.

3. Research and Findings

Imagine a world where business conserves and enhances natural capital. Consider, in contrast, the world that we live in today. The gap between these two worlds highlights the positive and significant role that business can and must play in addressing the enormous environmental challenges we all face.

(Introduction to the Draft Natural Capital Protocol, November 2015)

Having seen how NCA differs from other approaches to environmental protection and its place in the wider environmental debate we can now examine, through case studies, interviews and an industry specific survey, the applicability and understanding of NCA thinking to industry and, in particular, the construction industry. As outlined above, the NCA approach is in its infancy and has not yet been widely deployed. It has been necessary therefore to go outside the construction industry in search of concrete examples. However, as will be shown, the ideas involved are gaining acceptance within the construction industry. Two case studies are presented. One (Kering) far removed from construction but clearly illustrating key NCA concepts and the second (Utiylix) more closely related to construction in its focus on energy. The case studies are followed by two interviews (see Appendix 1 for interview questions) with key company representatives, one (Lafarge Tarmac) from within the construction industry and the other (The Crown Estate) closely related. Both companies piloted the UK Government's Natural Capital Committee's work on how to measure and value changes in both the UK's overall natural capital and that of land owning organisations. While it is in the nature of NCA that primarily quantitative methods are used, at this stage in the development of NCA the analysis of the case studies and interviews presented here remains an essentially qualitative process informed by the definitions outlined in section two above. Focussing directly on the construction industry, the work that Sir Robert McAlpine has jointly undertaken with Hammerson and Trucost on trialling Natural Capital Accounting to calculate the environmental benefits of selected building design options is then discussed. Finally, to gauge awareness of Natural Capital Accounting within the construction industry, albeit amongst sustainability professionals, a quantitative approach was taken with the findings of a short survey presented.

3.1 Case Studies

3.1.1 Case Study 1: Kering Environmental Profit & Loss (E P&L) 2013

Kering is a growing group of high-profile, profitable brands that create apparel and accessories for the luxury and sport and lifecycle markets' (Kering, 2016). Some of the Kering brands include Gucci, Stella McCartney and Puma. The company's 2014 Activity Report (Kering, 2015) shows a turnover of just over €10 billion with a very impressive net profit of 16.6% or €1.6 billion. Kering's CEO, Francois-Henri Pinault, 'take[s] the view that business needs to recognise its reliance on natural capital [and] doing so will lead to new environmentally responsible approaches, which is not only good for the environment and for society but for business itself.' In response Kering was the first company to develop an Environmental Profit & Loss (E P &L) account, a tool that helps identify and account for the value of natural capital to its business. The company has implemented an E P&L analysis across all the brand's supply chains to measure their environmental impact, and highlight environmental risk and business opportunities across the supply chain ensuring a more resilient business for the future.

3.1.2 Kering Methodology

The report argues that the methodology used 'goes far beyond traditional environmental reporting' (Kering, 2015 p.12) by broadening the scope way beyond the company's own operation and extending the focus across the entire supply chain and covering all the major categories of environmental impact including greenhouse gas emissions, air pollution, water consumption, water pollution, waste disposal and changes in ecosystem services with respect to the company's own operations and its entire global supply chain as outlined in Table 1 below. There is no data in table 1 below as it is placed there to demonstrate the monitoring of 5 environmental impacts across the company's full supply chain.

Table 1: Kering, five environmental impacts and across full supply chain

Environmental Impacts	Tier 0: Operations & Stores	Tier 1: Final Assembly	Tier 2: Preparations & Sub-components	Tier 3: Raw Material Processing	Tier 4: Raw Material Production
Greenhouse Gas Emissions					
Water Consumption					
Waste					
Water Pollution					
Air Pollution					
Land Use					

The E P&L measures across three dimensions:

- 1) Quantifying the environmental footprint, with the six impact areas grouped across 62 indicators covering different types of emissions and resource use.
- 2) Estimating the likely environmental changes resulting from emissions and resource use, calculated based on the local environmental context.
- 3) Valuing the change in wellbeing, i.e. the consequences of environmental changes for people's wellbeing are then valued in monetary terms consistent with policy recommendations of the EU.

Table 2 below shows the pollutants emitted and resources used by the business' operations along its supply chain. The resultant environmental changes caused by a business' operation are then valued in monetary terms.

Table 2: Kering, three dimensions of measurement

Emissions & Resource Use	Emissions & Resource Use Metrics	Environmental Change	Change in Wellbeing
Air Pollution	Emissions of pollutants (PM2.5 PM10 NOx, SOx VOCs NH, CFCs etc.) in kg	Increase in concentration of pollution	Respiratory disease, agricultural losses, reduced visibility
Greenhouse Gas Emissions	Emissions of greenhouse gases (N2O, CH, CFCs etc.) in kg	Climate change	Health impacts, economic losses, change in natural environment
Land Use	Area of tropical forest temperate forest, inland wetland, etc. in hectares	Reduced ecosystem services	Health impacts, economic losses, reduced recreational and cultural benefits
Waste	Hazardous and non-hazardous waste in kg	Climate change dis-amenity and contamination	Reduced enjoyment of local environment, decontamination costs
Water Consumption	Water consumption in m3	Increasing water scarcity	Malnutrition and disease
Water Pollution	Release of specific heavy metals, nutrients, toxic compounds in kg	Reduced water quality	Health impacts eutrophication, economic losses

While Kering acknowledges (Kering, 2015 p.29) that, 'in contrast to financial accounting there are currently no established and globally accepted standards and methodology for estimating [these] value[s]' the matrices above can be used as a means of placing a monetary value (albeit an arbitrary one as determined by Kering) on these changes associated with the environmental impacts of a given business along its entire supply chain. The methodology outlined can be applied to singular raw materials, energy systems evaluation, or entire business units and companies. Kering's E P&L examined environmental impacts across all of the businesses in the group.

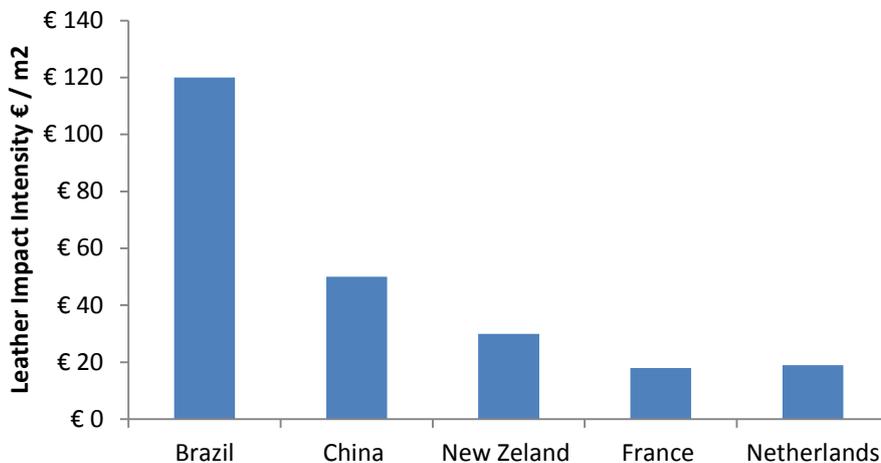
3.1.3 Kering Results

Kering analysed results across 578 manufacturing processes, 107 raw materials and 129 countries and found only 7% of the company's environmental impact deriving from its core operations of retail stores, offices and warehouses (Tier 0). Approximately 50% of the total impact is found at the far end of the supply chain (Tier 4, Raw Material Production), with 25% in Tier 3, Raw Material Processing, 17% in Tiers 1 and 2, Preparation and Final Assembly. If nothing else, the Kering study shows that focussing on core operations is inadequate in determining environmental impact.

How can Kering, or other companies, make use of analysis of this type? Clearly, an E P&L analysis across the entire supply chain can help the company to identify the location of significant vulnerabilities, indicate where investment in sustainability can have the greatest environmental and societal benefit, reduce risk vis a vis anticipated environmental regulation, ensuring resilience of natural resources, and ensuring timely supply of raw materials of the right quantity and quality and guaranteeing sustainable yields from existing land. For example, uncovering the full costs in its supply chain allowed Kering to identify glaring differences, for example, in the real

cost of leather production in Europe (intuitively thought to be expensive) versus Brazil (intuitively thought to be cheap) as shown below:

Graph 1: Kering, comparison of International Impact of Leather Production



The company was also able to use these findings to develop new metal-free tanning processes, reducing Tier 3 water use by 30% and energy consumption by 20% and, overall, to show its own performance in terms of environmental impact (Kering, 2015 p.29) as some 29% better (i.e. less) than the typical industry equivalent, at €773 million versus €1.1 billion.

3.1.4 Kering E P&L and Natural Capital Accounting

Bearing in mind the definitions and analysis presented in Section One of this study we can now ask to what extent Kering's approach to E P&L fits into the natural capital accounting paradigm. Kering (Kering, 2015 p.20) makes explicit reference to the tragedy of the commons concept explored previously (Kering, 2015 p.9) above, pointing out that 'the stocks of resources available from nature have been treated as "free" by business and society....and, where possible [we need to] invest in the restoration and enhancement of natural capital. This reasoning very much fits with Helm's Strong Aggregate Capital Rule (Helm, 2015 p. 64) above. Kering, however, is equally explicit (Kering, 2015 p.7) that 'the results [of the E P&L] are not related to Kering's financial results, past, present or future, and do not represent a financial liability or cost to Kering.' A strict application of Helm's strong aggregate rule, on the other hand would surely see a reduction of €773 million (reported environmental impact) on Kering's €1.6 billion reported profit, leaving a very respectable €827 million profit and a substantial €773 million fund for investment in natural capital. At the same time it is hardly reasonable to criticise Kering for not being the first to step up, sacrifice profit and invest. Kering's E P&L is a real start in natural capital accounting and, in fact, E P&Ls, such as that produced by Kering, are a necessary condition of true Natural Capital accounting although we must be aware that they are not a sufficient condition.

3.1.5 Case Study 2: Utilyx, Monetising Natural Capital through Environmental Profit & Loss for Decentralised Energy Assets

'Utilyx is a specialist energy consultancy [which] work[s] with businesses and organisations to help reduce costs and carbon emissions, develop smarter ways to meet energy needs and better manage the risks posed by volatile markets (Utilyx, 2016). Utilyx commissioned Trucost to develop an Environmental Profit and Loss account of the

energy centre at Addenbrooke's hospital, which has a decentralised energy system comprising Combined Heat and Power (CHP) technology, gas boilers, biomass boiler and an incinerator (Utiyx, 2013).

The Utiyx approach differs in a number of respects from Case Study 1 most notably in that it compares one method of energy production to a conventional baseline in order to identify the monetised net environmental benefits and savings of one approach over another. The conventional baseline in this study was using electricity off the grid to power the hospital as opposed to build a CHP energy centre to provide heat and power to the hospital.

It differs also in edging closer to a statement of liability (in the context of Natural Capital Accounting) with the introductory statement 'the E P&L represents how much we would need to pay for the impacts we cause and the services nature provides' (Utiyx, 2013, p.1).

The net environmental benefits are expressed by subtracting the E P&L of the new technology from the E P&L of the baseline technology with values assigned in line with the Greenhouse Gas Project Protocol (GHGPP) developed by the World Resources Institute and World Business Council (Green House Gas Protocol, 2016). The GHG project protocol recommends that all primary and secondary effects associated with a project activity are identified across its entire value chain – including all upstream and (products to a project) and downstream (products produced) activities (Utiyx, 2013 p.6).

The GHGPP identifies six primary project activity effects that should be identified across the entire project value chain, both up and downstream:

- Reduction in combustion emissions from generating grid-connected electricity.
- Reductions in combustion emissions from generating energy or off-grid electricity or from flaring.
- Reductions in industrial process emissions from a change in industrial activities or management practices.
- Reductions in fugitive emissions.
- Reductions in waste emissions
- Increased storage or removals of CO₂ by biological processes.

Secondary effects cover unintended changes caused by a project which can be positive or negative. For purposes of comparison the baseline system should:

- Provide an identical or (nearly identical) product or service to that of the project activity
- Have the same lifetime
- Be in the same geographical area
- Be in the same temporal range as the project

The Addenbrooke's energy centre scheme utilises: 1) gas fired combined heat and power (CHP); 2) two biomass steam boilers (fuelled by waste wood); 3) a clinical waste incinerator and; 4) three dual fuel conventional boilers.

The tables below outline the comparison between the energy centre scheme and the baseline.

Table 3 below relates to the energy centre's activity and services that it provides to the hospital. The project boundaries against each activity are defined as these were the cut off points for assigning financial valuations for those activities.

Table 3: Addenbrooke's, overview of project activities and effects

Project activity	Product and or service	Effect type	Project Boundaries
Generation of electricity and heat from Addenbrooke's energy centre	a) 52,325,859 kWh b) 64,179,913 kWh net heat output	Primary	a) The processing (including waste treatment) and transportation of wood fuel to the energy centre and supply of natural gas b) the supply of non-fuel inputs c) The operations of the energy centre
Energy centre construction	N/A	Secondary (one-time)	The construction of the energy centre
Diversion of waste wood from landfill	7,537 tonnes of waste wood	Secondary (one-time)	The landfilling of waste wood

Table 4 lists those environmental key performance indicators (eKPIs) that were selected for financial valuation based on the project activities. For example, one of the activities was the construction of the energy centre. All the pollutants emitted and water consumed during the construction phase was accounted for and assigned financial values based on the societal impacts of pollutants emitted and resources used.

Table 4: Addenbrooke's, overview of eKPIs used for analysis

Project Activity	eKPIs
Generation of electricity and heat from Addenbrooke's energy centre	1. GHGs (All Kyoto Gases) 2. Air pollution: Sulphur dioxide(SO ²), Nitrogen Oxides (Nox), Carbon monoxide (CO), Particulate matters (PM1,PM2.5), Volatile Organic Compound (VOCs) 3. Heavy metals to air: Arsenic (AS), Cadmium (Cd), Chromium (Cr), Nickel (Ni) Lead (Pb), Mercury (Hg) 4. Water consumption 5. Water pollution
Energy centre construction	1. GHGs (All Kyoto Gases) 2. Air pollution (same pollutants as above) 3. Water consumption
Diversion from waste wood from landfill	1. GHGs (All Kyoto Gases) 2. Air pollution (same pollutants as above) 3. Water consumption

Table 5 lists the savings made by construction of the CHP energy centre to provide heat and power to the hospital over a 25 year period as opposed to using the baseline scenario of getting electricity off the grid to power the hospital over the same duration.

Table 5: Savings identified

Activity	Emission Type	Savings
Generation of Electricity & Heat	GHGs	£55,442,225
Generation of Electricity & Heat	Air Pollution	£8,938,900
Diversion from Landfill	GHGs	£4,329,700
Water Consumption	N/A	£2,960,175
	Lifetime Savings	£71,671,000

3.1.6 Addenbrooke's E P&L and Natural Capital Accounting

As with the Kering case study it is worth asking whether the Addenbrooke's approach fits with the Natural Capital Accounting concepts explored in section one of the study. Does the comparison of a more with a less sustainable approach fit with Natural Capital Accounting? At first glance it is not immediately obvious that it does but, like the Kering study, it does firmly identify the natural capital elements of interest and, indeed, it goes much further by assigning monetary values via the GHG protocol. And, in contrast to Kering, the acknowledgement of some sort of potential financial liability is refreshing and close to the spirit if not necessarily the letter of Helm's aggregate rules.

3.2 Interviews

3.2.1 Interview 1: Sustainability Manager at Lafarge Tarmac

Lafarge Tarmac is a major provider of construction products, services and solutions with 6,900 employees and 390 UK sites including 120 quarries, 74 asphalt plants, 100 readymix concrete plants, 22 contracting offices and three cement & lime plants (Lafarge Tarmac, 2016). Lafarge Tarmac chooses to pilot the Natural Capital Committee's Natural Capital Accounting framework at its Mancetter Quarry. This pilot formed part of the Natural Capital Committee's report, 'The State of Natural Capital' published in March 2014 (Natural Capital Committee, 2014). At the end of its operational life in 2031 the quarry will be restored to a nature reserve with recreation facilities.

Prior to undertaking the natural capital evaluation of the quarry, Lafarge Tarmac had undertaken a company level assessment to determine those issues most important for the protection of people and the environment. Initially 70 – 80 individual areas were identified as having most significance to business and stakeholders. Eight internal subject matter experts were deployed to narrow these down to a single overriding goal, i.e. that the company should provide a net positive contribution to communities. This company level goal informed the subsequent natural capital assessment at the quarry, helping to clearly set and communicate the scope and boundaries of the assessment. The natural capital pilot study at the quarry clearly showed the intangible benefits the quarry provides and will continue to provide after its restoration to the local community.

The assessment was undertaken by a consortium of consultants from the Natural Capital Committee, including Economics for the Environment Consultancy (Eftec) and Price Waterhouse Cooper (PWC) concentrating on value assessment, and the Royal Society for the Protection of Birds (RSPB) with responsibility for the ecological assessment. Though the quarry had had an environmental impact assessment done eight years earlier the data from this survey was deemed outdated. A new species and habitat survey was undertaken, as well as a walk over survey and the collection of other data and evidence. Data collection involved two people over 12 weeks after

* In fact the study identifies a total of £79,480,454 of savings though only those shown in the table are broken out.

which the consultants provided the analysis. Overall, collecting and preparing all of the data required by the NCA approach to capturing the value of ecosystem services to business and the local community took six months.

Monetary values were assigned by cost consultants giving rise to questions as to how these values were derived. The Sustainability Manager pointed to a particular difficulty with valuation principles mentioning, for example, the relatively well known problem of carbon offset* pricing where the price per tonne can appear in a range from 50p to £80. For NCA to be more robust a standardised valuation mechanism is required.

At a practical level, a major benefit of the study was the highlighting of a costly and inefficient method being used to clean water discharged from the quarry into a river. The revelation of the £30,000 cost of pumping the water through an open lagoon circulation system prior to discharge allowed the financing of a reed bed to be brought forward by two years. Using the reed bed is a natural way to clean the water before discharge and eliminates the need to use fuel, providing significant savings on both cost and CO₂ emissions (Eftec & PWC, 2015).

3.2.2 Conclusion

Lafarge Tarmac felt that the NCA pilot study had been beneficial. However there was criticism that the benefits of using construction products to society were not included in the assessment. The manufacturing, distribution and use of construction products in buildings and infrastructure creates environmental pollution, however it also creates benefits to society as it creates improved infrastructure and buildings that enhance the wellbeing of individuals. The Sustainability Manager also pointed to the cost of the pilot study, with one data analysis consultant costing £4,000 over a one month period. If the company were to roll this type of assessment out over their 350 operations the cost would be prohibitive or, at the least, would require a very strong business case. It might be possible to undertake such assessments if the time scale could be reduced to two weeks data gathering and assessment per site, with assessments undertaken at five year intervals.

Though Lafarge has the necessary ecologist and quantity surveyor in house, NCA assessments are seen as an additional cost without obvious benefit, though this would change were NCA concepts to become embedded within existing processes, most importantly, back office data processing. There is little doubt that NCA can be beneficial at a corporate rather than a site level. But devolving responsibility for data gathering and analysis to site level, where the benefits are harder to perceive, is an obstacle to adoption.

3.2.3 Lafarge Tarmac and Natural Capital Accounting

The Lafarge approach seems to fit squarely into Helm's concept of Natural Capital Accounting with a direct correlation between the benefits derived by the company from the ecosystem services exploited via the quarrying operation (which can be seen as debits on the natural capital balance sheet) and the costs accepted by the company with regard to the eventual creation of a nature reserve with recreation facilities (credits on the natural capital balance sheet). Even more interesting is the identification of cost savings (water filtration) during the lifetime of the quarry, giving credence to the idea that NCA can be beneficial to companies as well as the environment. At the same time, Lafarge again points to the resource intensity of data acquisition and, in raising the question of what precisely is included in the assessment, raises a thorny problem for NCA. Taking the weak aggregate rule there is

* As discussed in Section 2.8

certainly room to argue that the contribution of the construction industry to the national infrastructure (increase in capital on the balance sheet) more than outweighs the depletion of natural capital (decrease in balance sheet capital) involved in construction and relieves the industry of the duty implicit in NCA to invest some of its profits in (natural and other) capital projects

3.2.4 Interview 2: Sustainability Director at the Crown Estate

The Crown Estate is one of the main land and property owners in the UK with a portfolio of urban properties and rural holdings, including the wider Windsor Estate covering 146,000 hectares of agriculture, forestry, minerals and property. The Crown Estate participated in the development of the Corporate Natural Capital Framework by using the Windsor Estate as a pilot study to evaluate the total natural capital contribution the estate makes to society.

The main business activity on the pilot site is farming and forestry, with the park also open for recreation. The major land cover is made up of farmland, woodland, parkland and open water bodies. The Estate provides significant services supported by natural capital including food provision, timber, recreation, landscape amenity, climate regulation and filtration.

3.2.5 Methodology Used

Due to the large size of the estate and the time and resources involved in data collection it was not seen as practicable to collect bottom up data from all of the sites. Instead, a top down natural capital assessment approach was deployed, using previously modelled valuation data from the UK National Ecosystem Assessment (UK NEA)², developed by Bateman et al. (Bateman et al, 2014). Part of the Living with Environmental Change (LWEC) Initiative the UK NEA ran from 2009 to 2011 and brought together expertise from government, industry, academia and NGOs. With support from consultants, Route2Sustainability, and using Geographic Information System (GIS) mapping, the data model was applied to a two km square grid sample of Windsor Great Park with results extrapolated from this sample.

3.2.6 Results

Maintenance of Windsor Great Park, and the deer by which it is inhabited, is an expensive operation, meaning that by any conventional accounting scheme the park is a loss making operation, with these losses offset by income from property, agriculture and forestry. From a natural capital perspective however, Windsor Great Park is home to the largest collection of veteran (some up to 800 years old) Oak trees in the UK (and possibly Europe), a wide range and diversity of invertebrates including rare species some only known in the UK from this location, and rich fungal assemblages (Joint nature and Conservation Committee, 2016). The park attracts some three million visitors annually.

The following ecosystem services provided by the park were assessed in the study;

- The role of its trees in filtering local air pollution
- The enjoyment of the park by 3 million annual visitors
- The reduction of greenhouses gasses resulting from carbon sequestration and storage by the site's soils and vegetation.
- The enjoyment of quality of life by people living in the areas surrounding the park

Based on Bateman's ecosystem services assessment model the ecosystem services of the park were valued at £4.4 Million per annum, providing a snapshot in time of the park's economic value. The NCA approach, therefore, transforms the park from a loss making enterprise as determined by conventional accounting into a valuable and profitable asset.

3.2.7 Conclusion

It was felt that the natural capital assessment had been useful in highlighting the wider value of the park in a way that couldn't be shown using conventional accounting methods, although it was emphasised that the study had not resulted in any changes to management practices as a sound land management methodology was already in place. The Bateman model might be more usefully applied in a comparative study perhaps looking at changing land usage over time or looking at trees cut down versus planted. The top down approach was also questioned as was the idea of extrapolating values from a single sample grid to the whole park, in this case with primarily forestry data applied to other ecosystems: site specific data would have been more useful. Building on this study the Crown Estate is now moving into a supply chain assessment across ten main natural materials (including copper and iron) in use within estate developments.

3.2.8 The Crown Estate and Natural Capital Accounting

Unlike either of the case studies or the first interview above, the Crown Estate study is not primarily concerned with depletion and replacement of natural capital rather it focusses on identifying value in ecosystem services. While all of the other studies are focussed on the debit column of the natural capital balance sheet, Crown Estate is very much focussed on the credit column. Once again, Crown Estate identifies resource and labour constraints, as well as some shortcomings, in the methodology deployed. On the other hand the Crown Estate study shows a path towards resolving the weakness identified in all other studies reviewed, i.e. the absence of an accepted valuation methodology. While the Crown Estates was not entirely satisfied with the methodology, nonetheless, the use of any methodological approach to this difficult question provides a starting point for remedying a significant weakness in the NCA approach.

3.3 Case Study – Built Asset Design Option

Although, yet to be applied across the business, Sir Robert McAlpine working with Hammerson and Trucost has deployed NCA principles to undertake an independent study on the WestQuay shopping development in Southampton to calculate the monetised environmental benefits of the selected building design option, using renewable technology compared to conventional energy system used in similar developments. The use of Photovoltaic (PV) panels and LED energy efficient lighting is compared to standard fluorescent lighting systems with the use of renewables and energy efficient products shown as monetary values reflecting the natural capital savings associated with their implementation.

The use of PV panels against "business as usual" standard energy system and the use of LED energy efficient lighting compared against standard fluorescent lighting system was investigated. The study translated the environmental benefits of using renewables and energy efficient products into monetary value that reflects the natural capital savings associated with their implementation. The environmental benefits of the selected technologies were calculated based on NCA principles and used to inform design decisions on the part of the

commissioning client's development and project management teams, and those of the main contractor undertaking its construction. By undertaking this study it is intended that both the client and main contractor can be assisted in their aspiration to design and develop built assets which have a positive environmental impact over their lifetime.

3.3.1 SRM/Hammerson/Trucost and Natural Capital Accounting

Very much like the Utilyx/Addenbrooke's case study explored previously the SRM/Hammerson/Trucost study utilises NCA concepts to compare one approach (more sustainable) to another (traditional) and, by doing this in monetary terms, makes a compelling case for the more environmentally friendly approach. While, from a sustainability perspective, this is laudable it does not directly address Helm's aggregate rules without which NCA remains susceptible to the charge that all that is involved is placing arbitrary monetary values on nature. Nonetheless, this more limited use of NCA provides a starting point for the wider and more ambitious goals of NCA approach.

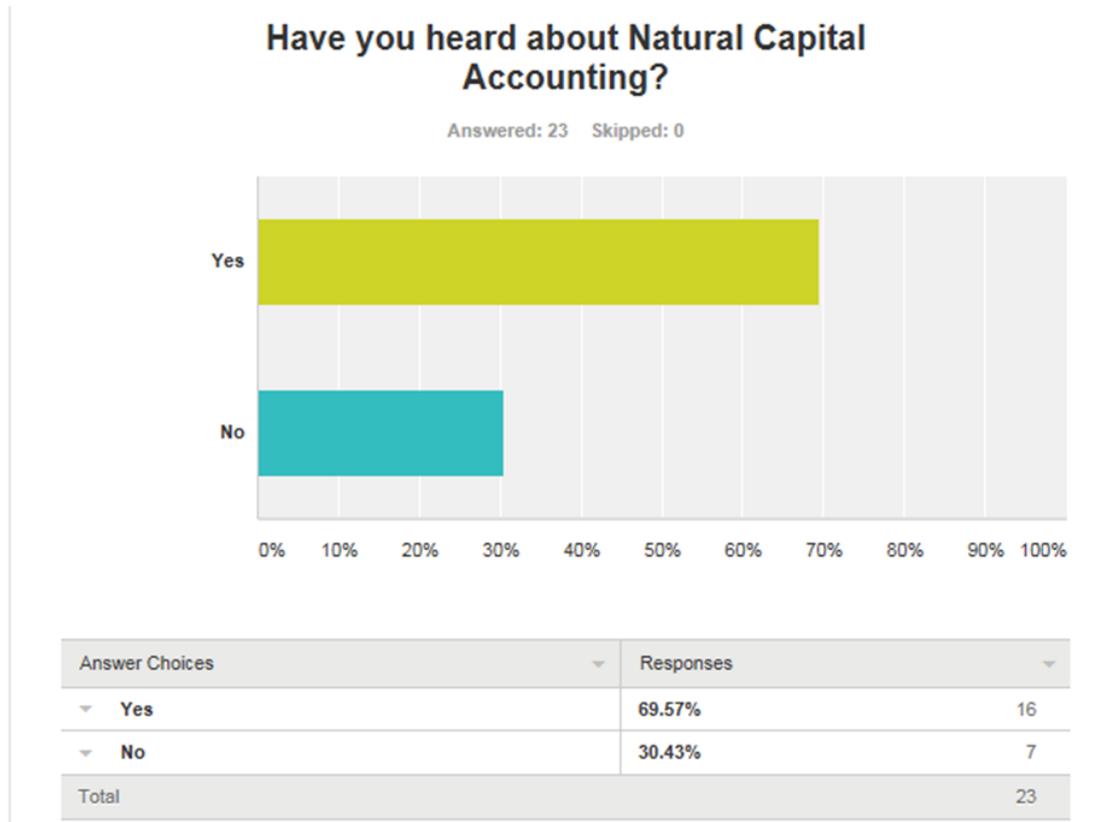
3.4 Survey Findings

A short survey questionnaire was designed using Survey Monkey (Survey Monkey, 2016) and sent to sustainability professionals who work in the construction sector and to companies within the top 100 UK contractors. Organisations such as the UK Contractors Group and CIRIA were contacted to ask some of their members to complete the survey. The survey was sent to 50 participants of whom 23 responded. The survey was devised to gauge awareness of NCA amongst sustainability professionals within the construction Industry. While sustainability professionals may be expected to have some awareness of emerging trends, and the sample size was rather small, the results are, nonetheless, revealing in respect of the growing awareness of and interest in the subject. Perhaps even more interesting than the numerical results are the more free-form responses provided by some respondents, a selection of which has been included below.

3.4.1 Question One: Have you heard about Natural Capital Accounting?

This question aims to establish an awareness baseline amongst sustainability professionals within the construction industry and while awareness might reasonably be expected to be relatively high, given the history of environmental awareness within the construction industry, a high level of awareness amongst this group can be seen as a precursor to more general awareness within the industry. Perhaps a 30% level of unawareness should be seen as surprising.

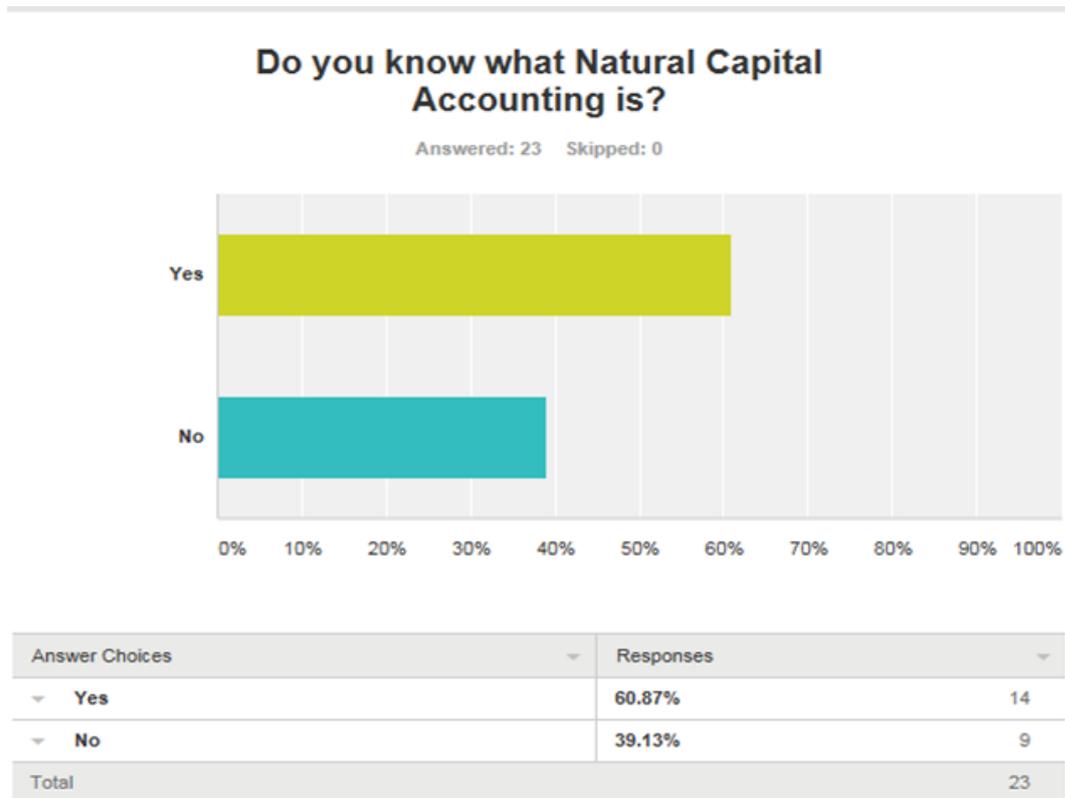
Figure 1: Level of NCA awareness



3.4.2 Question Two: Do you know What Natural Capital Accounting Is?

Having gauged awareness of the concept, this question goes on to explore the extent to which the idea is understood. Accepting that participants who were aware of the concept might have a tendency to also claim an understanding the results are, nonetheless, encouraging in the sense that sustainability professionals within the industry are clearly keeping abreast of current thinking.

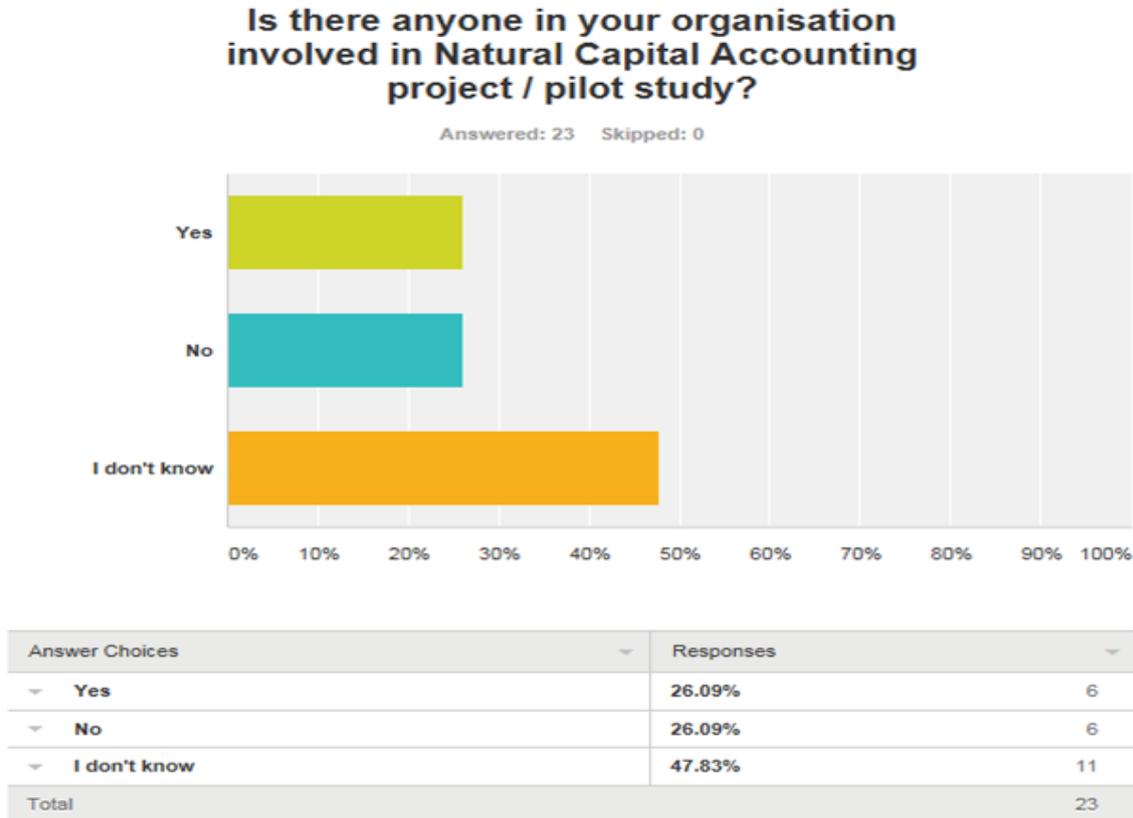
Figure 2: Level of knowledge of NCA



3.4.3 Question Three: Is there anyone within your organisation involved in Natural Capital Accounting projects or pilot studies?

Question three seek to find out if the respondents' organisations have been involved in NCA projects or pilot studies. 47% of respondents were unaware as to whether their organisations were implementing or trialling NCA, while 26% work for organisations that have some involvement.

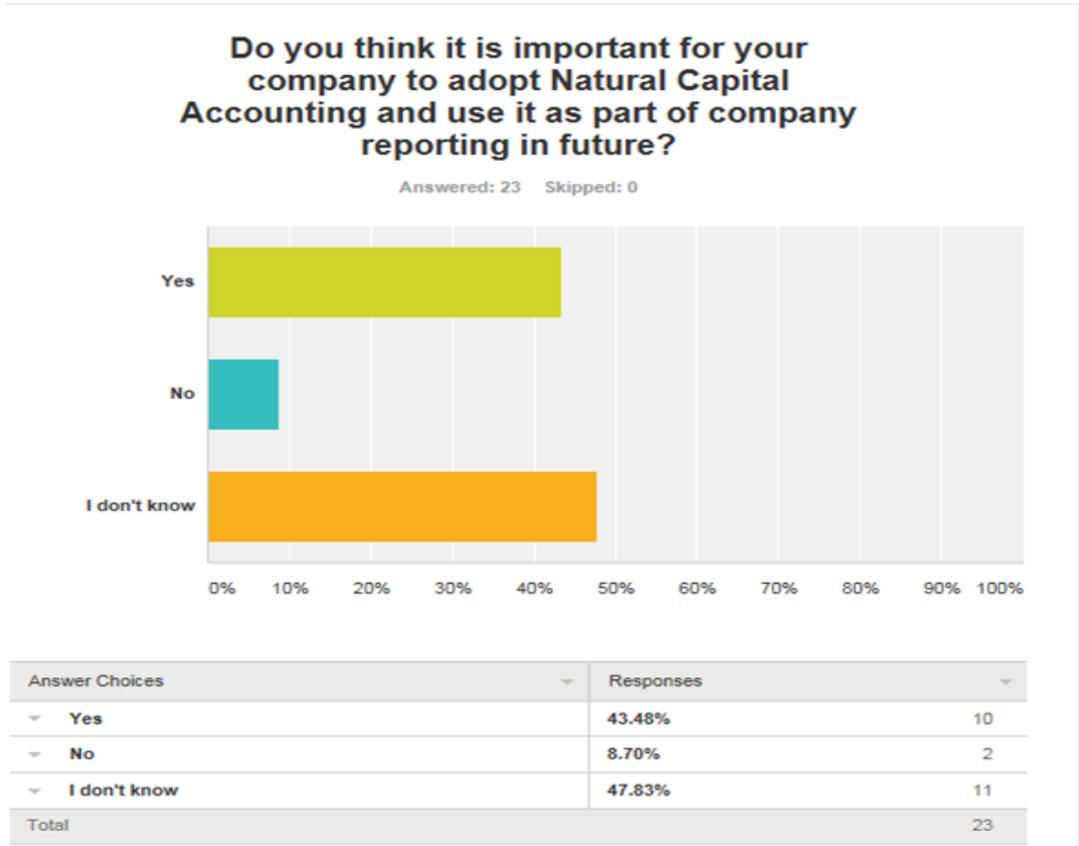
Figure 3: NCA implemented on projects or trialled by companies



3.4.4 Question Four: Do you think it is important for your company to adopt Natural Capital Accounting and use it as part of company reporting in the future?

The aim of the last question was to establish if the respondents felt it was important for their organisation to adopt NCA and use it as part of company reporting in the future. Over 50% of respondents didn't have a view on the importance of NCA within company reporting in the future or thought it not important while 43% felt it is important.

Figure 4: Importance of using NCA as part of future company reporting



3.4.5 Sample free-form responses

Most respondents provided additional information on their thinking. A selection of anonymized comments is included below:

It is an issue that should be on our agenda in order to prepare for a time when this would add value to our business. This is especially relevant where we are a developer on projects.

Environment Manager

Natural capital can support more informed decision making and give us a better picture about what the true impact it. We need to understand more about our true impact to know whether we are meeting our Business Purpose of building for a better society. More informed decision making better understanding of risks relating to natural capital. Guiding decisions on where to focus green investment and green innovation understanding how we can make cost efficient green investment communicating the bigger picture of sustainability across the business to further embed sustainability throughout our core business.

Environmental Advisor

I think if construction companies looked a little more long term in their decision making than, particularly for us, what shareholders want, they would see the obvious impact they are having in terms of natural capital and realize that business as usual will ultimately mean they won't survive. Perhaps other construction companies that innovate and change their business models to be more mindful of their impact will be the ones that survive long term and that means that more natural capital will be preserved and hopefully restored.

Sustainability Manager

Was going to answer yes, [to Question 4] but I'm not sure I'm confident with the answer. We deliver buildings for clients, and do not often have input into the development. Enhancing natural capital will normally add costs in the short term, which means the decision to add certain aspects may be rejected.

Senior Environment Advisor

Competitive advantage - few contractors are currently reporting in this way. Increased awareness of employees - in order to report natural capital the business would first need to gather information, and in order to gather information people need to know what counts as natural capital.

Senior Environment Advisor

Currently, I don't believe it would benefit, particularly through reporting. I ask the question who reads such reports and do they know what NCA is? The challenge would be whether there is a business risk i.e. legislative, market risk i.e. customer expectations, or societal risk i.e. reputation impact or moral imperative to do the right thing; for all of these I do not believe, or am not aware, that there is any form of NCA risk and therefore the requirement for such data gathering, analysis and reporting is a very low priority. That said, I appreciate circumstances change and move on, and there may be some driver in the future.

Head of Sustainability

Like everything it has some good sides (raising environmental awareness i.e. businesses understand value better if it is linked to monetary value, species and habitat protection enhancement) but if translated in legislation it could increase the administrative burden for main contractors, ecological survey costs and slow down planning permission processes instead of making them more efficient.

Environmental Advisor

We would have a better understanding of the actual impact we have on the environment. That might also facilitate the increase of environmental staff resources within the Group by raising environmental awareness at senior management level.

Environmental Advisor

As a privately owned organization, there are no external shareholders exerting pressure for this. At present our clients do not ask for this, which is not a reason not to do it, but there is no current driver from clients to demand it. Not aware of stakeholders looking for us to report in this way either.

Head of Sustainability for Construction

Unsure. The challenge would be to turn macro scale issues into something tangible and important for our projects and programmes. There are a number of questions such as how would measurement of such data benefit a business like ours, what can we usefully do with the information generated to inform our business development. Why should we implement this? What risks are there if we don't etc...

Head of Sustainability for Construction

5. Conclusion

The rule is simple to state but anything but simple to implement. It is: the aggregate level of natural capital should not decline.

(Dieter Helm, 2015)

It is hard to escape the conclusion that the term Natural Capital Accounting is considerably more widely discussed than it is understood. This is particularly true when considering the objections by Monbiot and others that NCA involves a crass and materialistic attempt to monetize or marketize nature. As has been shown, that criticism is to trivialise and misunderstand a serious attempt to reconcile what are sometimes seen as the conflicting views of environmental activists and the business world. This reconciliation is achieved by using the language and value system of business and economics to bring environmental concerns into clear focus. But, this approach is not simply intended as a lever to open the boardroom door. Rather, it is intended to make clear the extent to which businesses, especially within the construction sector, are entirely dependent on natural resources and ecosystem services and to make plain the fact that, to the extent that businesses do not adopt Natural Capital Accounting principles and methods, they are in fact short-changing themselves in terms of their own ability to take strategic decisions fully appraised of all the relevant facts and thereby jeopardising their own survival.

It is striking when considering the case studies and interviews presented here that where, most notably with Kering, the full implications of NCA in terms of short-term company profitability, are recognised there is an explicit disavowal of responsibilities in this respect. And, of course, this is entirely reasonable. A company that is sufficiently enlightened and far sighted to begin the exploration of NCA should hardly expect to be financially penalised for doing so. This brings to light a significant obstacle to adoption. A whole-hearted and meaningful embrace of NCA implies, amongst other requisites, a reduction in short-term company profits, as some of these profits must be reinvested to compensate for the use of natural resources. However it is equally clear that this short-term reduction in profit results in long-term sustainable profits and an enhanced capital base (natural and infrastructure) to the benefit of all. The idea of making short-term sacrifices in return for long-term sustainable gain is not unfamiliar in the business world and the sacrifices involved are certainly not an insurmountable obstacle. It seems unlikely, that companies will risk any loss of competitive advantage and some legislative or regulatory input will be required to ensure a level playing field.

Perhaps of more concern in reviewing the case studies and interviews is the tendency for some of the fundamental concepts of NCA to be missed altogether. A certain tendency is apparent whereby some aspects of NCA are embraced while others are ignored. For example, using NCA-like techniques to value and compare one approach to a given problem to another, and adopting the approach which has the lower NCA defined cost, is valuable in sustainability terms but fails to address the aggregate rules which are central to NCA. Whichever approach is adopted, there is a cost in terms of natural resources and a compensating investment is required. Adopting the lowest cost approach is, of course, to be applauded, but without provision for the compensating investment it is not Natural Capital Accounting. It is important to point this out and to insist on the meaning of NCA in order to avoid any risk of a new layer of 'greenwash' with the language of NCA being used to add enhanced credibility and apparent financial rigour to traditional sustainability.

Turning specifically to the construction industry, it is clear that NCA has yet to make a significant impact. It is equally clear that the concepts involved are critical to the industry: more so, in fact, than to many other sectors. NCA is beginning to penetrate and there is substantial awareness amongst sustainability professionals and others within the industry. But, as illustrated most sharply by the free-form comments of the survey respondents, there is also widespread scepticism that NCA is, or would be, taken seriously by senior management. Across the case studies, interviews, SRM experience and surveys, three clear and related themes emerge:

- 1) It is very difficult to make meaningful and persuasive valuations of natural capital usage in the absence of agreed valuation methodologies.
- 2) Accounting for natural capital consumption is time consuming, expensive and onerous especially when it is necessary to employ external consultants. This is particularly true when the onus is placed at the site level rather than centrally.
- 3) Those involved in gathering, quantifying and analysing the data and assigning value are not always convinced that their work is feeding into real decision making.

Recommendations

Taking these themes into account and based on the experience of conducting this study it is possible to offer a number of tentative recommendations that could help natural capital accounting to gain traction within the construction industry. Each of these recommendations could themselves be the subject of substantial further study:

- 1) Intra-company, multi-disciplinary natural capital valuation panels with academic advisors should be established to draw up, maintain, update and publish industry-wide valuation tables that can be used throughout the sector.
- 2) Rather than attempting to 're-invent the wheel' these panels should reach out beyond the construction industry, establishing links and data exchanges with other industry sectors and the universities, thereby, both contributing to and benefiting from a growing body of valuation expertise.
- 3) Multi-disciplinary training programmes should be established, spanning financial/management accounting and quantity surveying amongst other disciplines, to build up internal and readily available expertise in natural capital accounting.
- 4) Board level education is required along with the establishment of board level roles (e.g. Chief Natural Capital Accounting Officer), and associated departmental management and reporting mechanisms, to shift the ultimate responsibility for natural capital accounting above the site and/or project level and build centralised company functions around NCA.
- 5) Finally, and most controversially, board level recognition of the costs, in terms of reduced profit, of embracing natural capital accounting. It seems unlikely that companies can be expected to voluntarily embrace these costs. However, even if only with a view to preventing potential government regulation, perhaps a staged approach might be feasible with, for example, companies accepting 5% of the financial liabilities involved per year until 100% is achieved over the next two decades.

Natural Capital Accounting should not be seen as another obligation or regulatory requirement though, if not voluntarily embraced, it may take on the role of the latter. Rather, NCA provides, for the first time a clear prescription by which the legitimate needs and objectives of the business world can be reconciled with the equally rational and justifiable concerns of those committed to preserving our environment. In contrast to the inescapable conclusion of ever more growth on current trends leading to an ever more degraded and unbearable environment, NCA shows a clear path towards sustainable economic growth going hand in hand with an improving and replenished natural environment. The construction industry lies at the very heart of economic growth, is absolutely dependent on nature's bounty and is perfectly placed to show the benefits of and lead the way in Natural Capital Accounting. The protection of natural capital has been clearly identified as an EU policy objective (European Environment Agency, 2015). Experience indicates that this will translate into regulation and legislation at European or national levels or both. While it is fundamental to the concept of Natural Capital Accounting that self-interest coupled with a clear understanding of the nature of capital should be enough to prompt action, the construction industry also needs to take the ideas seriously and Government can be expected to insist on their adoption.

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7. Appendices

7.1 Appendix A - Interview Questions

1. How big is the organisation?
2. How did the organisation become involved in the Natural Capital Committee pilot study?
3. What was the aim of participating in the pilot study?
4. How were the project scope and boundary identified within the pilot study?
5. How were the sites selected for the pilot study?
6. What data was collected from the sites to undertake natural capital accounting?
7. Who did the natural capital assessment on the project?
8. How long did the assessment take?
9. Who did the valuation?
10. What was the cost of the assessment?
11. How did the project / organisation benefit by undertaking the natural capital assessment?
12. What were the lessons learnt?
13. Will natural capital accounting be implemented on other projects in the future?

7.2 Appendix B – Survey Questions

Question One: Have you heard about Natural Capital Accounting?

Question Two: Do you know what Natural Capital Accounting Is?

Question Three: Is there anyone within your organisation involved in Natural Capital Accounting projects or pilot studies?

Question Four: Do you think it is important for your company to adopt Natural Capital Accounting and use it as part of company reporting in the future?