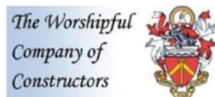


# Delivering sustainability throughout the project lifecycle

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YOUR LONDON AIRPORT  
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## ABSTRACT

Sustainability is becoming a more prominent consideration in a wide variety of industries. However, there are still significant challenges associated with achieving a balanced approach to sustainability, due to increasing demands on natural resources and population growth.

The construction industry has considerable influence on the social, economic and environmental challenges of sustainability. The industry is complex, with a multitude of organisations, working collectively to deliver projects. Obviously, no two projects are identical and therefore the variety of organisations associated with delivery will change. However, one constant amongst all parties involved with delivery is the client organisation the project is being delivered for. Therefore, this paper considers what actions the client can undertake to ensure that sustainability is delivered throughout the whole project lifecycle.

For the purpose of the paper, the project lifecycle is considered to run from the conception of an idea, through design and construction, and then handed over into operation. The research considers a variety of factors that influence sustainability early in the project lifecycle to enable an understanding of what may cause better solutions to be developed. The research entails a literature review, case studies, and interviews with members of the construction industry and analysis of the findings.

The key points during the project lifecycle that relate to delivering a sustainable project can all be related back to key decision points that were made in the early stages. The client has control over these decisions and therefore has a key influence over how sustainable a project may be. A number of key conclusions have been made:

1. Funding decisions have a huge influence on sustainability.
2. Embedding a balanced approach across all three aspects of sustainability with a supporting business case is challenging.
3. The understanding of sustainability within the client organisation influences how decisions are made.

The client influences these points, therefore a number of potential key actions have been provided that may stimulate more consideration for sustainability in client organisations when projects are starting out.

# 1.0 INTRODUCTION

## 1.1 Sustainable Development

### 1.1.1 Defining Sustainable Development

Sustainable Development is a term used across a majority of industries and is the guiding principle aiming to resolve significant issues facing the human population and the natural environment.

Sustainable Development was defined in 1987 as meeting the needs of today without compromising the ability of future generations to meet their own needs (Brundtland Commission, 1987).

Sustainability commonly constitutes of three main interdependent aspects (Figure 1), referred to as the three pillars of sustainability:

- Social,
- Economic
- Environmental

The three pillars of sustainability added environmental and human elements to the traditional model of economic development (Harris, 2003). Figure 1 demonstrates, in a simple format, how the balance of all three aspects is required to achieve sustainable development.



Figure 1 the three pillars of sustainability

Emas (2015) goes further with her definition and defines the overall objective of sustainability as the long-term stability of the economy and the environment, which is only achievable through the integration and acknowledgement of economic, environmental and social concerns throughout decision making processes (Emas, 2015).

Emas' (2015) definition of sustainability and the importance of economic, environmental and social concerns being considered in making decisions is most relevant for this research. It should be noted that in Emas' definition however, the necessity for balancing the three aspects of sustainability, may potentially only be perceived implicitly. This report will consider the balancing of all the three aspects of sustainability.

### **1.1.2 Sustainable Construction**

Sustainable construction can imply a variety of factors, but primarily the focus is on the social, economic and environmental impact of the building structure (Schultz, 2015). Since the Rio Earth Summit in 1992 raised public awareness of the issues and challenges associated with sustainability, there have been major changes to the regulatory, political, economic and environmental landscapes that the construction industry has had to adapt to (Edwards, 2014).

The industry has gradually taken steps towards accounting for and addressing environmental impacts, however economic and social aspects are frequently overlooked, leaving issues related to these out of decision making processes (Stubbs, 2008).

### **1.1.3 Key Parties Involved in Delivering Sustainability**

There are many parties involved with construction that have an influence on how successful a project is in relation to sustainability. These parties span the complete supply chain of construction and feature throughout the lifecycle of project. These include clients, designers, contractors, manufactures and suppliers to name a few (Stubbs, 2008).

Client organisations are a prevalent entity throughout the entirety of the project lifecycle and have the opportunity to interact with or influence the majority of these parties. They take the lead in how projects manifest and have early opportunities to set objectives and targets and drive positive behaviours towards achieving a sustainable outcome (Constructing Excellence, 2004). This research focuses on how the client can enable and shape the success of sustainability throughout a project.

## 1.2 Sustainability challenges for the client

Over the last few years it has become more and more common for clients to adopt a corporate sustainability policy that will set out the company's targets and objectives for the future. This is often referred to as corporate sustainability, which is the discipline by which companies align the decision-making about the allocation of capital, product development, brand and sourcing with the principles of sustainable development (Gacso, 2011). Corporate sustainability strategies often have barriers in the way of incorporating the social and environmental aspects of sustainability into the decision making process (Perera & Putt del Pino, 2013). The impacts of missing these aspects could lead to opportunities being missed, which in turn could have negative impacts. This could include increasing the operating costs, emissions, water consumption and negative impacts on the natural environment, or result in a loss of overall value and a poorer environment for end users (Constructing Excellence, 2004). A lack of focus on the sustainability agenda could also result in damage in the organisation's reputation (Friedman, 2012).

According to (Perera & Putt del Pino, 2013), potential barriers to corporate sustainability are that environmental aspects are not wholly valued, sustainability is not considered in up-front planning, there are a lack of metrics to account for external costs and environmental factors are not fully integrated.

These potential impacts and barriers are relevant to any client who is involved with construction and the built environment. This research paper considers all of these barriers and will focus on how to bring the sustainability agenda more firmly into up-front planning to enable the delivery of sustainability throughout the project lifecycle.

## 1.3 Aims and objectives

The aim of this research is to provide client organisations, who are involved with capital development projects, with a basis of information that will facilitate the early consideration of sustainability in construction projects. This in turn will hopefully enable balanced sustainable opportunities to be identified and acted upon earlier and processes in place to support implementation. Successfully incorporating a balanced approach to sustainability throughout the project lifecycle will have benefits not just for clients, but on the various social, economic and environmental aspects that projects will affect.

To support the client taking a successful leading role throughout the project lifecycle, this research will cover a number of key objectives:

1. Identify the challenges in including sustainability in up-front planning
2. Establish steps that could be adopted by clients in up-front planning to enable balanced sustainable solutions to be developed.
3. Share the findings with the wider construction industry.

## 1.4 Report layout

The report commences with a literature review, covering key information related to the challenges inherent with delivering sustainability. Conclusions will then be drawn as to how clients interact with sustainability throughout the lifecycle and how challenges could be overcome. The literature review has been separated into six main subsections:

- Sustainability in the construction industry
- Balancing sustainability
- Measuring sustainability
- Management and leadership associated with delivering sustainability
- Analysis of case studies

Following the literature review, the report will discuss the approaches used to collect data to support the research. It was determined that qualitative data analysis was the most effective way of obtaining suitable information to support the research, with the data being collected using a phenomenological research method approach.

A number of interviews were carried out to obtain information. The information was categorised into a number of key trends that relate to understanding the key objectives of the research further. The discussion section then develops a basis of information that ultimately formulates a set of key actions for client organisations to adopt.

Finally, the work is concluded with recommendations provided as to how the research can be progressed in the future.



## 2.0 LITERATURE REVIEW

### 2.1 Sustainable Development in the construction industry

#### 2.1.1 Overview

The principles of sustainable development in the construction industry have become more acknowledged over the last few decades (Gunatilake, 2013). To support this growing interest in delivering sustainable solutions, various accreditation schemes, checklists, assessment methods and processes have been developed by a range of organisations. Each of these considers sustainability in a variety of ways depending on the application and focuses the user through different methods. There are best practice case studies available for the use of each, which will have links provided at the end of the report for further reading.

Each of the methods generally considers the project lifecycle to cover the following key stages, set out by the RIBA Plan of Work in figure 2. There are variations on how the various lifecycle stages are represented, however the overriding principles of each are the same.

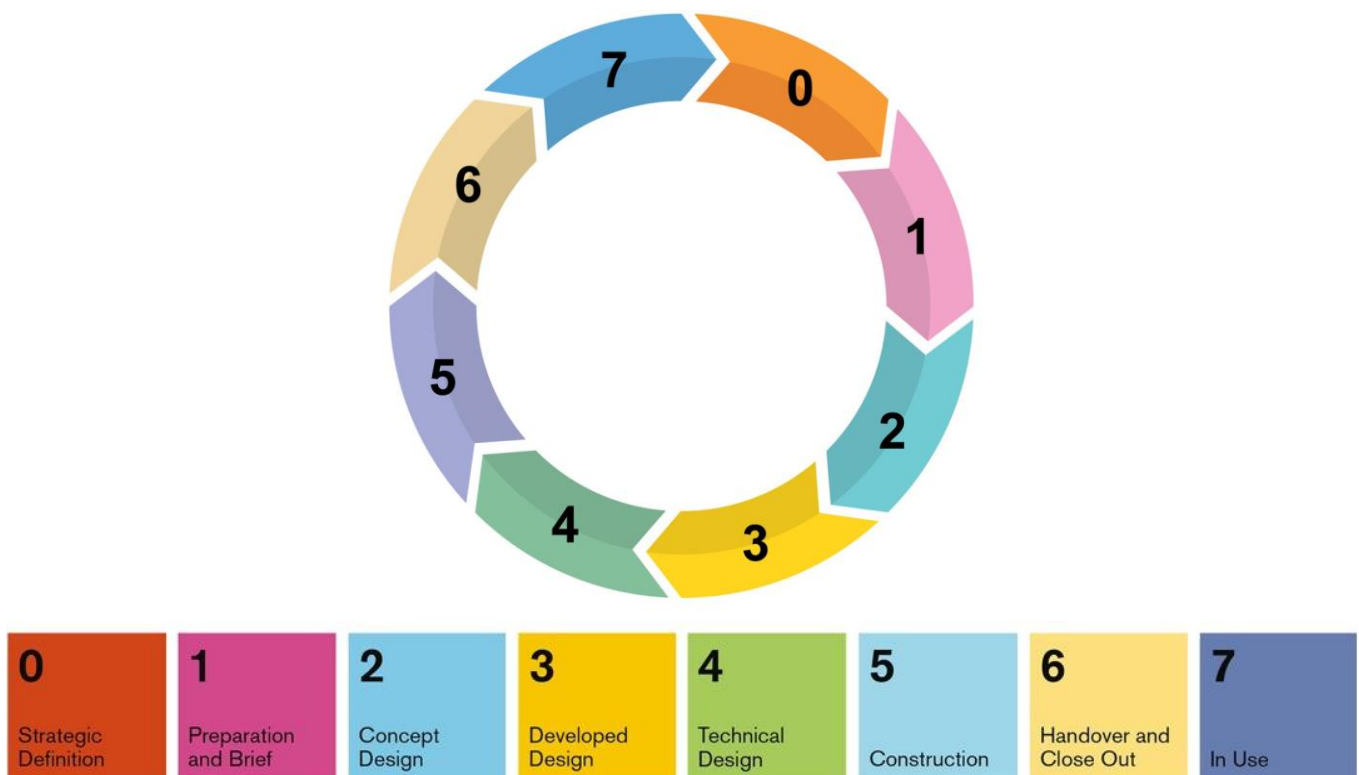


Figure 2 RIBA project stages from the plan of work (Morse Webb Architects, 2018)

## 2.1.2 Building Research Establishment (BRE)

BRE are internationally recognised as the developers of sustainability standards codes and methodologies for buildings, homes and communities (BRE, 2018). The BRE Environmental Assessment Method (BREEAM) evaluates the procurement, design, construction and operation of a development against targets based on performance benchmarks. The performance of a development is then certified on a scale ranging from pass to outstanding. It can be applied to master-planning, infrastructure and buildings and is applicable through various lifecycle stages (BREEAM, 2017).

A licensed assessor carries out an evaluation against a number of categories (Figure 3).

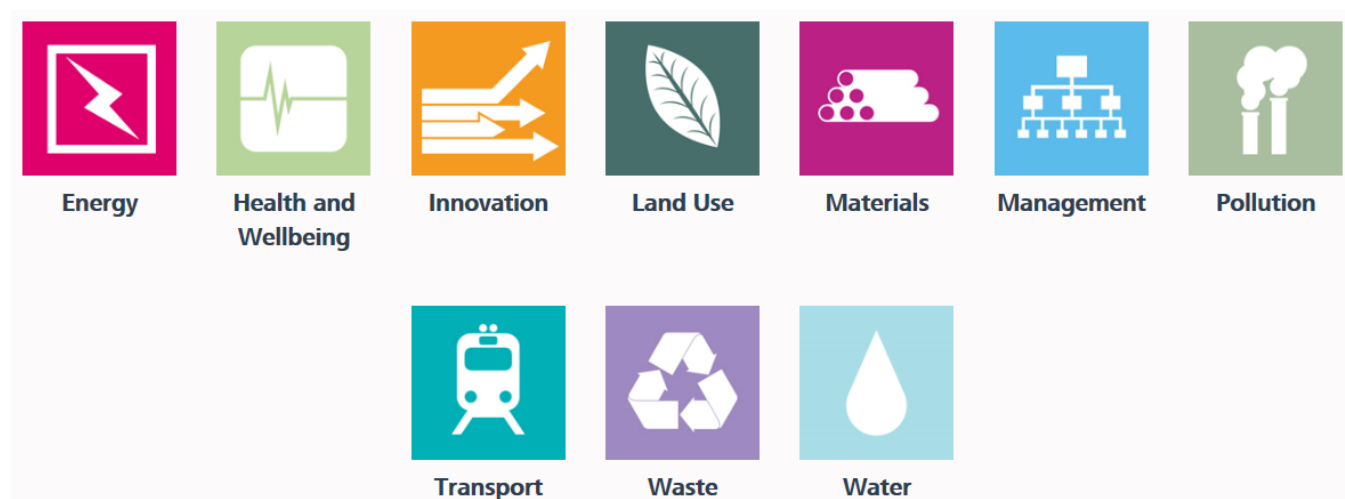


Figure 3 BREEAM assessment categories

BRE has also developed other tools such as the BREEAM Communities Technical Standard, which supports the integration of sustainable design into the master planning of new communities. This standard is applied in the early planning stages and assists decision makers in achieving results that balance the social, economic and environmental aspects of a project. A key aspect of the process is encouraging early collaboration in the process to achieve better outcomes, reduce the likelihood of change later in the project and reduce costs. A recent development in the BRE suite of products was the acquisition of CEEQUAL to support the civil engineering projects achieving more sustainable outcomes.

There are benefits for client organisations adopting schemes such as those promoted by BRE as it provides an independent verification of the work that is being undertaken. However, electing to deliver in accordance with a BRE scheme does not automatically mean a sustainable outcome

will be achieved. It still takes significant action from the parties associated with delivery throughout the project lifecycle. It also requires upfront acknowledgement of the potential cost impacts that may be associated with such a scheme.

### 2.1.3 Royal Institute of British Architects (RIBA)

The RIBA plan of work splits the development of a project into a number of key stages (Figure 2), from the inception of the idea to the operation and decommissioning of the development. It provides guidance as to key activities that should be undertaken in each stage and is commonly used throughout the construction industry (RIBA, 2013). In each stage of the plan of work there is a sustainability checkpoint that advises of activities that could be undertaken. The main focus of this report will be on the early stages of the project, as shown by the ‘Green Overlay’ in =Figure 4.

RIBA Work Stage		Description of key tasks
Preparation	A	<p><b>Appraisal</b></p> <p>Identification of client’s needs and objectives, business case, sustainability aspirations and possible constraints on development.</p> <p>Preparation of feasibility studies and assessment of options to enable the client to decide whether to proceed.</p>
	B	<p><b>Design Brief</b></p> <p>Development of initial statement of requirements into the Design Brief by or on behalf of the client confirming key requirements and constraints.</p> <p>Identification of procurement method, project and sustainability procedures, building design lifetime, organisational structure and range of consultants and others to be engaged for the project.</p>
	C	<p><b>Concept</b></p> <p>Implementation of Design Brief and preparation of additional data.</p> <p>Preparation of Concept Design including outline proposals for structural and environmental strategies and systems, site landscape and ecology, outline specifications, preliminary cost and energy plans.</p> <p>Review of procurement route.</p>

Figure 4 Excerpt from the RIBA plan of work ‘Green Overlay’ guidance (RIBA, 2011)

The RIBA Green Overlay is a supporting document that elaborates on these activities and provides further guidance to the user. The green overlay was developed in response to the growing impetus that issues concerning sustainability are actively considered in the design and

construction of buildings (RIBA, 2011). As shown in figure 5, this document provides a number of checkpoints that can be carried out in the early stages.

RIBA Work Stage		Sustainability Checkpoints	
Preparation	A	Appraisal	Strategic sustainability review of client needs and potential sites, including re-use of existing facilities, building components or materials.
	B	Design Brief	Internal environmental conditions and formal sustainability targets stated. Building lifespan and future climate parameters stated. Early stage consultation, surveys or monitoring undertaken as necessary to meet sustainability criteria or assessment procedures. Involvement of design team after Practical Completion defined. Site Waste Management Plan (SWMP) started.
	C	Concept	Key design team members appointed. Formal sustainability pre-assessment and identification of key areas of design focus. Deviation from aspirations reported. Initial Part L assessment. Plain English description of internal environmental conditions, seasonal control strategy and systems prepared. Environmental impact of key materials and construction strategy checked. Resilience to future changes in climate considered.

Figure 5 Excerpt from the RIBA plan of work, focusing on sustainability checkpoints (RIBA, 2011)

However, it perhaps does not provide specific guidance how a project might consider the balanced range of social, economic and environmental concerns that may affect a project and could be perceived as more environmentally focused. It also does not provide an explicit link between sustainability and finance. Economic development is an essential part of balanced sustainable development. Obtaining funding for and financing sustainable methods and solutions is essential and therefore potentially should be highlighted to clients in the early stages of development.

## 2.2 Balancing the three aspects of sustainability

It is assumed that throughout any project, up-to-date mandatory requirements such as Technical Standards, British Standards, Eurocodes and Building Regulations will already be driving designers and contractors to deliver projects to meet best practice (Eley, 2011). In spite of the revisions being made to the mandatory requirements, it is acknowledged that many impacts are often overlooked (Stubbs, 2008) and often social and economic concerns in particular not considered. Eley (2011) perceives that the mandatory requirements alone are not sufficient to deliver real sustainable benefits, with clients and their supply chain having to go beyond the minimum standards to bring tangible rewards (Eley, 2011).

Methods to achieve this could be through selecting the correct BRE scheme or following the sustainability checkpoints set out by RIBA, however there is potentially a risk that a client organisation may focus on one aspect of sustainability over others.

## 2.3 The business case for sustainability

There is an acknowledged perception throughout industries that sustainability may add cost without adding real benefit or value (BRE, 2014). This is not uncommon in the construction industry. However, there are growing numbers of research papers and data that provides evidence that sustainability benefits the bottom line of a business.

It is becoming more common for organisations that adopt a conscientious approach to their social, economic and environmental impacts and those that mitigate positively are often considered to have a competitive advantage. This is not just due to a perception amongst the customer basis through improved reputation, but also potentially due to a perception amongst investors. If an organisation is able to demonstrate that it can handle a range of risks associated with the three aspects of sustainability, it may be perceived as having more agile risk management and the ability to adapt to growing external challenges (Fink, 2016).

Efficiency and effectiveness are key components to achieving sustainability and therefore innovation becomes a natural aspect of exploring new ways to overcoming increasingly challenging constraints. Fostering innovation may lead to improved financial performances whilst also developing a project that enhances the local social and environmental aspects (Fink, 2016).

The validity of the business case for sustainability seems to be becoming more certain. However, careful consideration needs to be given to how the business case is developed to understand if the solutions proposed within a project are truly sustainable and are supported by evidence.

## 2.4 Delivering sustainability

It is perceived that a clear and robust Sustainability strategy that incorporates sustainable objectives adds value to a business. Research undertaken by Bonini and Görner (2011) found that only a few companies were capturing significant value by pursuing opportunities that sustainability offers. Analysis undertaken by the carbon trust shows that many of the top companies within the UK now set environmental targets within their strategies (Carbon Trust, 2011), however these were widely varied on their precision and potential effectiveness. It is also acknowledged that there is potentially an emphasis on setting environmentally focused targets rather than a balanced view across all three aspects of Sustainability. Considering the construction industry, Stubbs' (2008) believes that the full consideration of social, economic and environmental aspects is still rarely achieved.

Sustainability strategies are often found at corporate level or for large-scale development projects. Strategy documents will attempt to promote what the organisation wants to aspire to achieve. Therefore, any capital project should be aligned to the organisations sustainability strategy. It is within the very early stages of the project lifecycle that the project is shaped in terms of optioneering and procurement. Therefore, it is potentially a critical time in achieving maximum value in relation to sustainability.

According to (CABE, 2003), the cost of change increases as the development of a design progresses (Figure 7).



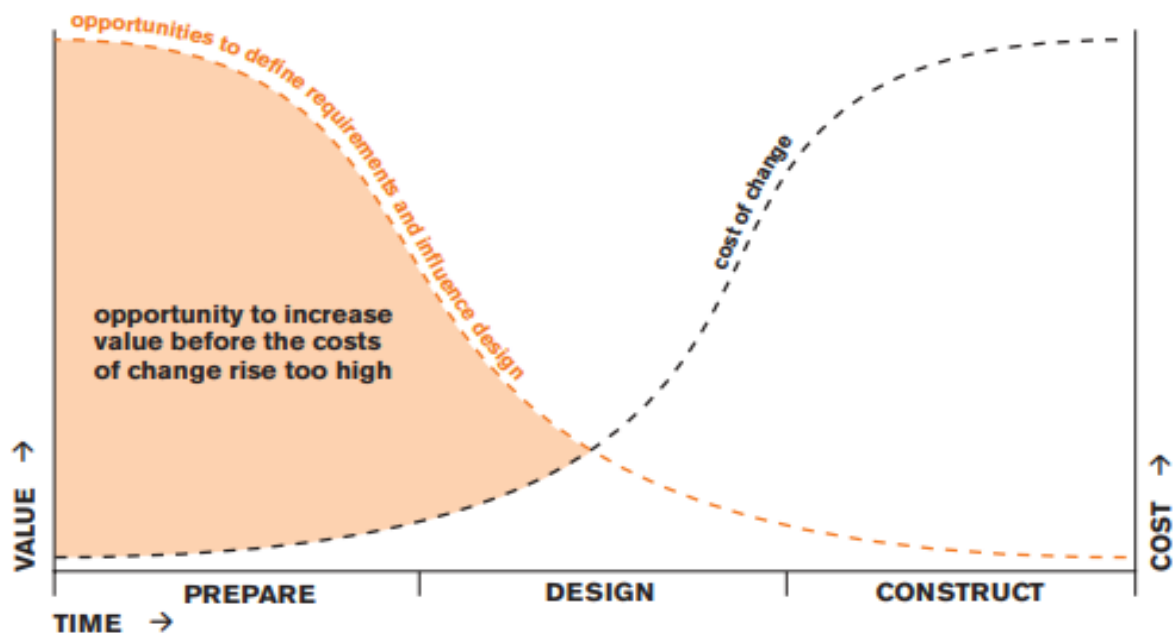


Figure 6 Change of value and cost throughout the project lifecycle

Therefore, to enhance the delivery of sustainability throughout a project, social, economic and environmental concerns need to be considered early and opportunities acted upon. This helps support the necessity to embed sustainability into the up-front planning of projects.

### 2.5.1 Roles and Responsibilities

Whilst there are various sources of guidance on how to develop a Sustainability strategy and many examples of Sustainability good practice measures, there appears to be little information on defining roles and responsibilities relating to the delivery of sustainability. BREEAM promotes the appointment of a 'Sustainability Champion' who plays an active role throughout the project to align the development with the BREEAM assessment criteria. However, it does not seem commonplace to align a specific team role to an activity related to sustainability throughout the project.

One tool that is common in the management of teams is the use of the 'Role and Responsibility Charting (RACI)' tool. The RACI tool has four different levels of participation for different team members (Smith & Erwin, 2017):

Table 1 Explanation of RACI management tool

R = Responsible	This is the individual(s) who actually complete the task. The degree of responsibility is determined by 'A'
A = Accountable	This individual is ultimately answerable for the activity or decision
C = Consult	Decisions / progress is to be checked with this individual(s) prior to any decisions being made
I = Inform	One way communication to individual(s) following a decision being made. This may prompt them to start their own action or report on progress.

It does not seem commonplace that tools such as 'RACI' are commonly connected with sustainability. Therefore, the conclusion could be made that Sustainability is not delivered in the same manner as other aspects of project management. For other areas of project delivery defining roles and responsibilities is critical in ensuring a project is successful, therefore it seems it would make sense for sustainability to be treated in the same manner.

## 2.6 Industry Case studies

Two case studies have been presented in the research. One from the researchers own company (Gatwick Airport Ltd) and the other from Oslo Airport, which has recently been accredited to a BREEAM excellent standard. The case studies offer two varied applications of the principles of sustainability across two different aspects of delivery. Development at Gatwick Airport is constrained by the size of the campus and therefore development is generally undertaken on existing assets, with the operational airport moving around the construction area. The new terminal at Oslo was a standalone new building, therefore there are different opportunities and challenges associated with each.



### **2.6.1 Gatwick Airport - 'Decade of Change'**

Gatwick Airport was used as a basis of information for the research to understand how a major client organisation can undertake capital development in a sustainable manner. The research aims to benefit the ongoing development of the airport to achieve even more sustainable results.

The airport is located approximately 30 miles south of central London and comprises of a single runway and two terminal buildings. The airport is situated in the borough of Crawley in West Sussex.

The airport was sold in 2009 to a consortium led by Global Infrastructure Partners (GIP) who control the board. Since ownership was transferred to GIP in 2009, a major investment programme has been underway with an initial £1billion being invested over 5 years. Investment was continued with approximately a further £1billion in 2013 and 2017, roughly equating to an annual development spend of £240million (Gatwick Airport Ltd, 2018).

Carrying out construction in an operational airport environment is challenging due to the necessary coordination and planning of projects to maintain a safe and stable operation. The changing requirements of airlines and various other third parties mean that often construction is reactive to operational requirements.

Developing in a sustainable manner within an airport environment is a challenge due to the scale of the facility and associated impacts on the local environment and communities. Gatwick acknowledges its responsibility to control and mitigate negative impacts and to act upon and enhance the positive impacts.

In 2010, a simple and effective plan was formulated that identified 10 key issues that would need to be acted upon over the upcoming 10 years. This strategy was titled 'Decade of Change,' the various aspects of which are outlined in Figure 8.

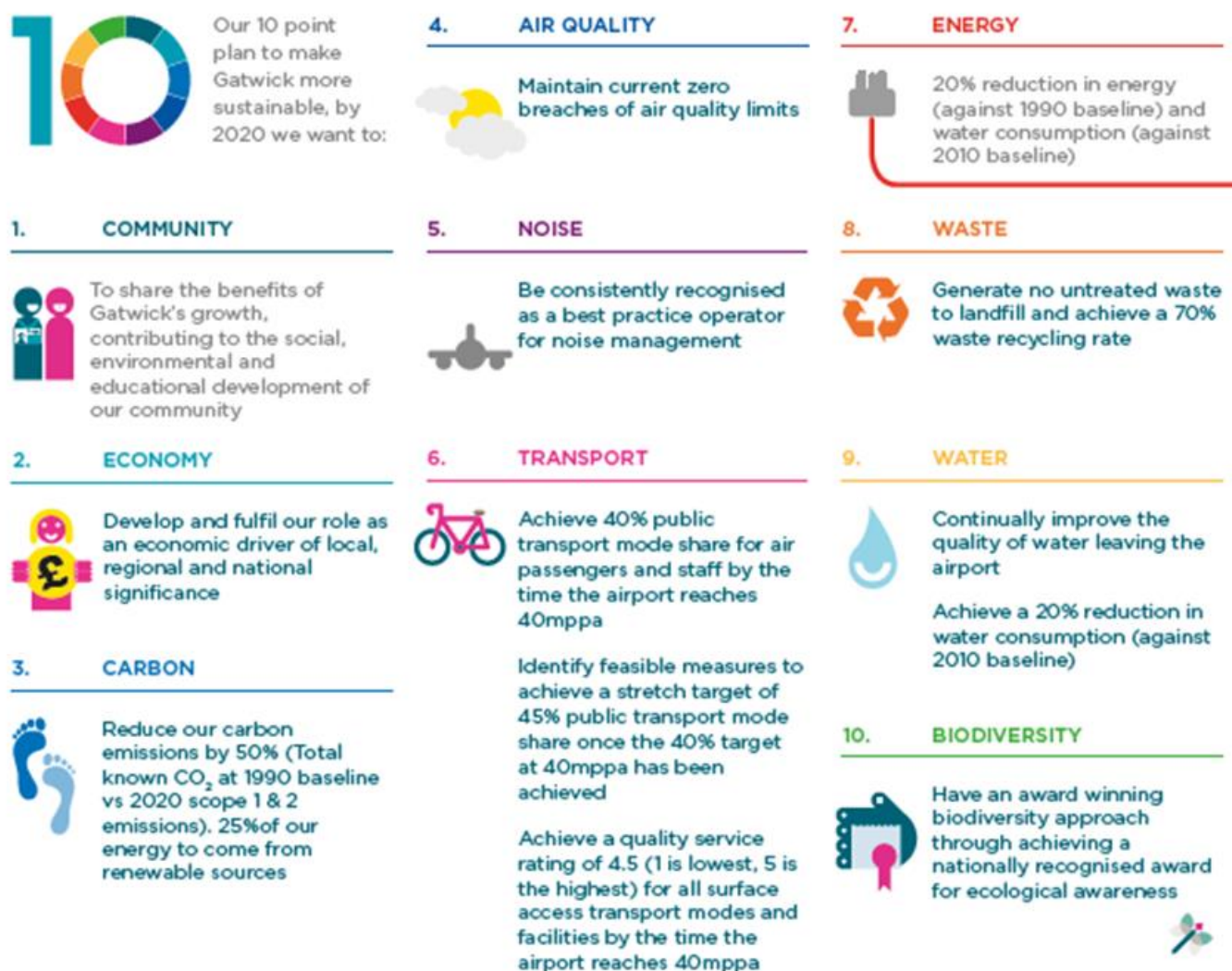


Figure 7 Overview of Gatwick Airport's Decade of Change (Gatwick Airport Ltd, 2010)

Gatwick are now more than half-way through the 'Decade of Change' programme, which targeted the reduction of the airport's environmental impact. All projects were tasked with finding ways to reduce their impact on the environment and improving sustainability, with such investment being included in the individual budget for each project.

Since GIP took ownership of the airport the passenger numbers have increased annually to over 45 million, which would often be expected to translate into greater energy and water usage, a larger carbon footprint and more emissions. However, in spite of the greater passenger numbers, all of these aspects of sustainability have been in decline.

All airport departments have had to become increasingly efficient to achieve this positive result. The construction department is one of the key components to how successfully the capital

investment programme is delivered in terms of sustainability. Projects are becoming increasingly forward looking and the sustainability team are looking for new ways to enhance delivery.

The construction sustainability team is working with the wider delivery teams to enhance sustainability in all projects, which is leading to positive changes. Industry assessment methods such as BREEAM and CEEQUAL are now becoming more popularised within the delivery teams and wider airport community. Another part of this invigorating change is the re-introduction of the Gatwick graduate scheme, which is now providing a regular influx of young engineers into the team. This is positive as university courses seem to be more focused on the sustainability agenda, which will bring knowledge into the construction team.

Some examples of the positive results of the decade of change strategy are demonstrated in the 2016 performance report:

### Water



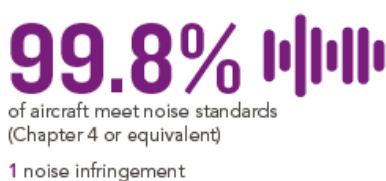
### Waste



### Surface Transport



### Noise



### Economy



### Community



Figure 8 Decade of Change 2016 performance results (Gatwick Airport Ltd, 2017)

### 2.6.2 New terminal at Oslo International Airport

An alternative airport example can be found in Oslo. Oslo Airport recently completed a seven year expansion project to double capacity to 32 million passengers per year and provide an extra 117,000 square metres of space. This project was awarded the first ever BREEAM 'Excellent' rating for an airport development (International Airport Review, 2017).



*Figure 9 New terminal at Oslo International Airport*

There are aspects of the delivery of this project that can be related to the findings earlier in the literature review. These are mainly process driven measures, which originate or relate to aspects in the early stages of the project. The key points have been summarised in table 2 with the importance of each key finding explained. The key elements of the case study then formed part of the basis of engagement with the wider construction industry.

Table 2 Key findings and points of importance from Oslo Airport case study (Vella, 2017)

Key finding	Importance
<p><b>i) A sustainable eco-friendly airport is a good business case.</b></p>	<p>Airports are not seen favourably in some social and environmental terms. Undertaking development in a manner that also detracts from any negative perceptions is good for business.</p>
<p><b>ii) Financial institutions focus on the control of environmental risk and having a robust sustainability delivery method helped to obtain good finance.</b></p>	<p>The sustainability agenda is becoming more prevalent in society, with more organisations acknowledging the risks across all three aspects of sustainability. Some risks will be outside of an organisation's control (REF) and therefore having a robust delivery plan will help mitigate the risks and provide confidence for investments.</p>
<p><b>iii) Someone on the project needs to own the sustainability goals. This person needs to manage them throughout the whole lifecycle of the project.</b></p>	<p>Similarly to other aspects of project delivery, someone or multiple people need to take responsibility for delivering the sustainability agenda on the project. There is a risk that without a direct drive from within the project team then the sustainability agenda will become less focused.</p>
<p><b>iv) Not everyone on a project will understand that a certain product holds risks to the environment.</b></p>	<p>To fully explore the impacts, benefits, threats and opportunities of a project, the full project team will need to be aware of sustainability.</p>



Key finding	Importance
v) <b>One of the main successes was gaining agreement for these targets from the executive board from the beginning.</b>	By introducing a top-down approach to delivering sustainability on a project an expectation is set for the project team to meet. For the project team to be successful, this needs to be translated into all aspects of project delivery.
vi) <b>Many projects have good intentions that are not followed up.</b>	Only with an educated and committed team will the full benefits of sustainability be delivered. Stipulating what is required and tracking and monitoring data to demonstrate success is vital in reaching a sustainable outcome.
vii) <b>People's mindsets had to be changed to meet the sustainability targets of the project</b>	There are various interpretations of what sustainability means. Therefore, it is important to ensure that the project team and all associated parties are all aligned as to what sustainability means to the project.
viii) <b>The contract for the works stipulated that materials had to meet certain sustainable claims</b>	This can be translated into many different aspects of sustainability. The project team should analyse what information will provide an indication on to how the project is performing in relation to its sustainability objectives.

The information obtained from the case study highlights some key measures that have been adopted that helped to achieve a BREEAM accredited building to 'Excellent' standard. The majority of these findings or measures are influenced or completely controlled by the client organisation. Further insights into the challenges of delivering sustainability were sought from the wider construction industry, through interviews, to expand on these points further.

## 3.0 RESEARCH METHODS

### 3.1 Method

Four interviews were held externally with a number of individuals in a variety of organisations recognised as having a positive influence on the successful delivery of sustainable outcomes. These were:

1. Managing Director
2. Head of Sustainability and Strategy
3. Senior Environment and Sustainability Manager
4. Project Manager

The participants were selected to attempt to draw out a varied response on how sustainability can be delivered throughout the project lifecycle and how perceptions on challenges may differ. The participants were all also part of organisations with strong links to client organisations or developers.

The interviews were transcribed so that common themes could be identified. The information from the interview was then categorised into similar categories to understand what supported the aims of the research the most.

### 3.2 Materials

The participants in the interviews were presented with a number of questions that are included within Appendix 7.1. The questions were developed in manner to identify what challenges are associated with delivering sustainability with a view to understanding what actions could be implemented to promote more sustainable solutions. The discussion points attempted to gain further insight on a number of topics that were thought to be key to the research:

- Challenges with delivery
- The Client's role in sustainability
- Implementing sustainability
- The cost of sustainability

- Accountability in relation to sustainability

## 4.0 INFORMATION FROM THE CONSTRUCTION INDUSTRY

The targeted topics for the interviews yielded a range of information that was able to be collated into a number of different categories. The topics that were most relevant to the research have been presented in the following sections. Each participant provided information related to each of the categories presented here.

### 4.1 The Client's Influence

One recurring finding from each of the participants was the variety of ways in which the client has influence on sustainability throughout the project or programme of works.

Each of these points can be related back to how the client defines sustainability and what aspiration the client has in achieving a sustainable outcome. What is also a fundamental aspect to these points, is the overall understanding of sustainability in relation to the organisation and others. It was clear during the interviews that the client is seen as a key driver in implementing sustainable development successfully. Highlighted in table 3 are some of the key challenges and actions related to clients and their ability to enhance sustainable.

*Table 3 Results related to the influence of the client on sustainable development*

<b>The influence of the client on sustainable development</b>			
i) Clients do not always understand the value proposition of sustainability.	ii) Clients having a more robust sustainability agenda usually results in better outcomes.	iii) Early engagement with sustainability is critical.	iv) There are limited options for change once the solution and strategy are fixed.



## The influence of the client on sustainable development

<p>v) Clients are often focused on money saving and therefore the presentation and communication of the value proposition is key.</p>	<p>vi) It is important to have clients on board right from the offset, otherwise sustainability may be missed from the overall strategy.</p>	<p>vii) It is difficult for the supply chain to implement sustainability if it is missed from the overall strategy and without the commitment from the client.</p>	<p>viii) Generally clients react positively with sustainability, but they are concerned with cost.</p>
<p>ix) It is hard to demonstrate value when it does not result in reduced operational costs or a reduction in carbon, which leads to reduced costs.</p>	<p>x) There is a risk that clients request that their delivery teams deliver sustainably, however they do not mandate it or require them to do it in a particular way.</p>	<p>xi) If there is no direction from the client then designers may miss opportunities to use schemes such as BREEAM or CEEQUAL.</p>	<p>xii) The client's sustainability strategy should be translated into framework or contractual agreements with designers and contractors.</p>

What stands out from 'table 3' is that without the client's focus and understanding on the sustainability agenda, decisions are often missed that will influence the project throughout the rest of the lifecycle. Whilst all projects will have unique aspects, the points within 'table 3, could generally be applied to most construction projects. 'Table 3' potentially demonstrates that there are deficiencies in how client organisations engage with the sustainability agenda.

### 4.2 Funding sustainability

The approval of funding for sustainability measures is still seen as an obstacle in achieving truly sustainable outcomes. This may be due to the perception that the costs of undertaking sustainability measures outweigh the benefits. However, the complicated nature of demonstrating

value in a tangible manner can be challenging and therefore the business case harder to construct.

Table 4 Results related to funding

Funding			
i) There is a desire to deliver sustainable solutions, however funding is one of the main challenges.	ii) The way funding is structured in relation to the separation of CAPEX and OPEX costs does not always align to developing a sustainable solution.	iii) The payback periods for sustainable solutions is often outside the design life of the project.	iv) Often the business case for a sustainable solution is valid and the payback period will be achieved, however there are insufficient upfront capital funds.
v) A feasibility report provides an opportunity to identify whether there is any additional benefit to allocating additional capital expenditure.	vi) It is important to put sustainability on an equal footing with cost management	vii) Often economic development carries far more weight than social and environmental aspects	viii) CAPEX is mostly still the focus on projects and OPEX is rarely considered in any great detail.
ix) There is a potential flaw in aligning the business case with lower OPEX through increased CAPEX because if the solution is not successful then you lose engagement.	x) CAPEX and OPEX are considered, but you would not necessarily consider the OPEX cost throughout the whole lifecycle of the asset	xi) It is imperative that funders understand the benefits of different options in relation to the cost impacts and any payback periods.	xii) The cost impact of the variants should be highlighted within the feasibility report so that the client can make an informed decision on the delivery strategy and solution.

The information obtained on funding can be loosely separated into three areas:

1. The consideration of CAPEX and OPEX costs.
2. The understanding and definition of sustainability on a project.
3. Allocating cost to specific sustainability measures.

Funding ultimately will determine what sustainability measures will be implemented. Therefore, the challenges and factors presented in Table 4 are potentially the most important challenge to overcome in terms of delivering sustainability throughout the project lifecycle. In order to do this a project will need to carefully consider the organisations strategy, who is going to be taking the lead in delivery and what management structure will be required.

### 4.3 Strategy, Leadership and Management

Strategy, leadership and management are all within the gift of the client to define and control. The procurement route selected, terms of contracts, management teams etc. can all be determined by the client. The points that have been presented cover a range of areas associated with delivering sustainability and what is considered important within the industry.

Table 5 Results related to strategy, leadership and management

Strategy, leadership and management			
i) Proactive leadership is required to drive the sustainability agenda throughout the project lifecycle	ii) Leadership is essential in communicating the sustainability agenda at key decision points	iii) It is beneficial to make the most suitable members of the delivery team responsible for different aspects of the sustainable solution.	iv) It is beneficial to establish different potential variables within the solution so that client can decide on what they want to deliver. This could be separated into categories such as normal and best practice.

## Strategy, leadership and management

<p>v) Variants of the solution can be presented in a feasibility report to the client for executive approval.</p>	<p>vi) It is important to determine what is achievable and not dilute the overall solution with too many measures / methods.</p>	<p>vii) Once a solution is determined, it is beneficial to have checkpoints throughout each stage to ensure delivery remains focused on the sustainability agenda.</p>	<p>viii) Sustainability should be treated as an equal discipline that has its own experts to inform the solution. It should be reviewed as part of the design and not as a bolt-on.</p>
<p>ix) The first key deliverable is developing the feasibility report. The second is to brief key members of the organisation, in particular the funders.</p>	<p>x) When delivering a sustainability strategy it is important to be really clear on what is important to the business.</p>	<p>xi) It is key to ensure that all stakeholders are aligned to the sustainability vision and that it is communicated to them in the correct way so that they understand what the organisation is trying to achieve.</p>	<p>xii) There is a danger of putting sustainability action into job roles as it may be missed and the emphasis on importance lost.</p>

## Strategy, leadership and management

<p>xiii) It is important for sustainability professionals to remind other team members about the sustainability agenda as it is only through many small interventions that the sustainability will be achieved.</p>	<p>xiv) If clients are taking sustainability seriously then there is usually a sustainability lead who has been designated responsibility for delivery.</p>	<p>xv) It is important to have people who are promoting sustainability right at the forefront of the decision making process so they can influence the decision making process.</p>	<p>xvi) Having the supply chain and stakeholders bought in to the organisations vision can have a lot of intangible benefits. If you become known as an organisation that hold certain values in high regard then people buy into that and it is highly beneficial.</p>
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What can be taken from the points in Table 5, is that there are many aspects of delivering sustainability that are driven or initiated by the client organisation. This reinforces the focus on the early project stages as a critical point for sustainability as key decisions related to the points in Table 5 will be made early on in the project. These points provide an insight into what methods could be considered when attempting to embed a balanced sustainability agenda within a project. One further aspect that could be considered to further enhance the above points is how accountability is defined on a project in relation to sustainability.

### 4.4 Accountability

Similarly to Section 2.5.1 of the literature review, accountability yielded few results that directly linked sustainability with roles and responsibilities within a project team. This is interesting in itself due to how other functional aspects of projects are delivered. Therefore, this potentially could be seen in a gap in how sustainability is delivered and therefore something to consider going forward.

The use of RACI matrix was discussed and the consensus was that it would be too onerous and complicated to be effective for all team members, however, there could be some benefit in senior leaders adopting a similar approach to align the business to sustainability. Three general points were gained on accountability:

Table 6 Results related to accountability

Accountability		
<p>i) Senior leaders are accountable for sustainability, but this is because they are generally responsible for the project.</p>	<p>ii) Managers should take ownership of the recommendations and actions provided by the sustainability team</p>	<p>iii) There are always people within a project construction team who are accountable for assurance on the job generally. Therefore, a part of this is to be accountable for sustainability as well.</p>

The points presented in Table 6 are not an uncommon consideration when delivering projects. However, to support the points made in Tables 3, 4 & 5, it makes sense for an individual or individuals to take responsibility and accountability for delivering the different aspects of sustainability. As sustainability acts upon every functional aspect of projects, it will likely be beneficial for responsibilities and accountability to be clearly defined.

## 5.0 DISCUSSION OF RESULTS

The interview process provided supporting evidence that client organisations are best placed to drive the sustainability agenda and achieve sustainable solutions. This is centred on clients being involved with the complete lifecycle of the project and having the ability to mandate to and influence the supply chain. However, there are challenges to overcome within client organisations to ensure that sustainability is considered at the right point in the project to be carried forward throughout the rest of the lifecycle.

The very early stages of the project lifecycle and definition of the project are very much in the control of the client organisation. Therefore it makes sense for the client organisation to be the main proponent of ensuring sustainability is defined in the project to be most effective (Table 3, Item iv). Throughout the interviews, it became apparent that there were a number of challenges and key factors associated with positioning sustainability at the forefront of project planning:

### 5.1 Scope development and obtaining funding approvals

There is a perception within the industry, which was recognised by each of the participants, that sustainability adds additional cost that may not ultimately add value (Table 3, Item i). This therefore creates an environment where obtaining funding approvals for more sustainability focused measures is more challenging than perhaps a more standard scope item might be (Table 4, Items i, vii, xi, xii). Generally clients react positively to the sustainability agenda, however there is always an overriding concern with cost (Table 3, Item viii). Therefore one of the main obstacles to overcome in relation to sustainability is that of cost. There are a number of factors that could be attributed to the development of the perception that sustainability just costs more that may influence how sustainability is embedded in the early project stages.

The length of payback periods play a significant part in how sustainability may be considered in budget planning for a project because sustainability measures need to be financeable (Table 4, Item iii). The longer the payback period the less likely funding approval is. The longer the payback period the more potentially challenging developing a viable business case will be. This may also

be a challenge depending on the investment cycle in which the shareholders operate (*Table 4, Items iii, iv*).

The presentation and communication of the value of sustainability could be considered key to embedding sustainability early in the project lifecycle (*Table 3, Item i*). It is therefore important to understand what is important to the business in terms of sustainability (*Table 5, Item x*) and therefore seems logical to align the scope to those key objectives. If the development of the scope is clearly of benefit to the business in the future, then funding approvals should be easier to obtain. However, client project teams should be prepared to undertake an evidence based approach to support the sustainability aspects of the scope. Sustainability will be harder to embed if the supporting evidence is weak. This is however a difficult task as it is hard to demonstrate value when it does not relate to a reduction in operational costs or a reduction in carbon, which leads to reduced overall costs. Embedding sustainability into the funding approval process, does not necessarily mean there will be a greater project cost than previously anticipated. However, what it does mean, is that sustainability has been considered as part of the allocation of funding, therefore reducing the likelihood of change or scope creep later in the project lifecycle.

The scope development should also be clearly aligned with the wider corporate sustainability strategy of the organisation. This provides another means to being successful when obtaining funding. If the project team is able to prove that the scope specifically relates to aspects of the organisation's sustainability strategy, then it will likely be seen in a more positive light.

Identifying key stakeholders and funding approvers is also critical in developing the scope in the correct manner to obtain funding. Through identifying key stakeholders the project team will be able to develop a scope that is tailored to meet the needs of those affected. This will enable the benefit of a project or aspect of the scope to be demonstrated to the funding approvers more effectively.

It is essential to embed sustainability in the early budget planning and funding approval process because if measures are adopted later in the project lifecycle they automatically risk becoming unsustainable from an economic perspective. The cost of change increases as the project progresses and funding approvals become less likely the further into the lifecycle you are (*Table*



3, *Item iv*). However, this should not detract from the fact that some measures need to be carried out because they are the right thing to do, of which there will always be an element of when considering sustainability (*Table 5, Item xiii*).

The cost impacts of all three aspects of sustainability need to be treated equally to other aspects of project delivery, in the sense that sustainability should be put on an equal footing with the mechanical services design for instance (*Table 4, Items vi, vii*). One method is to include sustainability in the early cost estimating to set the budget for the works. If sustainability is missed from this early stage, then the later addition of sustainability may be seen as an additional cost and potentially as a bolt-on to the wider project delivery (*Table 5, Item xv*). This could be detrimental as it will feed into the perception that sustainability just costs more.

It is also worth noting, that without the commitment from the client organisation, it will be difficult for the supply chain to fully deliver the best sustainable solution as any divergence from the defined scope for the project will likely go unpaid or challenged, but this would be dependent on a number of factors such as the procurement route (*Table 3, Item vii*). Therefore, it seems logical that to engage with the supply chain on sustainability successfully, the client organisation needs to consciously promote the sustainability agenda and define what aspects are important or relevant to the business.

## 5.2 Separation of capital expenditure (CAPEX) and operational expenditure (OPEX)

The separation of CAPEX and OPEX funding streams can create difficulty in demonstrating the value of a sustainability measure if the main saving is in the operational sector of the business (*Table 4, Items ii, viii*). The operational element of the business may be a different from the client organisation who has developed the new asset and therefore it becomes complicated to demonstrate the added value to warrant increased up-front cost if the operational saving is attributed to a separate entity.

There is also a potential flaw in always aligning the business case with lower OPEX through increased CAPEX. This is because if the solution is not successful then there is potentially a risk

of losing engagement (*Table 4, Item ix*). It is therefore potentially more effective to establish balanced reasoning as to why the project should deliver sustainability in a certain way, which in turn should relate to the overall strategy of the organisation. In this way successful outcomes can be clearly defined.

Providing a means of linking the CAPEX and OPEX funding streams through lifecycle analysis or whole life costing may be of great benefit to the overall sustainability of a project, however, once again, this aspect will need to be desired by the client organisation and communicated to the supply chain.

### 5.3 Understanding and appreciation of sustainability in delivery teams

There is a perception in delivery teams that sustainability is solely related to the environmental aspects of a project. It may be in some organisations that environmental aspects are more of a focus than economic or environmental elements, however in most sustainability strategies there will most likely be a reasonably equal spread of objectives from each of the three aspects of sustainability. Therefore, one key action that can be undertaken is to establish a delivery team's understanding of sustainability. The delivery team's understanding of sustainability can be separated into two elements; the understanding of sustainability itself and the understanding of what sustainability means to the organisation. This is because sustainability will mean different things for different organisations. For instance, the construction of a new airport will have far different sustainability drivers than the construction of a new tunnel structure (*Table 3, Items i, ii, x, xi*).

The development of a project scope will involve most of the functions within a team. To be successful in embedding sustainability into the scope early enough, there needs to be a sufficient basis of understanding of sustainability. Sustainability will only be successful through many small interventions by many different people. Therefore it is beneficial for all team members to have a full understanding and appreciation of sustainability to justify the purpose of what it is they are doing (*Table 4, Items xi, xii; Table 5, Items x, xi*).

There will be opportunities and threats with any project and it is the manner in which these are managed that will determine how successful the project is in relation to sustainability. To enable the opportunities to be acted upon or the threats mitigated then each team member needs to be aware of and understand the associated impacts (*Table 5, Items ix, xi, xiii*).

#### 5.4 Implementing the sustainability strategy

Most organisations will have some form of sustainability strategy that sets out what is important to the organisation. This report has not covered what makes a sustainability strategy ineffective, however the general consensus that arose in discussions with participants was that simplicity is key. Sustainability strategies do not automatically translate into achieving sustainable outcomes. Even if organisations have sustainability strategy in place there is a risk that the strategy is not aligned with the delivery of the project. Therefore, it could be deemed essential that aligning the scope of the project to the sustainability strategy and having the client on board right from the offset is key, otherwise sustainability may be missed (*Table 5, Item xi*).

By ensuring that the scope is aligned with the client's strategy, the key objectives for the client will feed into how the designers and contractors will deliver the project (*Table 3, Item vii*). It is difficult for the supply chain to implement sustainability if it is missed from the overall strategy and without the firm commitment from the client. Similarly, if there is no direction from the client then opportunities such as delivering in accordance with BREEAM or CEEQUAL may be missed as they require early engagement from the project team (*Table 3, Item xi*).

If there is not a developed understanding of sustainability within an organisation then there is a risk that the client organisation requests that their delivery teams deliver sustainably, however they do not mandate it or require them to do it in a particular way (*Table 3, Item x*). The lack of definition of sustainability and alignment to an overall strategy could result in the supply chain only paying lip-service to sustainability and sustainability once again being seen as a bolt on to the wider project delivery. It is only potentially through sustainability being put on an equal footing with other disciplines that client organisations will see the true value of sustainability being delivered (*Table 5, Item viii*).

One method that is proving successful for the Project Manager, is to have established sustainability as its own discipline, similar to civil, structural mechanical etc. The discipline of sustainability therefore has its own experts who influence and support the overall delivery of sustainability and interfaces with other disciplines (*Table 5, Item xv*). Another aspect of this particular delivery team is to have members of the team responsible for different aspects of sustainability. For instance the mechanical and electrical delivery teams will be best placed to deliver any objectives that relate to energy consumption and internal environment of a building (*Table 5, Item iii*). Therefore a key person is responsible for managing how that element of team delivers that aspect and how it interfaces with other disciplines.

Another method is to have the client's sustainability strategy translated into framework or contractual agreements with designers and contractors (*Table 3, Item xii*). However, this will likely only be possible if there is a basis of understanding in the early project stages so that the contract can be developed in a manner so that it provides actual value. One mandatory deliverable within the contractual agreement could be for the early development of a feasibility report that has a defined focus on sustainability. Within the feasibility report different options are identified associated with different benefits and cost impacts. By doing this funding approvers are able to clearly see and understand what effects their decisions may have on the overall sustainability of a project (*Table 4, Item xi*).

An element that underpins all of these items is that a project will only be sustainable if there is proactive leadership that drives the project down a sustainable route (*Table 5, Item i*). Therefore initial steps should be taken with project managers to ensure that the understanding and drive is there. Methods of stimulating project teams to be proactive in relation to sustainability is to align performance measures to the sustainability agenda, which will then provide a rewards basis for delivering sustainably.

A key factor that underpins the implementation of sustainability is that proactive leadership is essential in communicating and delivering a sustainable project (*Table 5, Items i, ii*). Without adequate promotion from the more senior levels of project delivery, it will most likely always be a challenge to implement sustainability as an additional challenge will be present, which will be to change the mindset of those who make key project decisions.

## 5.5 Lack of accountability related to delivering sustainability

Methods of defining accountability in relation to sustainability are not commonplace. The suitability of a method such as a RACI Matrix (Section 2.5) were discussed with each of the participants and the conclusion that has been made is that it is beneficial to define accountability, however a RACI Matrix may be too complicated a tool to be used across all functions of the delivery team. There could be potential benefits in defining accountability for some key roles such as the Project Manager with a RACI, however the more variables that are within the matrix the more complex it becomes and therefore the less user friendly.

The general consensus from the interview process was that by default senior leaders and managers are responsible for sustainability because they are responsible for the whole project (*Table 6, Items i, ii, iii*). However, as mentioned accountability in relation to sustainability seems to be rarely defined. Therefore, there may be benefits in allocating responsibility of the various aspects of sustainability to individuals, with senior leaders taking overall accountability.

## 5.6 Influencing the supply chain

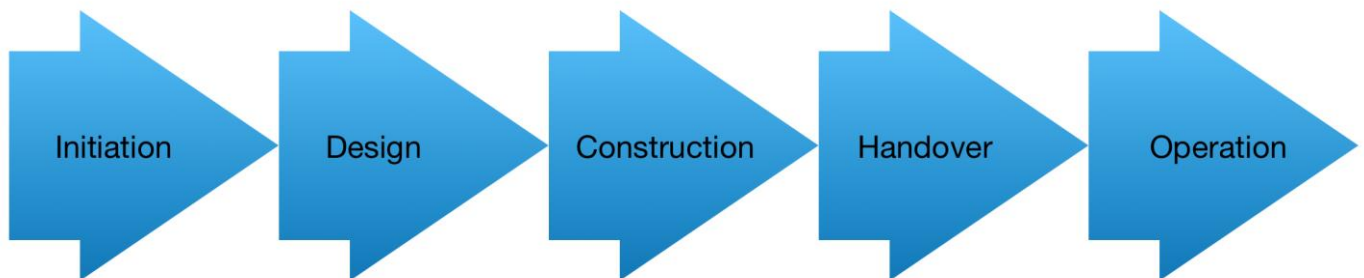
Client organisations are prevalent throughout all stages of the project lifecycle, therefore have opportunities to engage with and influence the supply chain. As client organisations have purchasing power, they are able to mandate the sustainability agenda as they see fit and the supply chain will adapt accordingly. The client is able to set challenging targets that require innovation and progressive thinking to deliver and if necessary can mandate aspects of this through procurement and the development of the contract. The contract is also another opportunity to reaffirm the client's commitment to the sustainability agenda. In contrast to the previous points, it is also difficult for the supply chain to implement sustainability if the commitment from the client is not apparent (*Table 3, Item vii, x, xi, xii*).

One key factor in the success of sustainability that became evident through the interview process is the benefit of collaboration through the supply chain. The client has the opportunity to set the parameters for collaboration across the supply chain. If the works are undertaken in a closed manner then opportunities may be missed due to a lack of communication or understanding across the various parties.

A key prerequisite for the supply chain to deliver the best possible solution is for the client to understand what is important to the organisation in relation to sustainability.

## 5.7 Potential actions for client organisations

There will be no one-size fits all solution for delivering sustainability across all sectors of the construction industry. However, there are potentially some actions that can be undertaken early in the project lifecycle to enhance the delivery of sustainability throughout the rest of the project lifecycle. The main conclusions from the earlier sections are that scope development, obtaining funding for sustainability and influencing the supply chain are key aspects to achieving sustainability. Therefore some potential actions have been outlined that could be undertaken to support these critical aspects of project delivery being achieved. Figure 10 shows the main components that are generally recognised to form the project lifecycle. The steps shown in Table 8 should all be carried out within the project Initiation phase and early design phase, depending on funding and governance structures within the organisation. The key message is that the later



sustainability is considered the less effective the solution will be.

Based on the information presented and discussed so far, the critical point for delivering sustainability throughout the project lifecycle can be perceived to be at the initiation and early concept design stages. Therefore, a number of actions have been determined in Table XX that could be adopted to aid embedding sustainability within projects.

*Figure 10 Identification of critical point for sustainability in project lifecycle*

Table 7 8 Key actions for clients

Step	Purpose / Objective
1	<p><b><u>Define the aspiration(s) of the project</u></b></p> <p>Defining the aspiration of the project could be a critical driver in shaping how the project will be delivered. This should feed down and be written into strategy documents, contracts, the scope etc. This will set out whether the project wants to go down a 'PassivHaus' solution or a BREEAM accredited excellent building, or provide stronger links with the community or a multitude of similar options. This action essentially frames what could be possible on the project and provides the initial stimulus for those associated with the project to understand what is expected in terms of sustainability.</p>
2	<p><b><u>Align the project aspiration(s) with the corporate strategy</u></b></p> <p>Aligning the aspiration(s) of the project to the corporate strategy is an essential step in preparing for later stages in making sure the foundations for a solid business case are developed. Sustainability measures are more likely to be approved if they are aligned to the corporate targets and strategy.</p>
3	<p><b><u>Determine high level opportunities and threats</u></b></p> <p>At this stage it is assumed that the client will have a reasonably well developed idea of the form whatever it is they are building or developing will take. This is point in time for the client to build upon past experience and use their knowledge of the type of development to highlight what opportunities or threats may exist. This information should then be fed to designers and contractors to enhance, act upon and mitigate. This should not negate designers and contractors from considering what opportunities and threats may exist.</p>
4	<p><b><u>Undertake option development and carry out a balanced sustainability assessment on each</u></b></p> <p>This step is potentially the most important. A selection of different options that deliver the overall solution need to be developed. For example, this could be build a new building, refurbish an existing building or alter and operational process. A balanced sustainability assessment to cover the social, economic and environmental aspects should then be undertaken for each option to reinforce the business case development in the next step.</p>



Step	Purpose / Objective
5	<p><b><u>Develop the business case for each option</u></b></p> <p>Each option should be supported by a business case that is evidence based and logical. In terms of sustainability the aim of the project team should be to ensure there is awareness of the sustainability merits of each and what the delivery risks are. This should then be supported by the up-front costs that will be required for the different options, the payback periods and the value that will be gained for each respective option. This stage is key to ensuring the correct funding is in place to actually deliver sustainability aspirations of the project.</p>
6	<p><b><u>Present business cases to funding approvers so they can make an informed decision on the options</u></b></p> <p>The business cases should then be presented to the funding approvers or those who allocate budget so they can make an informed decision on the options and embedded sustainability measures. It is imperative that the funding approved understand the value of the sustainability measures that are potentially going to be implemented. If the value is not understood then there is a risk that the upfront cost and payback information becomes irrelevant. Therefore, communication is critical. Another aspect is to reiterate the links to the corporate strategy that the business is delivering against.</p>
7	<p><b><u>Decide on the sustainability strategy for project delivery</u></b></p> <p>More complex or larger project may be beneficial to have a standalone strategy for sustainability that starts to pull together all of the information related to sustainability together. This could be beneficial document to outline accountabilities, procurement strategy and management arrangements and also useful for communicating the sustainability agenda to key stakeholders.</p>
8	<p><b><u>Use the option selected to write the scope for the designers and contractors</u></b></p> <p>Once all of the options are decided and funding allocated, they need to be translated into a detailed scope document to be carried forward through the rest of the project. This is the point to get the right level of detail into the scope document so that the designers, contractors and the rest of the supply chain have the impetus to deliver the best possible solution for the client organisation.</p>

The use of these actions is not intended to be prescriptive as different projects and organisations will have different governance procedures. The actions are however intended to provide simple guidance for clients and others to embed sustainability early in the project lifecycle, increasing the likelihood that the sustainability will then be delivered throughout the rest of the project.



## 5.8 Enabling the supply chain to succeed

By developing a scope for the project that explicitly refers to sustainability measures, the supply chain should be tendering to meet the requirements agreed within the client organisation. However, to ensure the sustainability agenda is clear and that the client organisation's commitment is evident, there are a number of key activities that could be undertaken as part of the procurement process:

1. Determine whether or not the tendering designers / contractors / consultants are best suited to deliver sustainability, similarly to how other disciplines would be considered.
2. Request what further innovations the designers / contractors / consultants could undertake to enhance the agreed scope.
3. Determine what terms are required within the contract to ensure all aspects of the scope are delivered to the desired standard.
4. Consider whether a reward style scheme would benefit the project and stimulate the right behaviours throughout the development of the project.

# 6.0 CONCLUSION & RECOMMENDATIONS

## 6.1 Summary

The aim of the research was to identify what actions could be undertaken by client organisations to enable sustainability to be successfully delivered throughout the project lifecycle. The research has provided an insight into a number of actions in the early stages of the project lifecycle that may benefit the overall sustainability of the project. The client is best placed to drive the project towards a more sustainable solution, due to being involved with the majority of the early project activities. The eight key actions that have been identified, hopefully provide a form of enabling sustainability to be delivered throughout the rest of the project lifecycle. The intention is for clients within the construction industry to use the actions as a means to initiating the project in such a way so that the sustainability agenda is more straightforward to implement.

## 6.2 Key Findings

The interview process highlighted a number of key topic areas of which the ones that most related to the objective of the research were selected to carry forward:

- Funding approvals
- The client's influence on the supply chain
- Strategy, leadership and management
- Accountability

A common theme that underpinned a number of the trends identified was the part that funding and the economic case play in the adoption and overall success of sustainability on a project. When analysing the information, the root cause of what might make a particular measure successful was often able to be traced back to how funding might have been allocated at the start of the project. This relates to the common understanding of how the cost of change, in relation to value, increases throughout the project lifecycle. In order to make a robust economic case for sustainability, it must be adopted at the very early stages of the project lifecycle similar to any other aspect of project delivery.

Careful consideration should be given to how a business case is justified, specifically if particular measures require additional upfront funding. There is a risk that if the value of the sustainability measures is not delivered then this may undermine future efforts to deliver sustainably. Therefore, sustainability aspects of a project should not be adopted without an appropriate evidence basis.

Organisations should be mindful of the overall objective of sustainability and that sometimes there may be a requirement to adopt more philanthropic solutions as they may be the right thing to do in relation to what is important to the organisation. These may yield more intangible benefits, however should not be discounted because there is not an obvious economic driver.

All of the information obtained throughout the various stages of research all underpin the theory that the client is the best placed party within the project lifecycle to drive sustainability. Due to funding being allocated at the start of the project and the fact that sustainable economic development is a key aspect of sustainability, it seems fair to conclude that the stages leading up to funding approval are critical.

If client organisations adopt and commit to sustainability across the whole lifecycle of a project, they will most likely see a variety of benefits:

- Decreased operating costs
- Improved reputation
- Decreased emissions
- Decreased water consumption
- Increase in value on the completed project
- Better environment for end users
- Fewer negative impacts on the natural environment

The communication of benefits such as these is a critical component of delivering the sustainability agenda. Therefore, those that understand or who are passionate about sustainability should take opportunities to intervene in the delivery projects to create more sustainable solutions.

### 6.3 Recommendations

This paper hopefully provides a stimulus for client organisations to reconsider the very early stages of the project lifecycle in relation to sustainability. To further enhance this research there are a number of topics that would be of benefit:

1. The effective incorporation of the three aspects of sustainability into early cost estimates.
2. How to write an effective contractual document in relation to sustainability.
3. How to develop the understanding of sustainability further with the parties involved at the early project lifecycle.

## 7.0 APPENDIX

### 7.1 Interview questions

1. What challenges do you associate with delivering sustainability?
2. Do you think client organisations are well positioned to drive positive behaviour in relation to delivering sustainability?
3. What actions could be undertaken to enhance sustainability early in the project lifecycle?
4. Do you think there is a perception that delivering sustainability objectives / targets are associated with increased costs?
5. Do you think there are any benefits by associating a management tool such as a RACI matrix with the delivery of sustainability?
6. Tracking and monitoring delivery could be seen as an integral part to understanding success. What challenges do you associate with tracking and monitoring the non-financial elements of sustainability and what methods could be used to overcome this?

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