Mapping sustainability assessment in relation to the life-cycle of a university campus project

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Sustainability assessment is increasingly recognised as playing a wider role than purely a technically based exercise that is focused on assessing the sustainability performance of building projects. The potential has been suggested for sustainability assessment to evolve as a tool that facilitates the consideration and management of sustainability across the different stages of the project lifecycle. This aligns with calls for assessment to increasingly contribute to the predominantly subjective approach to decision making within the built environment and the need to increase the level of integration between the activities of assessment and the project lifecycle. Key to such an approach, sustainability assessment offers a role in aiding stakeholder engagement and mediation, in addition to providing a stimulus for the required learning amongst practitioners to aid the delivery of project sustainability. However, the realisation of this aspiration has so far been limited in practice with many pointing to the lack of understanding amongst practitioners of the concept of sustainability, the nature of the assessment tools and the implications these present to current practice.

This paper aims to contribute towards this emerging understanding by considering an empirically based case study which follows the application of sustainability assessment across the lifecycle of an active project. A grounded theory approach was adopted, and a series of interviews conducted with those who were involved or influenced by the consideration of sustainability and its assessment across the lifecycle of the project. Presented are the findings of an exercise aimed at identifying the emerging phases and activities of sustainability assessment that were found in practice. The case study represented a progressive attempt by a project team to consider sustainability and to use assessment to guide the development of a university campus building project within the UK. The paper explores the application of sustainability assessment in relation to the key phases of the process i.e. identification of project sustainability issues, selection of an appropriate sustainability assessment tools, the implementation of the assessment tool and during the consideration of its outputs; and across the stages of the project lifecycle By exploring an empirical context that is forward thinking by nature, some key lessons are drawn to facilitate the evolution of sustainability assessment towards the advocated approach in practice.

Keywords: assessment tools, built environment, life-cycle, projects, sustainability assessment

1 Introduction

Increasingly sustainability assessment is perceived as a necessary tool for understanding the social, economic and environmental consequences associated with the way we design, build, operate, maintain and ultimately dispose of buildings and their support systems (El-Haram et al. 2007). However, the lack of a common framework and language around which to consider and assess sustainability, in addition to the absence of a truly integrated assessment tool, has resulted in the lack of a useable approach for practitioners to aid in its delivery within current building projects (Deakin et al. 2002; Brandon et al. 1997). Despite this, many argue that sustainability assessment has a key role to play in creating an environment where stakeholders are forced to rethink their priorities through the examination of the potential impact of their project on sustainability (Pope et al. 2004; Cole 2005). Assessment is called on to provide tangible information on key aspects of urban sustainability, providing guidance during the decision-making process in a manner that is transparent to and inclusive of the stakeholders involved (Mathur et al. 2008; Thomson et al. 2009). In viewing it as a proactive tool for instilling sustainability into decision-making, the likes of Lutzkendorf and Lorenz (2006) argue that through the promotion of discourse between stakeholders around the principles and implications of sustainability, a shared understanding can be fostered and applied to the contextual requirements of the building project. Kaatz et al. (2006) argues that an increased appreciation gained through assessment of the priorities of others, plays a significant role in aiding the mediation and inclusion of their values during decision-making within the project environment. In establishing such an environment during assessment, the basis is provided for an increased understanding of both the concept and its implications through the sharing and transfer of knowledge between practitioners and other stakeholders (Thomson et al. 2008). Significantly, the potential exists for this acquired knowledge and experience to be applied in future development projects with the objective of encouraging and promoting the sustainability during decision making.

The realisation of this aspiration has so far been limited in practice with many pointing to the lack of understanding amongst practitioners of the concept of sustainability, the nature of the assessment tools and the implications that these present to current practice as restricting the opportunity for evolution. It is argued that predominantly assessment tools are applied in a reactive manner, focusing simply on understanding and quantifying the flow of resources intended to be used within the project (Thomson et al. 2009). Recent awareness has emerged that such an approach is inadequate to support the predominantly subjective nature of the decision-making processes surrounding sustainability in the built environment (Lee 2006). If a more proactive approach is to be fostered, a better understanding is required of the role that assessment plays in delivering sustainability across the different lifecycle stages of the development project (Kaatz et al. 2006). Walton et al. (2005) in a review of 675 assessment tools identified significant variation in the nature of their applicability and function, and in the profile of the stakeholders involved over the course of the project lifecycle. However, despite the apparent volume and variation in the types of tools available (Fowler and Rauch 2006; Cole 2005; Deakin et al. 2002; Mitchell et al. 1995), practitioners commonly display a lack of awareness of other tools outside of the nationally based checklists such as BREEAM (BREEAM 2007), LEED (LEED 2008) and other tools such as SB tool (SB tool 2007), with evidence suggesting that often these tools are commonly applied in a reactive manner as opposed to the proactive manner intended.

This paper aims to contribute towards an emerging understanding of how sustainability assessment is applied in practice by considering an empirically based case study and to follow the assessment during its different phases across the project lifecycle. The case study illustrates a progressive attempt by the team to consider sustainability and to use assessment to guide its design, construction and operation. In order to understand the integration between the management of the project and the sustainability assessment, the phases and key activities of the assessment are identified and mapped in relation to stages of the project lifecycle. Knowledge mapping was adopted to identify the key-decision makers and various stakeholders involved, defining their roles, establishing where the knowledge resides and the nature of its flow during the phases of assessment and in relation to the stage of the project lifecycle. By considering a project that adopted a progressive approach to sustainability, some key lessons can be drawn to aid the evolution of sustainability assessment in practice towards the approach advocated.

2 Case study project background

The project emerged as a response to the need for a building to house a new Medical Sciences Institute at a UK university, to provide enlarged dedicated areas for medical research, biology teaching, chemistry teaching and photonics research. With planning permission obtained, preliminary works started in June 2008 with construction activities commencing at the start of July 2008 and a completion date targeted for January 2010. As an institution, sustainability was clearly rooted within the University's governance processes and practices, and was captured within the institutions sustainability policy and outlined in the sustainability strategy. As a project, a diverse range of stakeholders exist displaying a variation in interests and requirements from the building whether it be members of the project team, building users (academics, researchers, students, facilities managers), local and business communities influenced by its construction and its operation. The consideration of their needs has been aided to a large extent within the project as it was driven by the estates department of the University. The estates department displayed a vested interest in the construction phase achieving a focus on minimising the level of disturbance caused and in maintaining the operational performance and efficiency of the completed building forming a significant driver in the design and procurement decisions taken. The client actively sought a project team that would work with them to deliver a sustainable build, by appointing team members who they had either worked with before or could demonstrate sustainability credentials. The project was procured using a two stage procurement strategy.

The client had applied BREEAM (Building Research Establishment Environmental Assessment Method) (BREEAM 2007) as a tool for sustainability assessment within previous campus projects, but felt initially that the criteria offered failed to reflect the sustainability requirements of this building. The appointment of a sustainability advisor based with BRE (Building Research Establishment) provided the team with the knowledge to reach an agreement to adopt a tool that is based on the development of BESPOKE assessment criteria that reflected the nature of the building and its specific requirements. As an institution, the University is currently working towards a target of reducing its carbon dioxide emissions by 31,000 tonnes by 2012. This equates to a saving of £500K based on forecast 2012 energy prices. The Carbon Trust advises the University through their Carbon Management Programme to develop a targeted framework to deliver these targets, and as a result became involved in the project. They developed additional criteria

for assessment that supplemented those of the core BREEAM assessment and additional BESPOKE criteria. The project initially set out to achieve a 'Very Good' BREEAM rating, but it has been identified that the potential exists to achieve an 'Excellent' rating and the team members are actively pursuing this.

3 Methodology

An empirically based case study was identified as an effective means of examining the experience and interaction of those participating in sustainability assessment within the project (Yin 2003). By focusing on a real life example of assessment applied in practice, an opportunity is provided to gain greater understanding of the nature of its application across the different stages of the project lifecycle, in addition to its knowledge requirements and the nature of its flow. A series of semi-structured interviews, were conducted with those members of the project team involved or influenced by the application of the sustainability assessment within the project. The interviews were split in two phases, the first to develop an understanding of the project, the approach to sustainability, and the different phases of sustainability assessment across the project lifecycle. As a result, an interview was conducted with an individual who could provide an overview of the project and its consideration of sustainability, from its inception and across the various stages of the lifecycle. In this case the University's Environment and Energy Manager provided the required overview and understanding. The second phase aimed to focus in detail on those who participated specifically in the sustainability assessment in order to gain a practitioner's insight into the associated knowledge requirements, who is involved, what knowledge is required, who holds the knowledge, the nature of its flow and what mechanisms can be provided to aid its flow during a sustainability assessment. The interviews conducted during this phase were with the sustainability advisor, assessor and projects architect.

Knowledge mapping is a technique that has been adopted commonly by multi-nationals to understand where knowledge resides in their organisations, and the nature of its transfer between those who hold it (Vestal 2005). When applied in this context, knowledge mapping provides the basis for understanding the requirements associated with the individual stages of sustainability assessment. During the analysis, techniques such as organisational network analysis (ONA) (Vestal 2005) were deployed under the principles of grounded theory (Straus and Corbin 1990) in order that the nature of the relationship between the stakeholders is understood, identifying who is involved during an assessment, define what their role is, what knowledge they hold, what knowledge they require, and its preferred method of transfer. Grounded theory ensured that the findings were emergent by nature, rooted in the context and experience encountered within the case study.

It was observed that different professions representing the planning, design, construction, and operation stages of a development project understand the stages of the project lifecycle in a slightly different manner. A review was conducted to identify a suitable interpretation of the project lifecycle around which the various professions involved could relate the activities of their role with those required for achieving sustainability. These included RIBA plan of works (1999 2007), Process Protocol (Aouad et al. 1998), Building Design Management (Gray and Hughes 2001), The Office of Government Commerce Gateway Project Process (OGC 2007) and the HOK integrated design process (Mendler et al. 2005); with the RIBA plan of works 2007 identified as the most effective structure due to its wide

recognition (Thomson et al. 2008). This provided the common structure around which this case study and particularly the mapping can be considered.

4 Mapping sustainability assessment

Four key phases of sustainability assessment were identified within the research around which the key-decisions are taken i.e. identification of project sustainability issues, selection of sustainability assessment tools, implementation of the assessment, and consideration of tool outputs. The case study provided the opportunity to understand the role of the various stakeholders during each of these phases, and to map these different phases and the nature of stakeholder involvement across the project lifecycle. These maps provide an illustration of how sustainability assessment is a consideration through the stages of the project lifecycle, and provides the basis for the management of sustainability within the project. To enhance the level of understanding, a representation of the sustainability issues is provided as they emerge across the project lifecycle. The findings within this section emerged exclusively from the interviews conducted representing those involved or in delivering those phases of assessment.

4.1 Stakeholder involvement in project sustainability assessment

The analysis represented an initial mapping exercise to understand who was involved during each phase of the sustainability assessment. A list was established during the interviews of those involved and this was followed by a wider mapping exercise to identify at which phase of the assessment that this involvement took place. A summary of the findings is presented in figure 1. The figure illustrates that across all the phases the project board, client representative and sustainability advisor were involved. The project board and the client representative were responsible for delivering sustainability within the project, and in order to aid its management through assessment, they drew on the expertise of a sustainability advisor. The other stakeholders identified as participating in the assessment process were observed to contribute during the individual phases in a manner that reflected their role and the nature of the phase. The figure outlines the nature of the involvement played by each stakeholder during each phase of assessment.

Emerging from the analysis were seven different roles played by the stakeholders through their involvement i.e. the key-decision maker, responsible for overseeing activity, responsible for conducting the assessment, advising, consulted, evidence provision, informed and not included. A hierarchy was detected that required to be reflected, with ultimate responsibility lying with the project board within the decision-making process. Whilst they were not involved in the detail of the assessment, they would still perform the role of key-decision maker. The client representative took on the role of overseeing each of the phases of assessment, with expert advice and support coming from the sustainability advisor throughout and from the Carbon Trust (with exception of tool selection). The assessment was conducted by the sustainability advisor and sustainability assessor, and the evidence provided by members of the design and construction teams, in addition to specialist consultants (e.g. ecologist). A distinction was noted between those who provided advice as an expert (i.e. sustainability advisor, Carbon Trust), those who were consulted for input by the team (architect, project management consultancy and building users), and those who were informed of its progress (e.g. building users).

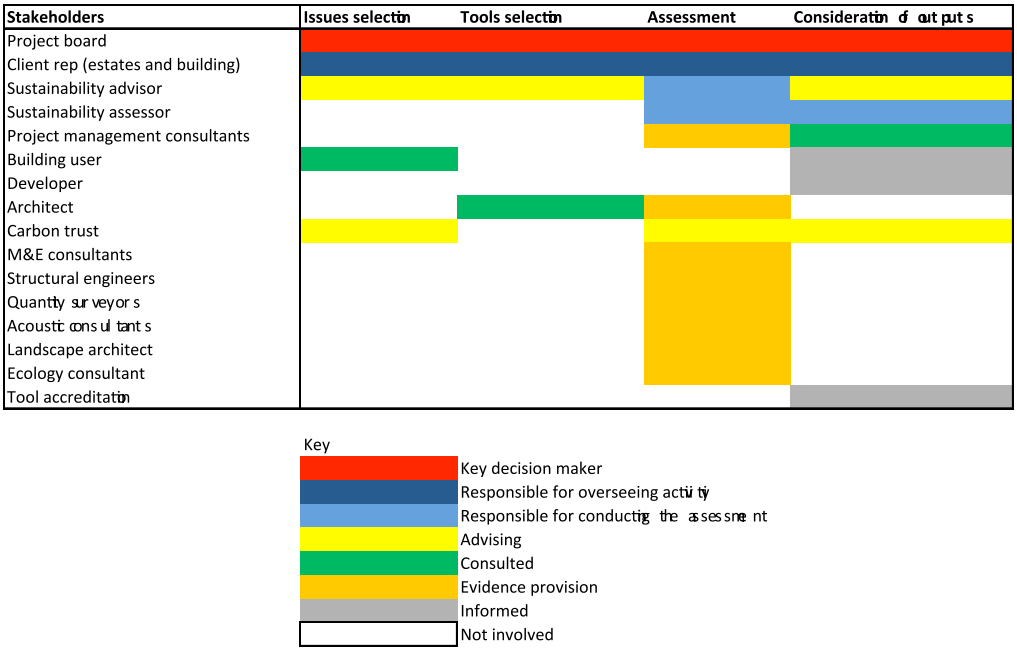

Figure 1: Project involvement in stages of assessment

During the selection of the sustainability issues, the project board and client representative demonstrated a good understanding of the issues that they wished to address within both the project and through an assessment. This was informed largely by the strong emphasis on sustainability running through the University's policies and strategies. The client representative stressed a focus on the operational considerations of the building, in addition to a need to minimise the impact of the construction phase on the campus as a whole. Initial issues of priority requiring consideration within this project were energy, cost, materials, water and biodiversity. Reflecting the emphasis on sustainability within the project, a sustainability advisor was employed as part of the team to provide expert advice regarding: the identification of suitable sustainability issues to address; the selection of an appropriate tool that meet the needs of the project; to advise the design and construction team during the development of the project; and to aid the implementation of the assessment. The Carbon Trust provided advice during the process of issues selection, although this emerged slightly later in the project lifecycle and required the issues initially selected to be revisited in light of the carbon agenda. As part of the projects wider engagement process, the potential users of the building i.e. as the academic staff, researchers, administrative, servicing staff and student bodies; were consulted regarding the sustainability issues they wished to see reflected. Given the public nature of the building nature and the emphasis on sustainability by the university, formal consultation regarding the sustainability issues was not explicitly sought with wider stakeholders, as the client body felt their requirements were implicitly reflected.

The university displayed familiarity with sustainability assessment, and had implemented BREEAM assessments on previous campus projects. Concern existed that the criteria within BREEAM was inappropriate to reflect the specific nature of the building given its wide ranging functionality, and the sustainability aspirations of the university. The sustainability advisor worked closely with the client representative to convince the project board that a BREEAM assessment would be suitable, if it was supported by BESPOKE sustainability criteria that reflected the function of the building and the University's additional criteria.

During this process, the architect was consulted to ensure that the emerging preliminary design was reflective of these aspirations and that these criteria could be delivered in practice. The sustainability advisor developed BESPOKE criteria for assessment that reflected these considerations, in addition to the requirements introduced by the Carbon Trust.

Although the client representative was responsible to the project board for the delivery of the sustainability assessment, it was the sustainability advisor and assessor who managed the collation of the evidence required from the design and construction teams, preformed the assessments and produced the reports. The sustainability assessor had responsibility for managing the traditional BREEAM assessment with the sustainability advisor overseeing the assessment of the additional BESPOKE criteria. The final assessment was post design by nature, and throughout the design process both the advisor and assessor liaised with the design team to ensure that the emerging design fell in line with the agreed BREEAM rating. It was this constant feedback that enabled an awareness amongst the team that through some modifications the emerging design had the potential to achieve a higher rating from its initial 'Very Good' to an potential 'Excellent'. This process was supported by some initial workshops provided by the sustainability assessor to help the design team to understand the expectations and processes involved in assessment. In addition, the sustainability advisor kept the client representative and project board abreast of the progress being made throughout the design phase. This allowed the project board as key-decision maker to revise the targets, and encourage the design team to achieve the higher rating.

The intention is for the outputs of the assessments to be available as the project moves into the construction phase. This provides two main functions, firstly to communicate the sustainability issues and associated targets to the developer and future operators of the building, and secondly to act as a tool for dissemination within the project team. The assessments will display a technical report which is used to support the first function and a simple rating and certificate to support the later. The project board decide the approach to the dissemination of the rating to the wider public, however, it is the sustainability advisor and assessor who require to interpret the technical report to the client representative and project management consultant, in order that they can inform the developer and future user of the building of the implications for their practices. This is preformed through written documentation and supportive meetings.

4.2 Sustainability assessment across the project lifecycle

Given this understanding, a mapping exercise was conducted to explore the nature of these phases of assessment in relation to the project lifecycle and to chart the nature of stakeholder involvement in relation to this. Figure 2 illustrates three representations: an interpretation of the phases of assessment, the involvement of the stakeholders, and the nature of that involvement in relation to the stages of the RIBA Plan of Works 2007 (RIBA 2007).

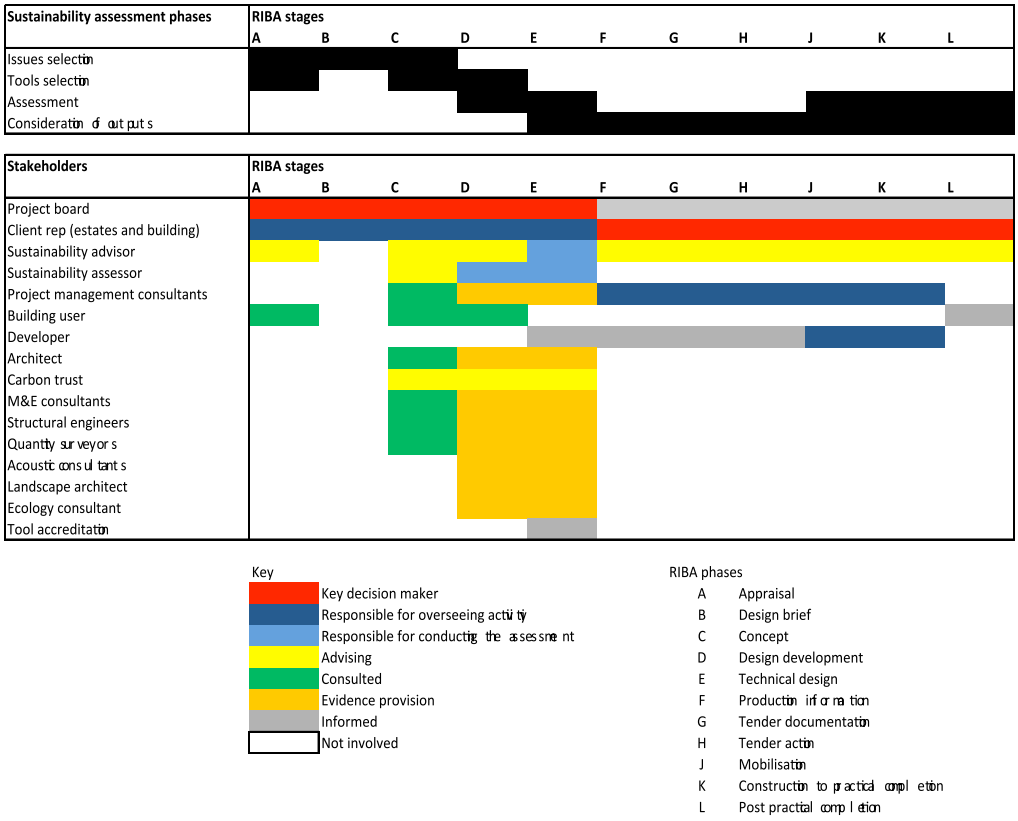

Figure 2: Project team involvement across RIBA stages in sustainability

Representing the phases of assessment across the project lifecycle highlights the often over lapping nature of these phases and the iterative manner which they are revisited during later stages of the project. This is illustrated in the process of selecting issues and the assessment tool. As a result of the University's experience of using BREEAM, they started with a good idea of the type of tool they were looking to adopt. During stage A, the client body expressed concern in the suitability of applying BREEAM and began a search for an alternative tool to match the initial set of sustainability issues identified. The figure illustrates the involvement of the project board, client representative and the role of the sustainability advisor in providing expert advice during this period. Consultation is also illustrated with those who will potentially use the building. Although the team were comfortable with the issues identified, the selection of the tool remained unresolved until stage C, when the sustainability advisor convinced the project board that a BREEAM assessment supported by a BESPOKE criteria based around the University's broader set of sustainability issues, could be delivered. At this point, the Carbon Trust became involved in the discussions and offered to fund a carbon emissions assessment in tandem with the BESPOKE assessment. As a result, the team revisited the selected issues and updated the criteria around which the BESPOKE assessment was structured. A sustainability assessor was employed at this point to advise the team on the implications of the different BREEAM ratings, and to contribute to the discussions between the client representative, sustainability advisor and the project board during the process of setting the target rating (i.e. 'Very Good'). Members of the design team were consulted to ensure the achievability of the rating and to ensure that the expectations for the emerging design were understood.

The implementation of the assessment tools took place over the course of stages C, D, and E with the final assessment being delivered and submitted to the BRE for

accreditation at the end of the design stages. The advisor and assessor worked closely with the design team to ensure that they understood the evidence requirements and to provide a monitoring function to consider the implications of the merging design against the desired rating. In considering the tool in this manner, the criteria and identified ratings were used to guide the evolution of the design and as a planning aid to procurement and construction activities. Evidence was gathered from members of the design team and a range of consultants brought in to support the assessments i.e. the ecological consultant. The submission of evidence was managed for the BREEAM criteria through the assessor, with the additional criteria for the BESPOKE assessment managed by the advisor. Increasingly, BREEAM assessments are required to be performed post-construction following 6 months occupation, but in this case it was conducted post-design with careful monitoring of its performance in construction and operation planned to support this. Due to the nature of the procurement route the developer was not involved in the assessment until stage E.

The intention was for the assessment outputs to provide the benchmark against which the post-design activities are considered. This ensures that decisions taken for the construction activities and the procurement of suppliers conform to the requirements of the assessment. During this phase, responsibility falls to the project management consultant to work with the sustainability advisor and the client representative to ensure that this is delivered in practice with the developer. Regular feedback was provided to the project board, to allow for changes to be made if required. During the construction and operational phase of the project lifecycle it was clear that a degree of assessment is required to ensure that the sustainability performance of the practices on site, the emerging building and finally the operational building, all align with the criteria and rating established within the assessment. This was recognised as a necessary element, as the university wanted to learn from the experience of this project in order that continuous improvement can be provided in future projects. Throughout this process the client representative took on the responsibility of key-decision maker, as the estates department was ultimately responsible for managing the operational performance of the building.

4.3 Sustainability issues considered during lifecycle stages

Displayed in figure 3 are the sustainability issues that emerged during the project against the main RIBA Plan of Works stages, detailing in the first level those described by the project team as the priority considerations, the second level those assessed as part of the BESPOKE criteria, and the third outlines the BREEAM criteria assessed by the team. It is necessary to point out that the BREEAM criteria are not presented in any order or in relation to the stages of the RIBA Plan of Works.

The principle priorities outlined initially by the project board and client representative related to cost, energy, materials, water, land use and biodiversity. These represented a mix of the priorities of the estates and buildings department who were concerned with the operational performance of the building (i.e. energy, cost, water) and those additional priorities of the University's sustainability strategies and policies (land use and biodiversity). The project board and the client rep's whole life view of the project, aided in allowing sustainability issues to be built into the activities of design, construction and operation due to the recognised value to potentially improve operational performance, especially with regards to costs, energy and more attractive environment that contributes to the wider campus (biodiversity, water and land use). It is apparent that the sustainability

issues of concern during the design phases reflect the means of achieving these higher level issues by setting principles around which the activities of design are set. During this stage it is possible to recognise a move towards a concern for carbon dioxide emissions, waste, and transport. This reflects the additional criteria of issues suggested by the sustainability advisor and the Carbon Trust. As the project moves beyond the design phase, concern shifted towards ensuring that the construction phases deliver sustainable materials, health and safety on site and minimise the impact of the project on the surrounding area. This is not surprising, and so the overall assessment moves towards a monitoring and auditing role. Reflecting the concern for the whole lifecycle of the project by the project board and client rep, it is not surprising to see the issues being considered during the use or operation of the building taking on the role of assessing the actual performance delivered by the building in practice.

The BREEAM criteria for assessment consider a wide range of sustainability issues, many of which match with the issues identified by the project board and it addresses these in a specific manner. It was the role of the sustainability advisor to consider the sustainability priorities of the project board and to identify those which were not addressed in the BREEAM criteria and to ensure that the BESPOKE criteria addressed these by highlighting and assessing their sustainability.

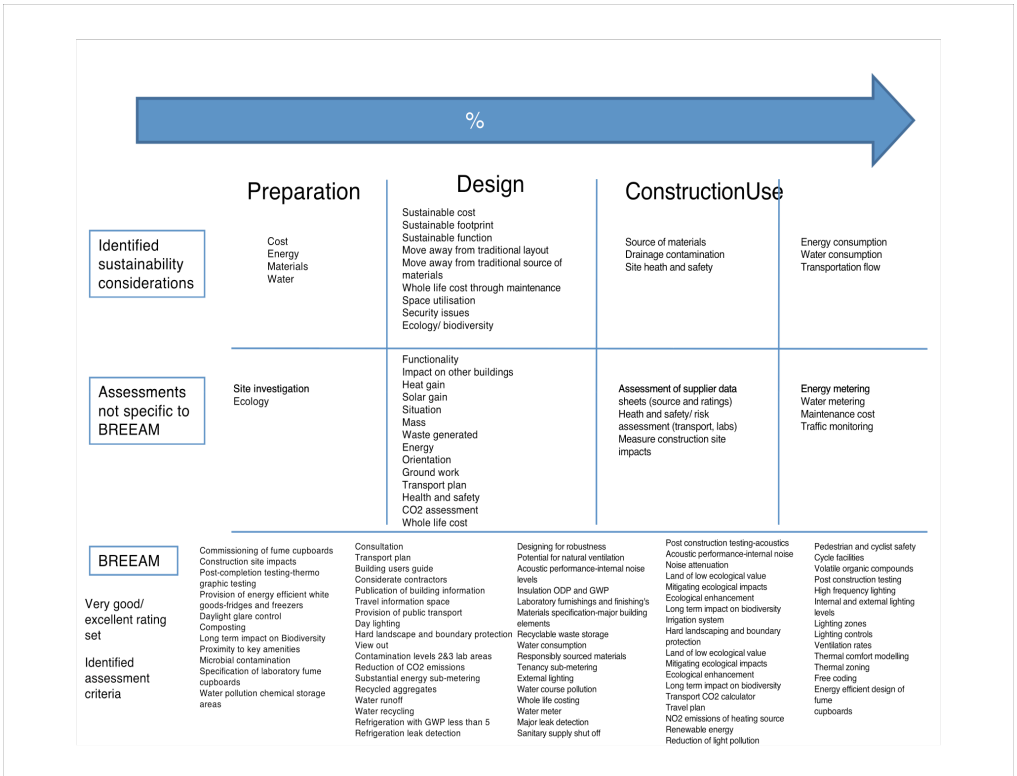

Figure 5: Sustainability considerations for assessment identified across the project lifecycle

5 Key findings

During the analysis six key factors emerged as important for sustainability assessment to be realised in practice in the advocated manner. The factors

emerged from the analysis of the case study, with some successfully demonstrated in practice and others requiring further consideration.

5.1 The contribution of expert guidance

The research demonstrated the value gained throughout the process by the expert knowledge provided by the sustainability advisor. This role is not typical within a project team, but in this case the contribution was clearly beneficial in supporting the level of understanding of members of the team regarding both sustainability and its assessment during relevant decision points of the project. The client body recognised the potential value of this role from the inception of the project. The guiding role provided through the advisor's experience and general understanding, coupled with their technical expertise clearly improved the team's ability to engage with the sustainability agenda and to effectively interact with its assessment across the project lifecycle.

5.2 Realising actual performance through assessment

The assessment was conducted post-design, but it is increasingly recommended that a better picture of the buildings sustainability performance is gained by performing the assessment post-construction and after 6 months of operation. That way the rating achieved reflects the actual performance as opposed to simply a predicted one. This would place greater emphasis on the role of facilities management and its influence on sustainability. In addition, the behaviour of the buildings users would represented in the performance of the building.

5.3 Striving for aspirational practice

Although this project represents a progressive attempt to deliver sustainability with an 'Excellent' BREEAM rating being achieved, there were a couple of aspects that require future consideration. Whilst whole life costing was considered within this project, a greater emphasis was required for the wider issues of sustainability across the whole life cycle. BREEAM by its nature has a limited provision for socio-economic issues. The team tried to incorporate some of these additional issues through the BESPOKE criteria. However, it is widely acknowledged that even best practice examples (such as this project) fail to reflect the wider principles of sustainable development, as they represent a culture of mere compliance with legalisation that is acknowledged by many to be behind the curve. Within the UK building projects are emerging that view sustainability in its wider sense (i.e. development in line with environmental limits and quality of life), an aspiration around which decisions of design, construction and operation are based. Projects developed by Bioregional Quintain such as the BEDZED and Greater Middlehaven (Bioregional, 2008), are being developed in line with One Planet Living Principles (Desia and King 2006). Within these projects targets are set in line with OPL, and the likes of BREEAM are considered within a suite of assessment tools used to support the project's quest to deliver aspirational targets and therefore go far above legislative demands.

5.4 Implications of procurement route on the inclusion of wider project team

In selecting a two-stage procurement route the ability of the developer to be involved in any of the assessment phases was observed to be significantly restricted. Evidence from projects able to include the construction team in the selection of the project's sustainability issues, demonstrate not only the buy-in of

the construction team around its objectives, but also benefit from the input of those considering sustainability from a site viewpoint, and thus aid project teams to set realistic targets that are deliverable in practice.

5.5 Significance of leadership

Leadership within the assessment process was demonstrated to be extremely important to the success of the assessment within this project. From the outset of the project the client body set a direction which placed sustainability as a clear priority within the project. They displayed a good understanding of sustainability and the role of assessment, and were well placed to provide the required leadership. This ensured involvement at all phases of the assessment process ensuring adequate feedback between the assessment and the decision points across the project lifecycle. The client body displayed significant leadership in their recognition that additional guidance from a sustainability advisor would be beneficial and through their commitment to sustainability by effectively resourcing the assessment.

5.6 Engagement as an aid for performance improvement

Through the engagement of the relevant stakeholders across the process, the team were able to contribute to the assessment across all of the phases, and therefore learn from each other and benefit from the expert advice provided by the sustainability advisor and assessor. The awareness created amongst the team of the evolution of the assessment process and its requirements aided in the collation of the evidence and presented the opportunity for the team to recognise the potential to improve the sustainability of the building.

6 Conclusions

Sustainability assessment plays an increasing role in the development of our urban environment, and a better understanding is required of the nature of its practical application within the project environment. In recognising that the evolution of sustainability assessment lies not solely as a purely technical exercise, but as a valuable process for the promotion of urban sustainability through stakeholder engagement, mediation and learning; new challenges are placed on the management of knowledge. This paper has considered an empirically based case study and followed the assessment during its different phases across the project lifecycle. The case study demonstrated a progressive attempt by a University to consider sustainability and the application of an assessment that intended to act as a guide to the design, construction and operation of the building. As a client, they illustrated a clear strategic appreciation of the value of sustainability, partly due to their role in managing its eventual operation and therefore emphasised a need to maximise the building's performance given their whole life responsibility for it; but also as part of their development strategy for the campus and the need to promote and ensure that this follows a sustainable direction.

In mapping the four stages of assessment across the project lifecycle and in identifying the role of the relevant stakeholders within this, a process was identified in this case that reflected the intertwined nature of the selection of sustainability issues and tools. This was partly due to the prior experience of the client body in using an assessment tool like BREEAM, but confirmed the often iterative nature of the decision making that surrounds these two phases of assessment. Highlighted was the value of developing an assessment methodology

that accommodates the context of the project, in this case the requirements of the client and the specific function of the building demonstrated through the BESPOKE criteria. In applying the assessment in practice, the significance and value of a structured approach to managing the gathering and collation of data and evidence required was highlighted as enabling effective feedback between the assessment and decision making processes.

Stressed was the need to support decision making within each stage by facilitating the flow of knowledge regarding sustainability and its assessment as widely within the project team as appropriate. This allowed the team to demonstrate a high capacity for social learning about both sustainability as a concept and its assessment, and this was best demonstrated through the ability of the team to recognise the opportunity to raise the BREEAM rating during the design process.

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