

Leading sustainable school building projects

Outlining research and resources for leaders involved in delivering school building projects which aim to support the principles of sustainability.

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Forum for the Future

SCHOOL LEADERS

Report

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Contents

Executive summary	4
1 Introduction	9
2 Policy context	11
3 Methodology	16
4 Project findings and analysis	20
5 Recommendations	39
References	42
Appendix 1: Guidance for school leaders	44
Appendix 2: Case studies	60
Appendix 3: Survey questions	118
Appendix 4: English schools	119
Appendix 5: Overseas schools	120
Acknowledgements	121

Executive summary

Sustainability provides a framework that can unite many different government policies and initiatives, from individual learning through to extended schools and the flexible use of information and communications technology (ICT).

The quality of environment provided by a school building can have a profound impact on both sustainable learning and sustainable lifestyles. Current levels of investment in new buildings give us a once-in-a-lifetime opportunity to deliver real change in the sustainability of the schools estate and the learning it is designed to support.

In order to grasp this opportunity, school leaders must be equipped with the knowledge and skills required to deliver sustainable buildings through existing procurement systems and processes.

Aims and approach

This study for the National College for School Leadership (NCSL) aims to identify and develop the leadership skills and knowledge needed to deliver school buildings which embody both sustainable learning (environments that will remain fit for learning into the 21st century) and sustainable environments (centres of learning that have a minimal impact on the biosphere). Both these aspects are critical. However, as research exists elsewhere on sustainable learning, this study places more emphasis on the creation of sustainable environments.

To fulfil this purpose, we identified six objectives:

- Develop a set of principles for good practice in leading sustainable building projects
- Explore what makes a good leader when building sustainable schools
- Identify the key people involved in school procurement, design and building and their roles in making or influencing big decisions related to sustainability
- Prepare a process map that identifies the points in the Building Schools for the Future (BSF) process when leadership intervention is needed to ensure that sustainability requirements are implemented or retained
- Compile case studies of school projects that exemplify some or all of the features of a sustainable school, including details of how school leaders have achieved their sustainability outcomes
- Make recommendations for future action to school leaders and NCSL, including possible next steps within the current BSF Leadership Programme

Our approach involved dividing the work into two distinct phases:

- Desk study: examining existing guidance on sustainable building principles, sustainability leadership skills and key sustainability intervention points in the BSF procurement process
- Primary research: conducting semi-structured interviews with leaders from 11 schools, an online survey of 364 school leaders and detailed consultation at events and workshops

Project findings

Principles for Sustainable Schools

The Sustainable Schools National Framework defines eight areas of school life in which school leaders are encouraged to address sustainability issues. These 'doorways to sustainability' cover a wide range of activities and operations, from the food and drink served in school to strategies for inclusion and participation.

Some of these 'doorways' are not as relevant to school buildings and their grounds, so for sustainable school construction projects a more detailed list of principles directly relating to the buildings themselves is required. Our research sets out these principles in two categories that need to be addressed at different times within the procurement process and by different leaders:

1. Principles relating to sustainable learning, contributing to the delivery of a building that provides additional facilities for the local community and which will be flexible enough to meet learning needs for many decades
2. Principles relating to sustainable building, such as energy consumption and the materials used in construction

Principles for sustainable learning

According to our research, the most important principles for delivering 'sustainable learning' are:

- The sustainability of the learning environment itself – the extent to which it will continue to be fit for learning in the future. This principle is linked to considerations such as space (providing classrooms that are robust and flexible, with enough room outdoors and a good mix of public and private areas); the curriculum (supporting personalised learning and meeting the learning needs of all pupils); and technology (adaptability for future ICT capability)
- Commitment to sustainability among school leaders
- Achieving positive social, economic and environmental outcomes
- Considering the building as a tool to learn about sustainability issues
- An integrated approach, that is, rethinking schools' learning and organisational approach along with the physical design

'The learning environment must be fit for purpose since this is the reason for providing any school building. The building must be flexible enough to enable new teaching methods to be used in the future. To achieve this goal, it is imperative to know what you require from your building and to have a good, easily understood brief. This gives the architects the parameters of their work and the needs that the client [school] wishes to have fulfilled.'

(survey respondent)

Principles for sustainable buildings

Many aspects of sustainability are relevant to school buildings, but school leaders consider the following environmental and operational aspects as crucial:

- Energy efficiency
- Physical manifestations of the estate including ventilation, natural lighting, green space and attractiveness of design
- Quality and durability of the building
- Sustainability of the materials used in construction

Attributes of leadership for sustainability

We found that the most important attributes of leadership for sustainability in schools align closely with those of school leaders in general. The research revealed a core group of attributes that are integral to the success of sustainable school building projects:

- An ability to challenge the status quo
- Understanding of future educational needs
- Consulting and involving others
- A personal commitment to sustainability
- An ability to develop a broad and clear vision
- An understanding of the complexity of sustainable development and built environment issues
- Tenacity and perseverance

‘The headteacher has to be able to understand and articulate the vision, then have the tenacity and attention to detail to ensure that the project manager delivers on what has been agreed.’
(survey respondent)

Identification of key people and their roles

Our research establishes that the three most important leadership roles in the successful delivery of a sustainable school are those of headteacher, architect and chair of governors.

Conclusions

1. Our interviewees and survey respondents stressed that sustainability presents an opportunity for an integrated learning and organisational approach. School leaders can deliver schools that not only provide an environment fit for learning in the future but also serve as tools to help pupils learn about sustainability. For example, opportunities for monitoring and maintaining energy-saving features are built into the curriculum. We propose a set of strategic principles to guide the visioning and briefing processes for new schools and refurbishments.
2. In addition to the attributes listed above, those who have led successful sustainable building projects are characterised by excellent relationship management skills, an ability to be authoritative when necessary and a passion for sustainability. These qualities should be sought and nurtured when assembling a team to drive sustainable school construction.
3. School leaders embarking on the process would like more help in understanding what a sustainable school looks like, the interconnectedness of sustainability issues, pitfalls to avoid and links between sustainability and improved standards.
4. The Strategy for Change stages of the BSF process are the most significant points at which active intervention by school leaders is needed to ensure the successful delivery of sustainability features. In this report we spell out what steps leaders need to take and when (see Section 4.4).
5. Understanding how to enhance and support the key relationship between headteacher and architect is critical to the success of school building projects since this was identified as the key mechanism for translating the school's vision into a physical form. Besides requiring support in this area, the leaders we interviewed expressed a need for assistance with the specifics of procuring and managing a complex project. They also wanted practical pointers on how to advocate for sustainability and manage the value engineering process. Our recommendations for action, found in detail in Section 5 and summarised below, set out the kind of enhanced support framework school leaders require in order to succeed.

Recommendations

The following recommendations are aimed at those steering NCSL and its BSF Leadership Programme.

1. Expand the sustainability content of the NCSL school Leadership Programme. While the skills and competencies required to lead major change projects are addressed in current leadership training provision, there is a need to bridge the gap in school leaders' understanding of sustainability issues, such as the links between sustainability, learning and raised standards.
2. Incorporate sustainability skills training and learning groups into Phase three of the BSF Leadership Programme. School leaders need specific training on how to manage a complex building project, covering everything from key stages of the procurement process (including sustainability intervention points), to interpreting architects' drawings. Ideally, this training should draw on practical experience from people who have already been through the process. The methodology could include action learning groups and role-play involving other school leaders.
3. Capture learning from post-occupancy evaluations. To give school leaders the best chance of success and to avoid repeating past mistakes, practical knowledge needs to be recorded and passed on through post-occupancy evaluations and case studies. Interviewees would like this information to be made available through a web-based resource.
4. Appoint a sustainability adviser attached to BSF or to local authorities. Local authorities and school leaders need specialist sustainable development advice and support in parallel with the kind of support they already receive through ICT advisers.
5. Allow more time for key stages of the BSF process. Some school leaders feel under unnecessary pressure because of the tight timetable that often applies to the early stages of BSF projects. They need leeway and encouragement to spend more time on visioning and budgeting if these projects are to be given the best chance of succeeding from a sustainability perspective.
6. Promote realistic budgeting and sustainability audits. School leaders need specific guidance on whole-life costing for sustainability and on maintaining sustainability during the costly re-engineering process. This will help them develop more realistic budgets and avoid losing all their sustainability aspirations during the latter stages of the BSF process. School build bidders should also be required to undertake a sustainability audit.
7. Ensure that school leaders have sufficient access to external expertise. There is a need to support and enhance relationships between school leaders and project architects so that every school's aspirations can be translated faithfully into practical reality. School leaders would benefit from the appointment of a BSF sustainability adviser (see Recommendation 4 above) or having an external contractor made available to work as a project manager on their behalf.

1 Introduction

1.1 Background

Sustainability provides a framework that can unite the many different government policies and initiatives related to schools and local communities. But making Sustainable Schools a reality requires a significant culture change across the whole school community. New buildings will achieve little on their own without changes in working practices and systems.

To address this challenge the National College for School Leadership (NCSL) developed its Building Schools for the Future (BSF) Leadership Programme in 2006. The aim is to support school leaders through the BSF process.

An important aspect of the project so far is the debate among school leaders on how the BSF opportunity can be used to transform learning. Few new schools were built during the 1980s and 1990s, so until recently there was a lack of expertise in this area of work. We now have more school leaders with experience of leading building projects, and many more will need to lead such projects over the next 15 years.

Sustainability has become an important consideration for schools in recent years (DfES 2006; Sustainable Development Commission 2006). This is becoming evident as increasing numbers of new school buildings are acclaimed for their environmental features.

Many of these buildings were not built with a view to tackling every part of the sustainability agenda in one go. Instead, emphasis was placed on addressing particular aspects of sustainability. Reflecting on the experience gained from the priorities adopted, and understanding what skills and knowledge are required to lead sustainable building projects successfully, are crucial.

1.2 Rationale

This study for NCSL aims to identify and help develop the skills and knowledge that school leaders need to lead sustainable building projects. To be truly sustainable, new buildings must meet the Education and Skills Select Committee's dual definition of sustainability. They should be sustainable from a learning perspective – buildings that will remain fit for purpose for learning into the 21st century. And they should be environmentally sustainable, that is, with a minimal impact on the biosphere.

These two overlap, of course. The physical environment created by a well-conceived new school can enhance the potential for pupils to learn about environmental sustainability, covering a range of curriculum areas in the process. It can also provide exciting and stimulating surroundings that can enhance the learning experience. Both these aspects are critical. But as research on sustainable learning already exists, this study emphasises creating sustainable environments.

1.3 Aims

We have identified the skills, knowledge and competencies required by school leaders to lead sustainable building projects and also highlighted the best ways to develop these qualities. We hope NCSL and policy makers can use our findings to ensure that school leaders are adequately equipped to create truly sustainable schools in the future.

The objectives for the research were:

- To develop a set of principles for good practice in leading sustainable school building projects
- To explore what makes a good leader when building sustainable schools
- To identify the key people involved in school procurement, design and building and their roles in making or influencing big decisions related to sustainability
- To prepare a process map that identifies the points in the BSF process when leadership intervention is needed to ensure that sustainability requirements are implemented or retained
- To compile case studies of school projects that exemplify some or all of the features of a sustainable school, including details of how school leaders have achieved their sustainability outcomes
- To make recommendations for future action to school leaders and NCSL, including possible next steps within the current BSF Leadership Programme

2 Policy context

This section sets out the big policy imperatives in education along with relevant regulations and how they relate to sustainability. We concisely describe each policy or report, drawing out the sustainability implications in a single paragraph.

Policy imperative	What is it about?	What does it mean for sustainability?
<i>14–19 Education and Skills</i>	A White Paper (DfES 2005a) that sets out aims to transform secondary and post-secondary education so that all young people achieve and continue in learning until at least the age of 18	There are implications for energy use in having larger buildings and more equipment, particularly ICT, being used by more people at any one time
<i>Every Child Matters</i>	A new government approach for all children to get the support they need to be healthy, safe and happy; to succeed in learning and to make a contribution to society; and to achieve economic well-being (DfES 2003)	All groups providing services for children will need to work together. The goals are specifically aligned to the social and economic aspects of sustainability: health, social cohesion and a strong economy. There are implications for building design due to the need for co-location of services
<i>Extended Schools</i>	By 2010 all schools will be required to offer a core set of extended services: childcare, parenting support and specialist services such as speech therapy or mental health services (DfES 2005b)	Longer opening hours are likely to increase resource use. Buildings will need extended heating and lighting into the evening, for example. Schools may also need more space to accommodate the new services. The new services should address social dimensions of sustainability
<i>Five-year Strategy for Children and Learners</i>	A strategy for education through to 2009. It seeks to break the link between lower social class and under-achievement (DfES 2004)	The drive for personalised learning, joined-up education and new services from schools will put more pressure on schools and their buildings. More space will be needed, and longer opening hours. This strategy focuses on the social aspects of sustainability

Policy imperative	What is it about?	What does it mean for sustainability?
Healthy Schools	The National Healthy Schools Programme, established in 1999, has four themes: personal, social and health education (PSHE); healthy eating; physical activity; and emotional health and well-being. These relate to both the school curriculum and the emotional and physical learning environment in school. Under each theme there are a number of criteria that schools need to fulfil in order to achieve national Healthy School status. Nearly all schools have joined	The issues are very similar to those raised by <i>Every Child Matters</i> , in that improving the health of pupils helps to tackle social aspects of sustainability. The programme also has implications for new schools – especially for the space allowed for dining and physical activity. This may affect management of the grounds, biodiversity and/or energy use
<i>Sustainable Schools for Pupils, Communities and the Environment</i>	The Sustainable Schools National Framework, published in 2006 (DfES 2006)	Describes a sustainable school as one that is committed to care: ‘care for oneself, care for each other (across cultures, distances and time), care for the environment (near and far)’. It defines eight ‘doorways’ for engaging with sustainability, listed in Section 4.1
<i>Securing the Future</i>	The UK government’s strategy for achieving sustainable development, published in 2005 (HM Government 2005)	Defines the overarching goal of sustainability as enabling ‘all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations’. For schools, this means thinking about the global effects of their activities

Policy imperative	What is it about?	What does it mean for sustainability?
<i>The Children's Plan</i>	The UK government's 10-year strategy to 'make England the best place in the world for children and young people to grow up'. It sets out a series of ambitions for all areas of children's lives (DCSF 2007)	It sets out an unequivocal commitment to 'world-class buildings' and that all new schools will be zero carbon by 2016. £110 million will be allocated for sustainable buildings. New buildings will have space for co-located services and parents will have more involvement in school. Investing in safe areas to play at school will be a priority
Regulation	What is it about?	What does it mean for sustainability?
BREEAM schools	The Building Research Establishment's Environmental Assessment Method for school buildings. A point-based system that allows schools to see how well designs for new or refurbished buildings are addressing sustainability	Every newly built and refurbished school must achieve at least a 'very good' rating, which means scoring points on management, health and well-being, energy use, transport, water, materials, land use and ecology, and pollution
Part L of the Building Regulations on Energy Conservation	Mandatory minimum standards for new buildings and large refurbishment projects. These mean that all big building projects have to estimate CO2 emissions from heating and power	Every new building or large refurbishment for a school must be around 23 per cent more efficient than equivalent buildings built before 2006. This should make a positive contribution to reducing carbon emissions and running costs. However, it may also inflate the capital cost of school buildings

Regulation	What is it about?	What does it mean for sustainability?
Building Bulletin 87 (BB87): Guidelines for Environmental Design in Schools	A technical manual published by the Department for Education and Skills (DfES, now the Department for Children, Schools and Families or DCSF). Covers energy use, ventilation, lighting and water services in schools	Sets a standard for energy use in schools, which for secondary schools is 5kgC per m ² per year. It has not yet been revised to match the current building regulations for energy conservation
Building Bulletin 93 (BB93): Acoustic Design of Schools	A technical manual published by the DfES. Outlines standards for noise entering the school, and for how easy it is to hear someone talking in a class	The acoustic criteria can preclude natural ventilation for urban schools due to noise caused by open windows. It is recognised that the standards are set high. As a result it is accepted that some schools will not meet them all
Building Bulletin 98 (BB98): Briefing Framework for Secondary School Projects (Revision of BB82)	Recommended area guidelines for new school buildings. Intended for use in briefing school design teams and explaining how much space will be needed for basic teaching, halls, learning resources, staff and administration, storage, dining and social space	The new space standards, published in 2004, increase the minimum floor areas for primary schools by 17 per cent and for secondary schools by seven per cent. Increased space is being allocated for teaching areas. These stipulations will mean more materials and land are used in construction, and may lead to higher energy consumption. New resources developed by Partnerships for Schools (PFS), the agency that oversees BSF, show how the BB98 guidelines can support flexibility in creating sustainable learning environments

Policy implications

Although education policy is complex and changes frequently, government messages about education and sustainability are consistent. The fact that the UK school estate accounts for 15 per cent of the public sector's carbon emissions is a strong imperative for action. *The Children's Plan* (DCSF 2007) sets out an unequivocal commitment that all new school buildings will be zero carbon by 2016 and it has been announced that £110 million will be allocated for sustainable buildings. There is a real sense of urgency about improving understanding of the issues among school leaders and others.

Some government policies, such as *Every Child Matters* and extended schools, will affect the use of school buildings. In practice they may require more accommodation and/or longer opening hours. At the same time they are likely to result in buildings being used more effectively and efficiently, with no long periods out of use. Both these policies should help to address social aspects of sustainability, including social cohesion and breaking the link between deprivation and poor educational achievement. They also raise issues around benchmarking environmental performance, including how new schools are measured against older, more traditional ones.

Other parts of government policy explicitly affect the environmental performance of schools. The latest building regulations require project teams to look harder at energy use and reduce CO₂ emissions compared to schools built before 2006. Government purchasing rules also mean that all new schools have to achieve at least a 'very good' rating using BREEAM. It is likely that environmental performance requirements will be further tightened in coming years. The Building Research Establishment (BRE) is currently revising BREEAM, and it will become a lot more difficult to achieve an excellent standard in the future.

In conclusion, school leaders involved in procuring new or refurbished facilities need access to sustainability expertise from someone who understands all the links to the wider agenda. This need could be met by a sustainability adviser attached to individual BSF projects and/or the local authority, working in parallel with the ICT adviser. We think it would be worth exploring the feasibility of this option.

3 Methodology

We conducted the research from October 2007 to March 2008. It was divided into two strands: desk-based and primary research.

3.1 Desk-based research

To summarise the key principles that apply to sustainability in school buildings (see Section 4.1), we reviewed the existing literature. These principles were then used as a way to benchmark the current front-runners among sustainable school buildings in England and abroad. This benchmarking exercise was carried out in order to identify possible case study exemplars of good practice.

We conducted an extensive review of the literature on leadership qualities, focusing on leadership for sustainability.

After identifying the key roles involved in building a sustainable school, we mapped out the responsibilities attached to those roles.

The BSF step-by-step guide provided the basis for creating a process map to identify the points in BSF implementation when leadership intervention is required to ensure that sustainability requirements are implemented or retained.

3.2 Primary research

We compiled a list of completed or ongoing school projects that could be examined in more detail. We selected newly built or re-modelled schools in England that included a number of sustainable features. Schools were also selected to ensure a wide variety of types of capital investment and a good mix of primary and secondary schools. Since very few BSF schools have reached the occupancy phase, most of those we focused on were built under other schemes such as the Private Finance Initiative (PFI).

We conducted in-depth, semi-structured interviews with school leaders and other stakeholders to build up a comprehensive picture of how particular schools were constructed and how the delivery process was viewed. This included finding out who the key players were, their specific roles and the leadership skills they used.

Type of capital investment	Name	Location	Interviewees and role	Type/number of pupils	Case study findings
Primary new build	Larmer and Sacred Heart Catholic Primary School	Brook Green, London	Sister Hannah Maria Dwyer, Head; Andrzej Kuszell, Studio E Architects; input from Melanie Marwick, Max Fordham, Engineers	Voluntary-aided Roman Catholic with 445 pupils	Appendix 2 page 51
Primary new build	Notley Green Primary School	Braintree, Essex	Jacqui Green, Head	380 pupils	page 80
Primary new build	Kingsmead Primary School	Northwich, Cheshire	Catriona Stewart, Head	210 pupils, 25 staff	page 77
Secondary new build	Whitcross High School	Hereford	Denise Strutt, Head	900 pupils and over 100 staff Secondary and sports college	page 100
Secondary new build	St Francis of Assisi Academy	Liverpool	Ursula Penarski, Vice Principal; Jim Burke, Head; Gareth Jones, E-learning Co-ordinator; Sally Flaherty, geography, science and citizenship teacher; Paul Rooney, governor; five pupils	800 pupils, 100 staff	page 57

Type of capital investment	Name	Location	Interviewees and role	Type/number of pupils	Case study findings
Secondary new build	Bristol Brunel Academy	Bristol	Armando Di Finizio, Principal; David Carter, Executive Principal	Secondary specialising in communications, with 1,080 pupils	page 89
Secondary new build	Queen Elizabeth's School	Wimborne Minster, Dorset	Kevin Brougham, School Business Manager	1,500 pupils	page 92
Secondary new build	Bideford College	Bideford, Devon	Mike Newby, New College Co-ordinator	Secondary with over 1,600 pupils	page 85
Secondary re-model	Townley Grammar School for Girls	Bexleyheath, Kent	Linda Hutchinson, Head; input from David Lloyd-Jones, Studio E Architects	Over 1,400 pupils Selective grammar school with special status for performing and visual arts	page 66
Secondary re-model	Kingsdale School	Dulwich, London	Steve Morrison, Head	1,100 pupils	page 96
Sustainability investment	Old Warren House Pupil Referral Unit	Lowestoft, Suffolk	Paul Shepherd, science teacher; Elizabeth Rodgers, Head	Pupil referral unit for Key Stage 4, with 24 pupils and 11 staff	page 74

Online survey

In addition to the in-depth interviews, we used an online survey which was sent to contacts on the Encams Eco-schools (see www.ecoschools.org.uk) database and posted on the NCSL talk2learn website. We encouraged teachers and leaders involved in a capital project of over £1 million to respond.

The survey questions were structured around the principles and processes identified in the desk research. There were 13 multiple-choice questions, with space provided for additional comments, plus two free-form questions (see Appendix 3).

We obtained 364 responses, 62 per cent from primary school leaders, 28 per cent from secondary and 10 per cent from other types of educational institution. Of those who responded 41 per cent had embarked on planning a new or modified school building and 20 per cent had reached the occupancy phase. The remainder were at the information-gathering stage. In order to ensure that we only used data from school leaders with experience of planning a capital build programme, we removed from our analysis those who had not reached the formal planning and procurement stage and those who were still gathering information or developing their project vision.

Event consultation

About a hundred school leaders in total were consulted during three workshops, the results of which were used to refine our findings and recommendations. These were the NCSL Leading Sustainable School Building Projects seminar (28 February 2008) and the BSF Leadership Programme's Phase three conferences in Harrogate and London (3 and 11 March 2008).

4 Project findings and analysis

4.1 Principles of achieving sustainable buildings for schools

Literature review

Although sustainability in schools has received considerable attention over the past 10 years, there is no widely accepted definition or set of principles about what constitutes a sustainable school building.

There is, however, an overarching framework provided by the government's Sustainable Schools National Framework, which talks of eight 'doorways' for engaging with sustainability:

1. Food and drink
2. Energy and water
3. Travel and traffic
4. Purchasing and waste
5. Buildings and grounds
6. Inclusion and participation
7. Local well-being
8. The global dimension

The following section focuses explicitly on school buildings and grounds. Although many of the other 'doorways' are directly affected by decisions about the built environment, they are insufficient on their own as a way to assess sustainable schools.

BREEAM schools

The Building Research Establishment's Environmental Assessment Method (BREEAM) (summarised in Section 2 above) offers some pointers for the main principles to bear in mind when assessing buildings. BREEAM offers points for:

- Management
- Health and well-being
- Energy use
- Transport
- Water
- Materials
- Land use and ecology
- Pollution

However, BREEAM alone is not enough because it does not include social aspects of sustainability such as inclusion, participation and fair shares for all. Nor does it take account of what makes a good learning environment (for example, daylight, integration of external and internal space, flexibility of spaces for different uses, adaptability of building structure etc).

Composite principles for a sustainable school building

For this research, a composite list of principles has been created – drawing on BREEAM schools and the National Framework ‘doorways’, plus sustainable learning elements from past work by the Teaching and Learning in 2020 Review Group (Teaching and Learning Review Group, 2006), and Cambridge Architectural Research, as follows:

- Management: where the school has a formal management approach that seeks to minimise environmental impact, including training for staff and the setting and monitoring of targets for energy, water and waste
- Energy use and CO₂: where energy use for heating, lighting and appliances is significantly lower than the target levels stipulated in the building regulations
- Renewable energy: where a significant proportion of energy used on site (five per cent plus) is generated from renewable sources
- Ventilation: where there is evidence of sufficient ventilation for all teaching areas for pupils to concentrate, at the same time as reducing energy use for ventilation
- Lighting and daylight: where there is evidence of adequate daylight in all areas, with glare control and energy-efficient lights and controls
- Transport: where private car travel is discouraged and there is exemplary provision for pupils to travel to school on foot, by bike or on public transport
- Water: where there is evidence of low-consumption water services and/or large-scale rainwater harvesting with sustainable urban drainage systems (SUDS)
- Materials: where there is evidence that the project team has used materials with low environmental impacts for all major building components, sourcing these locally where possible and/or from recycled or reused materials
- Waste and recycling: where there is evidence that construction generated the minimum of waste on site, and recycled or reused as much as possible of the unavoidable waste
- Land use and ecology: where there is evidence that the building’s impact on habitats and biodiversity has been minimised
- Pollution: where there is evidence that the project team have avoided pollution incidents during construction, and materials that could result in poor indoor air quality (for example, solvents)
- Personalising learning: where implications for ways of working, such as flexibility of spaces, have been taken on board
- Promoting pupils’ learning and engagement through use of the whole site beyond the buildings
- Inclusion and participation: where there is evidence that facilities are accessible to all, including the local community, and all relevant stakeholders participate in major decisions about the school
- Fair shares and employment: equal opportunities and best practice in employment are upheld, including work done through sub-contractors. Health and safety concerns are at the fore

Assessing sustainable schools

We identified 18 English schools on the basis of the sustainability credentials of their buildings and evaluated them against these principles (see Appendix 4). It is fair to say that progress is patchy in terms of the UK's position on sustainable school buildings – even our sustainability exemplars exhibit inconsistent performance across the full spectrum of the principles mentioned, usually because of cost constraints. And despite considerable attention to energy and CO₂ (in many ways one of the easier aspects of sustainability to deal with), many of these schools only manage to achieve average energy efficiency.

However, there are two areas where real progress is being made: ventilation and daylighting. This may be because it is widely understood that both are important to learning outcomes and achievement in schools as well as for sustainability reasons. Alternatively, it could be because school designers who prioritise sustainability also prioritise these aspects of the learning environment.

There is currently insufficient evidence to assess these schools against other aspects of sustainability. As with so many topics in schools research, more work is needed.

Our literature review found four schools that are known to exhibit European best practice, in Germany, France, Denmark and Norway (see Appendix 5). These are summarised in the same format as the English schools assessment. It appears that continental schools place more emphasis on energy use over other aspects of sustainability. It is clearly a priority in continental Europe – as in England – to provide good daylighting and ventilation in low-energy schools. However, there is inadequate evidence about how these schools have addressed other aspects of sustainability.

We conclude that school leaders procuring new or refurbished facilities should start with a more holistic view of sustainability, not just focusing on some aspects such as energy and renewables to the exclusion of others. Queen Elizabeth's School has been planned from just such a holistic perspective.

By making the eight 'doorways' of the Sustainable Schools Framework central to their visioning process and consulting widely with students, Queen Elizabeth's School is on the way to building an exemplar school. Their challenge now is to manage the project successfully despite rising costs, to deliver on their aims. (Case study: Queen Elizabeth's School)

Furthermore, spending more money on capital costs for very conspicuous symbols of environmental good practice is no guarantee of better sustainability performance.

This is not just a problem for sustainable educational buildings. We have found that construction clients in many sectors often focus too quickly on specific aspects/technologies, rather than developing a more holistic vision and framework for action. This reinforces the importance of having a comprehensive vision that takes in the whole school ethos and how a sustainable school site will serve the curriculum and the wider community.

Strategic principles

As a result of the research outlined above, we arrived at a set of strategic principles for use in the primary research phase:

- Sustainability considered from concept stage
- Good design (CABE 2007)
- Positive social, economic and environmental outcomes
- Integrated approach
- Assessment of current and future uses
- All stakeholders involved
- Long-term thinking
- Thinking of the building as a learning tool (in construction and in use)

A similar set of strategic principles was discovered subsequent to this research, arrived at by BioRegional (2005) and laid out in a clear architects' brief. It emphasises the design of 'human-scale environments' – schools that enable action learning, participatory decision making and service to the local community as well as addressing environmental aspects of the building.

Findings from the primary research on key principles of sustainable buildings for schools

School leaders who had managed a capital building process were asked to indicate their level of satisfaction with the sustainable elements of their school. Forty per cent said they were dissatisfied, indicating that there is still much to learn. Notley Green Primary School was an early innovator and much has been gleaned from their experience.

Notley Green Primary School was built to serve a newly constructed community in Essex. Essex County Council and the Design Council worked in partnership to realise the building of this school as a model of sustainability. The key challenge for the head has been taking over a school designed by others and serving an emerging community. In a number of ways the school design has not lived up to expectations, but the learning from this process has been invaluable. (Case study: Notley Green Primary School)

School leaders were also asked what principles and factors are critical to ensure a learning environment is fit for the future. These included the most important strategic and operational aspects as well as environmental and educational factors.

Strategic aspects that are most important in delivering a sustainable school building

The sustainability of the learning environment (that is, will it be fit for learning in the future?)	47%
Commitment to sustainability among senior staff	34%
Achieving positive social, economic and environmental outcomes	30%
Considering the building as a tool to learn about sustainability issues	29%
Integrated approach (that is, rethinking the school's learning and organisational approach with the physical design)	28%

'The learning environment must be fit for purpose since this is the reason for providing any school building. The building must be flexible enough to enable new teaching methods to be used in the future. To achieve your goals it is imperative to know what you require from your building and have a good, easily understood brief. This gives the architects the parameters of their work and the needs that the client (school) wishes to have fulfilled. Ecologically robust building often requires the use of more expensive materials and technology. However, to make these kinds of projects viable, the whole life financial and environmental cost of the building must be considered.' (survey respondent)

Educational factors that need to be considered in ensuring the learning environment is fit for the future

Responses centred on three core themes of: **space**, the **curriculum** and **ICT**.

Space

Planning for the right balance of space – between private (personal), privileged (shared), semi-public (communal) and public spaces (Worthington 2007) – was considered key. Multi-functional spaces need to be created – classrooms that are robust and flexible, designed for community as well as school use. In addition, there needs to be sufficient outdoor space for learning throughout the year. Above all, the school needs to ‘create a clean, bright and welcoming environment for staff, pupils and the community’ (survey respondent).

Curriculum

Meeting the demands of personalised learning and the statutory curriculum has to be a fundamental requirement. In addition, features that motivate children and help them learn effectively need to be identified. The environment should be designed to support the learning needs of all pupils, focusing on environmental issues as part of the visible and invisible curriculum. This should result in children being more eco-aware and spreading the word to their families and friends, as illustrated by Old Warren House Pupil Referral Unit.

Through the Eco-school scheme, Old Warren House has become a beacon for sustainability in the local community, receiving grants for a wind turbine and solar panels. Sustainability is woven into the curriculum. The enthusiasm and commitment of the staff overcame the challenge of securing planning permission for renewable energy sources. (Case study: Old Warren House Pupil Referral Unit)

ICT

Access to ICT and new technologies is crucial for ‘future proofing’ learning facilities.

Environmental factors that need to be considered in ensuring the learning environment is fit for the future

Three categories emerged: energy efficiency, the physical manifestations of the building and its surroundings (for example, ventilation, light, design and green space) and longevity (the quality and durability of construction). There was a consensus that the materials used in construction should be biased towards the local, from renewable sources or recycled where possible.

Operational aspects of delivering a sustainable school building considered most important

Energy efficiency	67%
Biodiversity, landscaping and green space	38%
Daylight	35%
Ventilation	24%

Adequate heating was also mentioned. The interviewees generally regarded environmental factors and operational aspects as synonymous.

Summary

School leaders recognise that commissioning new buildings presents a real opportunity to consider how the learning and organisational approaches of schools fit in with construction projects. The basic building design must be fit for purpose as a learning environment. This means it should be designed to meet the ethos of the school and the needs of all users. It should show the interconnections between natural systems and human needs where possible, making the building itself a positive factor and tool in learning about sustainability rather than just a neutral backdrop.

The researchers concluded that school buildings should be durable, with low maintenance demands and a significant lifespan. The most up-to-date design principles should be used in terms of circulation analysis and space planning. Every building should be sited and designed to ensure energy efficiency.

Given the difficulty in predicting future educational needs, the interior should be as adaptable as possible to enable reconfiguration as required. Whitecross High School in Hereford exemplifies this approach. The head proudly states that virtually every internal wall can be removed and the building will still stand.

Whitecross is a school with many leading sustainability features. The main challenge was to incorporate sustainability right at the start of the process. By continually championing sustainability, the head ensured the build stayed on the agenda. The adaptability of the building will ensure the school's changing needs are met well into the future. (Case study: Whitecross High School)

Thinking specifically about leadership, one of the weakest areas in the schools examined was the straightforward step of managing environmental impacts properly: monitoring energy and water use, comparing performance with benchmarks and taking action when there is a problem. There is a real opportunity for whole-school engagement and linking the school site to curriculum delivery by engaging pupils in these activities as part of their course work. Bideford College is an example of a school that is integrating measurement into the science curriculum. Methods for monitoring energy and water consumption should be as simple as possible so that they can be implemented successfully.

This new build secondary school is still in the planning process and is part of the One School Pathfinder programme. The college has been awarded national demonstration status for sustainability and science, and, with its new buildings, will become a focus for the whole community. So far, the biggest leadership challenges have been around community engagement, delivery within prescribed project budgets and planning a new college to be built alongside the existing school. (Case study: Bideford College)

4.2 The roles and responsibilities of key individuals

Identification of the key people involved in the process and their roles in making or influencing key decisions related to sustainability.

From our desk research we were able to identify the key roles involved in building a sustainable school, and the responsibilities connected with each role were then sketched out. We tested and adapted this work during the primary research phase.

Role	Responsibility in connection with building sustainable schools
Head	<ul style="list-style-type: none"> • Stakeholder engagement in order to create a vision of a sustainable school and establish a whole-school ethos • Managing contractors • Communicating with stakeholders • Ensuring that the school's needs and vision are not compromised and that rules are interpreted flexibly where necessary
School business manager/bursar	<ul style="list-style-type: none"> • Clarifying the vision of a sustainable school • Managing contractors • Communicating with stakeholders • Ensuring that the school's needs and vision are not compromised • Providing effective leadership of all support functions – finance, personnel, estate management, administration and marketing • Giving strategic advice to the headteacher and governing body in this area
Chair of governors	<ul style="list-style-type: none"> • Leading the school's involvement in the BSF process • Finding additional funding sources • Seeking agreement from the governors on which sustainability principles/elements are non-negotiable • Seeking out networks, contacts and skills from all stakeholders to tap into as needed • Managing community consultation • Supporting the head throughout the whole process
Local authority	<ul style="list-style-type: none"> • Ensuring that the school leadership team has enough time to arrive at its vision and key performance indicators • Championing higher initial investment for a sustainable school building • Ensuring that bidders have the necessary sustainability credentials • Serving as a source of sustainability expertise

Role	Responsibility in connection with building sustainable schools
Teachers	<ul style="list-style-type: none"> • Becoming actively involved in any consultation process • Seeking opportunities for pupils to be involved in aspects of the design and meeting contractors • Looking for opportunities to include the design and construction elements in the curriculum, as well as ongoing energy monitoring on completion
Pupils	<ul style="list-style-type: none"> • Participating actively in the consultation process • Contributing to the vision of what an ideal/sustainable school should look like
Parents	<ul style="list-style-type: none"> • Participating actively in the consultation process • Volunteering particular expertise or skill

From interviewing school leaders, it became apparent that there were no fixed roles in relation to capital build. The two leadership roles perceived as most important were those of headteacher and chair of governors. In Larmenier and Sacred Heart Catholic Primary School the chair of governors was an architect himself. In the case of St Francis of Assisi Academy, the governors ‘sticking to their guns’ had been a key factor in delivering sustainability features.

St Francis of Assisi Academy was built through a partnership between the local community of Kensington, the Anglican diocese and Catholic archdiocese of Liverpool and the then Department for Education and Skills (DfES). The buildings include a multitude of sustainable features that reinforce the academy’s environment specialism, and it took strong project management and engagement skills to realise them. The challenge for the governors was to complete the job of creating a new school while ensuring that the sustainability vision remained intact. Securing the financial resources required and acquiring the necessary sustainability knowledge were among the biggest hurdles that the team overcame. The process is now being used as a model for a new academy in St Helens.

(Case study: St Francis of Assisi Academy)

Who do you think the key players are in delivering sustainable school buildings?

Architect	87%
Headteacher	81%
Builder	60%
Local authority	55%
School business manager	51%
Pupils	51%

'The head has the commitment to push forward proposals, the local authority for the resources, the architect for inspirational ideas, the builder for honest up-to-date knowledge and the application of energy saving initiatives, and the government the financial resources to allow us to make changes.'
(survey respondent)

Respondents named the headteacher and architect as key individuals and stressed the importance of their relationship. They need to understand each other's language. The most successful partnerships were those where the architect had spent a considerable amount of time in the school – observing classes and consulting stakeholders – and shared the head's passion for the school's sustainability ethos. Helping stakeholders interpret the plans in creative ways was important. The way the architect and headteacher worked together to create Larmenier and Sacred Heart Catholic Primary School, exemplifies this approach.

The new Larmenier School reflects the value of having a strong vision for sustainable learning. The school's vision was to create an integrated internal and external environment that would act as a stimulus for thought and investigation by its young pupils, making learning a joy and an inspiration. The challenges faced by the school leaders included amalgamating schools and seeing through the sustainability ethos on a very unpromising site along with budgetary constraints. The vision has been realised through the passion and leadership of the both the head teacher and the architect.
(Case study: Larmenier and Sacred Heart Primary School)

4.3 The necessary leadership skills

Features of a leader for sustainable development

From the desk research we distilled the key attributes required both for effective sustainability leadership in general and for leadership of sustainable schools in particular. We drew on a variety of sources from both the public and private sectors as well as from Forum for the Future's action research in the further education sector (CEL 2007). Analysis also incorporated two NCSL reports on sustainable schools and school leadership (NCSL 2007; Vanilla Research 2007), and one independent study (PWC 2007). The key attributes are set out and illustrated in terms of specific behaviours. Those characteristics in bold type were added as a result of the primary research.

Attributes	Characteristics of school leaders for sustainability
Challenges the status quo	<ul style="list-style-type: none"> • Creates the impetus for change by encouraging innovation and challenging others to think differently
Builds partnerships; creates collaborative networks and alliances	<ul style="list-style-type: none"> • Outward orientation, looking beyond the school gates • Secures governor support, with some governors taking responsibility • Seeks and secures practical assistance from parents • Additional resources provided from funds outside school • Develops meaningful and reciprocal relationships with the local community, including local businesses
Futures-orientated: builds vision and sets direction	<ul style="list-style-type: none"> • Optimistic outlook • Sustainability is central to the curriculum and ethos • Uses strategic insights to create a broad vision balancing economic, social and environmental factors • Sustainable development is given a broad interpretation – not just the environment but also healthy living, social justice etc • Has a unifying vision of how sustainability can bring together the agendas of <i>Every Child Matters</i>, extended schools etc • Has the ability to form and communicate a clear vision for education and the school environment, addressing the needs of the present with an eye to the future

Attributes	Characteristics of school leaders for sustainability
<p>Skilled communicator (see Kingsmead Primary School*)</p>	<ul style="list-style-type: none"> • Inspires others and captures their imagination, using the power of the media and communicating by example • Communicates effectively with staff • Articulates his/her concept of sustainability to a wide audience both inside and outside the school • Successes such as awards and funds secured are celebrated and communicated to the local community • Conveys passion
<p>Consults, empowers and mobilises others (see Bristol Brunel Academy*)</p>	<ul style="list-style-type: none"> • Empowers and includes everyone through listening, communicating, influencing, inspiring, enthusing, facilitating • Fosters participation in decision making • Encourages staff and pupils to contribute ideas and to participate in decision making and implementation – through the school council, for example • Engages key stakeholders • Adopts an open, consultative and non-hierarchical approach • Distributes leadership and delegates effectively, ensuring time is allowed for continuing professional development (CPD) • Makes education for sustainable development the collective responsibility of all staff • Builds capacity and develops his/her own awareness of sustainability issues • Good relationship management (including the realisation that some conflict is healthy)
<p>Demonstrates integrity</p>	<ul style="list-style-type: none"> • Provides a clear values proposition, ensuring a consistency of words and actions
<p>Understands complexity</p>	<ul style="list-style-type: none"> • Has an understanding of the wider world and the place of the school in it that s/he is able to communicate to others • Understands the interconnectedness of society, the environment and individuals within this context
<p>Perseveres</p>	<ul style="list-style-type: none"> • Determination, resilience and commitment • Maintains drive, focus and vision while aiming for long-term goals • Acts assertively in challenging times • Assesses and exploits opportunities

Attributes	Characteristics of school leaders for sustainability
Adaptable	<ul style="list-style-type: none"> • Open minded and ready to learn from others • Flexible • Able to adapt his/her approach in the face of challenges • Prepared to take risks to bring about change
Profile	<ul style="list-style-type: none"> • Strong presence; maintains a high profile • Encourages, enquires and maintains momentum • Visible and approachable throughout the school
Outward-facing	<ul style="list-style-type: none"> • Connects school with wider community • Has an international outlook encompassing links with major national/international initiatives, particularly in relation to developing countries, leading to improved pupil understanding about global issues

**Kingsmead is an exemplar of sustainable design and construction, but the real challenge for the head – who joined the school only six months before it opened – has been to capitalise on the building to embed sustainability into the curriculum and ethos of the school. Her success in inspiring others is such that Kingsmead readily attracts staff wanting to share in that ethos. (Case study: Kingsmead Primary School)*

**The needs of the students were central to the design of Brunel and the end result has certainly gained their favour. A ‘wall of wishes’ at the entrance includes ‘I wish more children could enjoy having a school like this’. The leadership challenges included: becoming part of the academy process midway, changes in leadership and the need for both strong prioritisation and project management to ensure delivery both on budget and on time. (Case study: Bristol Brunel Academy)*

Very little has been written about the skills needed to lead sustainable building projects or indeed the process. The findings from our literature review highlighted that attributes of leadership for sustainability align closely with those of leaders in general. However, four attributes were singled out as of particular significance. These mirror closely those identified in the Leading Sustainable Schools report (NCSL 2007):

- Challenges the status quo
- Forward-looking, with a futures orientation
- Consults, empowers and mobilises others
- Understands complexity

Findings on leadership skills from the primary research

Respondents to the survey were asked what core attitudes and skills a school leader should possess in order to deliver a successful school building. The verdicts of our respondents were looked at separately for primary and secondary schools initially but the rankings came out in almost identical order for both types of school.

The top five emerged as:

An understanding of future educational needs	55%
Consulting and involving others	51%
Personal commitment to sustainability	37%
Ability to develop a compelling vision	35%
An understanding of the complexity of sustainable development and built environment issues	31%

Other characteristics ranked in descending order of importance were:

- Challenging the status quo
- Building partnerships
- Perseverance
- Communication skills
- Adaptability
- Empowering others

‘The headteacher has to be able to understand and articulate the vision, then have the tenacity and attention to detail to ensure that the project manager delivers on what has been agreed.’
(survey respondent)

In terms of building partnerships, the relationship with the architect was rated as particularly significant.

The survey findings are backed up by what we learned in interviews with the case study schools. Among those who had successfully implemented sustainable school building projects, some core attributes were evident. These reinforce the desk research findings.

These leaders had exemplary relationship management skills. They were able to inspire and convince others, and choose their advisers wisely. They also demonstrated the ability to assess and grasp opportunities. Underpinning these attributes were the key qualities of determination/perseverance and a strong presence, as illustrated by the head of Kingsdale School.

Head Steve Morrison saw a direct link between physical infrastructure and educational achievement and was ahead of the BSF policy. The challenge he faced was to see his vision of a massive refurbishment through to reality and overcome funding obstacles along the way. The head's high expectations and attention to detail ensured a successful outcome. (Case study: Kingsdale School)

'I feel that evangelical and authoritative leadership is needed to drive sustainability, as it is easy to give up on that aspect when people, like the local authority, feel you are just making their lives difficult.'
(survey respondent)

Summary

These findings reinforce the underpinning research on the characteristics of leaders for sustainability. The only variation is around leadership style. Those leaders who have been in the vanguard of implementing sustainable school buildings have the ability to adapt their style to suit the need, along a spectrum from open and consultative to forcefully directive. This directive element, described by leaders as a strong presence/assertiveness – even 'bloodymindedness' – has been necessary for some to ensure that their vision for their school has not been compromised and that they have obtained the resources necessary to achieve it.

4.4 A ‘map’ indicating where and when key decisions are made in the BSF process, along with leadership intervention points

The BSF step-by-step guide has been used as a basis for adding leadership intervention points, demonstrating how sustainability can be incorporated into the procurement process. We asked leaders what specific skills and knowledge they needed to assist them in this process. The actions in bold type were added as a result of the primary research. Those in italics have been added as tips for leaders.

BSF stages	Important sustainability intervention points for school leaders
<p>Pre-project Information gathering and establishing structures and processes</p>	<ul style="list-style-type: none"> • Ensure information about the school and its wider context is accurate and available • Delegate tasks to allow the head time to manage the project • Research options – <i>visit other sustainable schools and review best practice case studies</i>. Ensure that necessary research is conducted in order to ascertain sustainable development requirements • Plan how to include a wide variety of stakeholders – <i>plan student engagement at every stage and work out how building design and construction can be built into the curriculum</i>
<p>Strategy for Change Part 1 Develop school vision and Strategy for Change</p>	<ul style="list-style-type: none"> • Plan work strands to consult stakeholders and develop the sustainability vision • Work with local authority staff committed to sustainability • <i>Use national framework of eight ‘doorways’ to form vision. Be as specific as possible</i> • Get governors to agree which principles are non-negotiable
<p>Strategy for Change Part 2 Build on school vision and Strategy for Change development</p>	<ul style="list-style-type: none"> • Have building sustainability embedded in education vision • <i>Attract the right team to work with you by developing a compelling vision that excites them</i> • <i>Ensure careful selection of an architect who has a sustainability vision, knowledge, skills and imagination</i> • <i>Keep control and do not be pressurised on the time scale. Push for extra time, if needed</i> • Locate other sources of funding for sustainability features
<p>Outline business case and preparation to procure Prepare procurement documents</p>	<ul style="list-style-type: none"> • Make sure that whole-life costing is considered in the business case

BSF stages	Important sustainability intervention points for school leaders
<p>Official Journal of the EU invitation to participate in dialogue (ITPD) Assessment and initial selection</p>	<ul style="list-style-type: none"> In specification/briefing documents, ensure that sustainability forms a core part of the school's vision Outline clear sustainability-performance requirements in the brief. Ensure these are meaningful and measurable
<p>Dialogue following ITPD, through to invitation to submit final bid (ITSFB) Design development</p>	<ul style="list-style-type: none"> Ensure bidders understand school vision Get architect and construction team to spend time in the school in order to really understand it Choose bidder with strong commitment to sustainability by knowing what questions to ask and seeking specific examples from previous projects Ensure you have selected a team you can work with
<p>ITSFB to financial close Detailed design development</p>	<ul style="list-style-type: none"> Allow time and resources for thorough consultation in design process, incorporating sustainability Communicate design to stakeholders Ensure reports are provided on the sustainable development implications of value engineering Test the sustainability options that emerge
<p>Construction Safety and curriculum enrichment</p>	<ul style="list-style-type: none"> Use community-focused open days to communicate design and answer questions
<p>Occupancy Orientation and training</p>	<ul style="list-style-type: none"> Ensure the handover process helps users Understand how the building operates Provide staff training and delegate ownership of sustainability monitoring to staff with relevant curriculum links Provide training for management and maintenance operatives responsible for innovative systems. Ensure there is funding available for this Make sure that sustainability performance is considered in post-occupancy evaluation and that remedial actions are proposed

We asked survey respondents what they would do differently if they were to work on a sustainable schools building project again:

'I would want to ensure that every new build had a specific focus on sustainable development and the process of the build was directly incorporated into the children's learning.'

'I would make sure that I pinned down certain elements with the architect and the local authority to make sure they were definitely going to be included. I would then try to find funding from other sources if the local authority could not fund that element.'

'I would like to be more involved in developing the outside area on the plans because I did not have much say in this area or what I wanted from the building.'

In terms of the knowledge and skills leaders require to go through this process, most report that they need help to understand how to procure and manage a complex building project and how best to capitalise on the sustainability intervention points: 'A robust understanding of project management and associated process skills related to project delivery is needed'. Townley Grammar School for Girls is a case in point. Our respondents would also like web-based case studies of where sustainability has been successfully achieved, as well as where it has not. They also reported that they would like to have access to a website incorporating frequently asked questions, a list of schools prepared to host visits and details of useful contacts.

The innovative design of the new performing arts centre, sports hall and science laboratories at Townley Grammar School provide an enhanced learning experience for pupils. The new facilities also underline the school's special status for the performing and visual arts. In sustainability terms, its greatest success is having natural heating, cooling and ventilation in spaces that would traditionally be air conditioned. The key leadership challenge was developing the project management skills to organise construction. Much time and effort could have been mitigated by training of the school's leaders in procuring and managing a complex building project. (Case study: Townley Grammar School for Girls)

Summary

The respondents identified developing a vision and a business case as two key elements in the BSF process. The Strategy for Change steps are therefore critical. Research has shown that communicating the design effectively to all stakeholders is also crucial, as is maintaining the vision while continually pushing for improvement and innovation throughout the procurement and design process. Leaders noted that specific knowledge is needed on how to procure and manage a complex building project as well as capitalising on the sustainability intervention points.

5 Recommendations

The following recommendations are aimed at those directing NCSL and its remit for supporting the BSF Leadership Programme.

Expand the sustainability content of the NCSL school Leadership Programme

Current leadership development programmes already address the key skills and competencies school leaders require in order to lead on major change projects.

However, leaders do need to understand the interconnectedness of sustainability. What does a sustainable school look like, and what are the essential and desirable features? How can the school site serve as a tool to support the curriculum and community?

The Sustainable Schools National Framework (DfES 2006) goes some way towards addressing these questions as does the Valuing our Future: A toolkit for developing sustainable schools (NCSL 2008). But leaders would like to know more about the opportunities that a sustainable building offers and the link between sustainability and improved standards. While this research has added to the knowledge bank, more is needed. The new sustainable development module for the revised National Professional Qualification for Headship (NPQH) presents an opportunity to address this.

Incorporate sustainability skills training and group-based learning into Phase three of the BSF Leadership Programme

School leaders need some very specific skills in order to procure and manage a complex building project. These include project management and the ability to interpret architects' drawings. Leaders may have the basic leadership skills they need and some knowledge about sustainability, but more input is needed to build competence and confidence. This can best be acquired through experience. In its absence, however, the next best thing is learning through case studies or through simulations and role-play. Involving peers who have been through the process would be valuable. Looking at the BSF programme, we propose that there should be an opportunity for cohort groups in Phase three to use this methodology to consolidate learning. This would give school leaders the opportunity to practise their skills in pitching their vision (in order to attract the right design team), and to practise negotiation skills in exploring design options and managing the value engineering process, for example. Experience and feedback would help build confidence.

Capture learning from post-occupancy evaluations

Since everyone involved in sustainable building design is on a steep learning curve, it is crucial that knowledge is captured from post-occupancy evaluations (POEs) for new waves of BSF to learn from. The scenario described below represents the real experience of one of our respondents, and we need to make sure that this kind of experience remains a rarity. A forthcoming revision to BREEAM will require POEs as standard. In the meantime, we recommend that contractors and Local Education Partnerships (LEPs) share information from POEs.

'Automatic water taps run too long. Energy bills are too high. The sustainable airflow system (which means you shouldn't need air conditioning or much heating) does not work well. Classrooms are too hot in summer; the server room has overheated to the extent that the computer systems have crashed. Classroom sizes are not all fit for purpose.' (survey respondent)

Other areas that school leaders would like to find information on include aspects such as instilling a sense of pride in pupils so that they look after the building, and how to retrofit listed buildings. In addition, echoing a recommendation of the Gilbert report of the *Teaching and Learning in 2020 Review Group* (2006), it would be helpful if certain myths could be addressed and clarified such as what is required for guidance only, for example BB98.

Appoint a sustainability adviser attached to BSF or local authorities

Our recommendations endorse those of the *Leading Sustainable Schools* report (NCSL 2007); respondents reported that 'the lack of apparent support for sustainable development within many local authorities and therefore lack of support for the Sustainable Schools strategy' was a significant barrier to progress.

A key issue for the BSF programme is where expertise in implementing sustainable buildings should reside – within the DCSF and the BSF programme or in local authorities. Given that local authorities will need to develop expertise to support all their secondary and primary schools as well as make all their public buildings sustainable in the future, it would make more sense for investment in developing capacity and knowledge to be located there. It is noticeable that BSF has appointed advisers for key aspects such as ICT and it is proposed that a similar position is created for sustainability. A sustainability adviser would be able to advise on identifying both key professionals with experience in sustainability and additional sources of funding. S/he would also be able to advise how best to influence decision makers within the local authority, along with potential bidders.

Certain design standards such as BB87, which sets a standard for energy use in schools, are out of date and need updating in order to match current building regulations for energy conservation.

Allow more time for key stages of the BSF process

The time taken for school leaders to research, consult on, develop and firm up their vision and make the business case for sustainability is crucial. Those leaders currently going through the BSF process report feeling pressured to deliver 'something' in a relatively short period of time. This pressure should be eased, as it means that the time taken to research, develop and cost visions incorporating sustainability is often squeezed.

Promote realistic budgeting and sustainability audits

Cost constraints have proved to be a huge barrier for many sustainable school building projects. If sustainability is to be taken seriously, the budgeting procedures for the sustainability dimension of construction projects need to be transparent and workable. Guidance needs to state how to protect against value engineering. Policy makers could provide more guidance and hints on how to budget properly and ensure that all options are accurately costed. In addition, there should be a requirement on bidders to undertake a sustainability audit.

Ensure that school leaders have sufficient access to external expertise

Our research, not surprisingly, reinforced the value of trust and having a good open working relationship between school leaders, their leadership teams and the architect and contractor. Key to this is immersing the architect in the school before any drawings are made. However, many leaders report that they lack the final say about whom they work with. Furthermore, the role of the local authority architect in these sustainable school building projects is somewhat confused, and there are significant capacity issues. Some schools benefited from having a devoted external contractor made available to work as a project manager on their behalf. Appointing a sustainability adviser to the BSF or local authorities, as proposed above, provides an alternative solution.

References

- BioRegional, *A One Planet Living School – Designing to support learning for Sustainability*, BioRegional Development Group, Surrey, draft 2005, unpublished, www.bioregional.com
- CABE (The Commission for Architecture and the Built Environment), 2007, *Creating Excellent Secondary Schools*, London, CABE
- CEL (Centre for Excellence in Leadership), 2007, *Leadership for Sustainability: Making sustainable development a reality for leaders* (www.centreforexcellence.org.uk/usersdoc/SustainabilityResearch.pdf)
- DCSF (Department for Children, Schools and Families), 2007, *The Children’s Plan*, London, The Stationery Office
- DfES (Department for Education and Skills), 2003, *Every Child Matters*, London, The Stationery Office
- DfES, 2004, *Five-year Strategy for Children and Learners*, London, The Stationery Office
- DfES, 2005a, *14–19 Education and Skills*, London, The Stationery Office
- DfES, 2005b, *Extended Schools: Access to opportunities and services for all, A prospectus*, Nottingham, DfES Publications
- DfES, 2006, *Sustainable Schools for Pupils, Communities and the Environment*, London, DfES Publications
- HM Government (2005) *Securing the Future: Delivering UK sustainable development strategy*, London, The Stationery Office
- NCSL (National College for School Leadership), 2007, *Leading Sustainable Schools*, Nottingham, NCSL
- NCSL 2008, *Valuing Our Future: A toolkit for developing sustainable schools* (www.ncsl.org.uk/sustainableschools-index/sustainableschools-toolkit.htm), Nottingham, NCSL
- PWC (PricewaterhouseCoopers), 2007, *Independent Study into School Leadership*, London, DfES Publications
- Sustainable Development Commission, 2006, *Schools Carbon Footprinting – Scoping Study*, Final report
- Teaching and Learning Review Group, 2006, *2020 Vision. Report of the Teaching and Learning in 2020 Review Group*, Nottingham, DfES Publications
- Vanilla Research, 2007, *School Leaders’ Perspective on Building Schools for the Future*, Nottingham, NCSL
- Worthington, J, 2007, *Building Excellence – Exploring the implications of the Curriculum for Excellence for School Buildings*, Edinburgh, Scottish Government Publications

Additional references

International Energy Agency/DfES, 2003, *Retrofitting of Educational Buildings: Case study reports*, Birmingham, Faber Maunsell

NCSL (National College for School Leadership), 2007, *Green School Leadership*, Leading Practice Seminar, Post-Seminar Report, Nottingham, NCSL

Leithwood, K, et al, 2006, *Seven Strong Claims about Successful School Leadership*, Nottingham, NCSL

Appendix 1: Guidance for school leaders

This guidance is designed to be a ‘stand alone’ resource for school leaders. As a result, some of the material duplicates that which is contained in the main body of the report.

What is sustainability in a school building context?

Sustainability provides a framework that can unite many different government policies and initiatives, from individual learning though to extended schools and flexible use of ICT. The quality of environments provided by school buildings can have a profound impact on both sustainable learning and sustainable lifestyles. Current levels of investment in new buildings give us a once-in-a-lifetime opportunity to deliver real change in the sustainability of the schools estate and the learning it is designed to support.

In order to grasp this opportunity, school leaders must be equipped with the knowledge and skills required to deliver sustainable buildings through existing procurement systems and processes. NCSL commissioned research to identify and develop the skills and knowledge needed in terms of both:

1. Sustainable learning: environments that will remain fit for learning into the 21st century
2. Sustainable environments: schools with a minimal impact on the biosphere

Both aspects of sustainability are critical. However, as research exists elsewhere on sustainable learning, this study places more emphasis on the creation of sustainable environments. The approach involved desk study research – examining existing guidance on sustainable building principles, sustainability leadership skills and key sustainability intervention points in the Building Schools for the Future (BSF) procurement process. These findings were then tested through primary research in the form of semi-structured interviews with leaders from 11 schools, an online survey of 364 school leaders and detailed consultation at events and workshops.

Why is it important?

'Sustainable development will not just be a subject in the classroom; it will be in its bricks and mortar and in the way the school uses and even generates its own power. Our students won't just be told about sustainable development, they will see and work within it: a living, learning place in which to explore what a sustainable lifestyle means.' (Tony Blair, September 2004)

In 2006, the Sustainable Development Commission identified that the UK schools estate contributes almost 15 per cent of the UK public sector's carbon footprint and two per cent of the UK's total carbon emissions. Almost half of the schools' carbon footprint is related to emissions from the use of energy in buildings, 32 per cent is from emissions in the supply chain, including school food and construction activity and 14 per cent comes from travel to, from and at school.

The government recognises what a key role schools have to play in reducing UK carbon emissions, and has set a target that all new school buildings must be zero carbon by 2016. Given that this research discovered that 40 per cent of school leaders who had gone through a capital build process said they were dissatisfied with the sustainable elements, designing for sustainability and reducing carbon emissions is a key challenge for school leaders to address.

Energy

- UK schools currently spend about £450 million on energy each year. This represents 3.5 per cent of their budgets and is three times the amount spent on books (Eco-schools at www.ecoschools.org.uk)
- Secondary schools spend £39,000–£55,000 each on energy every year (BRE at www.bre.co.uk)
- Surveys show that simple low-cost or no-cost measures can cut at least 10 per cent from energy bills (Eco-schools at www.ecoschools.org.uk)

Carbon

- Schools are responsible for approximately 10 million tonnes of carbon dioxide per annum (Sustainable Development Commission 2006)
- With combined heat and power (CHP) systems, heat that might be lost as a by-product of electricity generation is captured for space and water heating. Locally supplied electricity incurs lower transmission losses than the national grid (40 per cent losses). Payback periods of four to ten years are possible with CHP. CHP can also produce a 30–50 per cent reduction in carbon dioxide emissions (BRE green guide to specification at www.bre.co.uk/greenguide)

Water

- A large secondary school can spend as much as £20,000 a year on water, but careful water management and a sound education programme can cut consumption by two thirds (Eco-schools at www.ecoschools.org.uk)

What are the advantages?

Many of the school leaders (with good records on sustainability), that we interviewed reported better motivated and higher-achieving pupils, greater demand for places and ease in attracting and retaining high-quality staff.

North American researchers, the Heschong Mahone Group (2002), found that primary school children in classrooms with high daylight levels learn faster than those in classrooms with poor access to natural light. They recorded a 25 per cent improvement in reading and a 16 per cent improvement in maths in classes with the most daylight compared to those with the least.

Sustainability is central to the ethos of Kingsmead Primary School. The building is being used as a learning resource for sustainability with features such as a transparent downpipe running through the centre of the school and an electronic display panel for pupils to see how much rainwater is being collected. Staff say that conditions in the building significantly contribute to their perceived productivity at work. The ethos of the school has been a key element in attracting staff who share the school's values. (Case study: Kingsmead Primary School)

What constitutes a sustainable school?

There is a big difference between an environmentally sustainable school building and a truly sustainable school. What makes that difference is having a whole-school sustainability ethos, based on a broad vision that incorporates sustainability into the fabric of school life. The aim should be to create a building and environs that are more than just an energy-efficient backdrop for the learning experience – they should help engage and teach children about living in a sustainable world. Involving the whole school in the development and maintenance of school buildings and grounds gives everyone ownership and pride in their environment, which in turn becomes an excellent resource for action-centred teaching and learning. The schools that have succeeded are those that have looked for simple responses to complex issues.

The Sustainable Schools National Framework (DfES 2006) consists of eight sustainability 'doorways' – areas that schools are encouraged to consider when thinking about their sustainability performance (buildings and grounds, for example). These doorways connect with each other, providing different openings into a set of common challenges. Each can be taken forward through major areas of school life, both on site through ways of working and the curriculum and in relation to the wider community. This provides an overarching framework for creating the vision of a sustainable school.

From 'Sustainable Schools leadership' materials (www.teachernet.gov.uk/sustainableschools/leadership)

Campus	Values and ways of working
Operating and capital expenses	Environmental management saves money through energy, water, waste and purchasing efficiency. Doing 'more with less' produces a classic 'win-win' situation for both the environment and the school budget
Pupil involvement	When pupils are involved in caring for, and in some cases designing, their school environment, they are less likely to damage or disrespect it, drop litter or bully others
Staff morale	Many staff are 'switched on' by the values of sustainable development. Efforts in this area will give them an added sense of purpose, with an impact on morale, performance, staff retention and recruitment

Curriculum	Teaching provision and learning
Teaching and learning	The school estate and its local area provide a virtually limitless resource for learning about sustainable development, as well as providing an engaging context for teaching core subjects
Pupil achievement	Sustainable development concerns real problems in real places among real people, including on the school's doorstep. It motivates pupils by making learning relevant to their lives. It breeds self-esteem, confidence and teamwork skills by involving them in the solutions
Pupil well-being	A safe caring environment for pupils is good for children's physical and emotional well-being, and also good for their learning and achievement. Healthy food, water to drink, safe and comfortable facilities, and enhanced fitness through walking or riding to school can increase pupils' concentration and alertness in the classroom

Community	Wider influence and partnerships
Trust	Working with the local community on shared concerns like diet, obesity, litter, drugs, teenage pregnancy, congestion, safety and respect demonstrates a school's commitment to its community and builds trust
Parent involvement	Projects addressing environmental, community or global concerns provide opportunities to involve parents and other stakeholders in school improvement, tapping into their time, energy and expertise
Local influence	A green image improves the school's reputation in a sector increasingly influenced by parental choice, it helps attract pupils, it supports development/expansion plans and it has an influence on local affairs

In addition, we propose a set of composite principles to follow in creating a sustainable school:

- Management: where the school has a formal management approach that seeks to minimise environmental impact, including training for staff and the setting and monitoring of targets for energy, water and waste
- Energy use and CO₂: where energy use for heating, lighting and appliances is significantly lower than the target levels stipulated in the building regulations
- Renewable energy: where a significant proportion of energy used on site (five per cent plus) is generated from renewable sources
- Ventilation: where there is evidence of sufficient ventilation for all teaching areas for pupils to concentrate, at the same time as reducing energy use for ventilation
- Lighting and daylight: where there is evidence of adequate daylight in all areas, with glare control, and energy-efficient lights and controls
- Transport: where private car travel is discouraged and there is exemplary provision for pupils to travel to school on foot, by bike or on public transport
- Water: where there is evidence of low-consumption water services and/or large-scale rainwater harvesting with sustainable urban drainage systems (SUDS)
- Materials: where there is evidence that the project team has used materials with low environmental impacts for all major building components, sourcing these locally where possible and/or from recycled or reused materials
- Waste and recycling: where there is evidence that construction generated the minimum of waste on site, and recycled or reused as much as possible of the unavoidable waste
- Land use and ecology: where there is evidence that the building's impact on habitats and biodiversity has been minimised
- Pollution: where there is evidence that the project team have avoided pollution incidents during construction, and avoided materials that could result in poor indoor air quality (for example, solvents)
- Personalising learning: where implications for ways of working, such as flexibility of spaces, have been taken on board
- Promoting pupils' learning and engagement through use of the whole site beyond the buildings
- Inclusion and participation: where there is evidence that facilities are accessible to all, including the local community, and all relevant stakeholders participate in major decisions about the school
- Fair shares and employment: equal opportunities and best practice in employment are upheld, including work done through sub-contractors. Health and safety concerns are at the fore

What to do at different stages and how to do it

Stages in the BSF process are mapped along with key points when leadership intervention is needed to help ensure that sustainability requirements are implemented or retained. Type in italics indicates tips for school leaders.

BSF stages	Important sustainability intervention points for school leaders
<p>Pre-project Information gathering and establishing structures and processes</p>	<ul style="list-style-type: none"> • Ensure information about the school and its wider context is accurate and available • Delegate tasks to allow the head time to manage the project • Research options – visit other sustainable schools and review best practice case studies. Ensure that necessary research is conducted in order to ascertain sustainable development requirements • Plan how to include a wide variety of stakeholders – plan student engagement at every stage and work out how building design and construction can be built into the curriculum
<p>Strategy for Change Part 1 Develop school vision and Strategy for Change</p>	<ul style="list-style-type: none"> • Plan work strands to consult stakeholders and develop the sustainability vision • Work with local authority staff committed to sustainability • Use National Framework of eight ‘doorways’ to form vision. Be as specific as possible • Get governors to agree which principles are non-negotiable
<p>Strategy for Change Part 2 Build on school vision and Strategy for Change development</p>	<ul style="list-style-type: none"> • Have building sustainability embedded in education vision • Attract the right team to work with you by developing a compelling vision that excites them • Ensure careful selection of an architect who has a sustainability vision, knowledge, skills and imagination • Keep control and do not be pressurised on the time scale. Push for extra time, if needed • Locate other sources of funding for sustainability features
<p>Outline business case and preparation to procure Prepare procurement documents</p>	<ul style="list-style-type: none"> • Make sure that whole-life costing is considered in the business case

BSF stages	Important sustainability intervention points for school leaders
<p>Official Journal of the EU invitation to participate in dialogue (ITPD) Assessment and initial selection</p>	<ul style="list-style-type: none"> • In specification/briefing documents, ensure that sustainability forms a core part of the school's vision • Outline clear sustainability performance requirements in the brief. Ensure these are meaningful and measurable
<p>Dialogue following ITPD, through to invitation to submit final bid (ITSFB) Design development</p>	<ul style="list-style-type: none"> • Ensure bidders understand school vision • Get architect and construction team to spend time in the school in order to really understand it • Choose bidder with strong commitment to sustainability by knowing what questions to ask and seeking specific examples from previous projects • Ensure you have selected a team you can work with
<p>ITSFB to financial close Detailed design development</p>	<ul style="list-style-type: none"> • Allow time and resources for thorough consultation in design process, incorporating sustainability • Communicate design to stakeholders • Ensure reports are provided on the sustainable development implications of value engineering • Test the sustainability options that emerge
<p>Construction Safety and curriculum enrichment</p>	<ul style="list-style-type: none"> • Use community-focused open days to communicate design and to answer questions
<p>Occupancy Orientation and training</p>	<ul style="list-style-type: none"> • Ensure the handover process helps users • Understand how the building operates • Provide staff training and delegate ownership of sustainability monitoring to staff with relevant curriculum links • Provide training for management and maintenance operatives responsible for innovative systems. Ensure there is funding available for this • Make sure that sustainability performance is considered in post-occupancy evaluation and that remedial actions are proposed

Who: what roles do key individuals play?

Role	Responsibility in connection with building sustainable schools
Head	<ul style="list-style-type: none"> • Stakeholder engagement in order to create a vision of a sustainable school and establish a whole-school ethos • Managing contractors • Communicating with stakeholders • Ensuring that the school's needs and vision are not compromised and that rules are interpreted flexibly, where necessary
School business manager/bursar	<ul style="list-style-type: none"> • Clarifying the vision of a sustainable school • Managing contractors • Communicating with stakeholders • Ensuring that the school's needs and vision are not compromised • Providing effective leadership of all support functions – finance, personnel, estate management, administration and marketing • Giving strategic advice to the headteacher and governing body in this area
Chair of governors	<ul style="list-style-type: none"> • Leading the school's involvement in the BSF process • Finding additional funding sources • Seeking agreement from the governors on which sustainability principles/elements are non-negotiable • Managing community consultation • Seeking out networks, contacts and skills from all stakeholders to tap into as needed • Supporting the head throughout the whole process
Local authority	<ul style="list-style-type: none"> • Ensuring that the school leadership team has enough time to arrive at its vision and key performance indicators • Championing higher initial investment for a sustainable school building • Ensuring that bidders have the necessary sustainability credentials • Serving as a source of sustainability expertise
Teachers	<ul style="list-style-type: none"> • Becoming actively involved in any consultation process • Seeking opportunities for pupils to be involved in aspects of the design and meeting contractors • Looking for opportunities to include the design and construction elements in the curriculum as well as ongoing energy monitoring on completion

Role	Responsibility in connection with building sustainable schools
Pupils	<ul style="list-style-type: none"> • Participating actively in the consultation process • Contributing to the vision of what an ideal/sustainable school should look like
Parents	<ul style="list-style-type: none"> • Participating actively in the consultation process • Volunteering particular expertise or skill

What leadership qualities are required?

Attributes	Characteristics of school leaders for sustainability	Examples
Challenges the status quo	<ul style="list-style-type: none"> • Creates the impetus for change for sustainability by encouraging innovation and challenging others to think differently 	<p><i>Whitecross High School</i></p> <p>The head aimed to be in the top 10 per cent of schools for low water and energy consumption. She challenged the status quo regarding the girls' ambitions, requesting that women professionals from contracting organisations contribute to school careers talks during the design and build process</p>
Builds collaborative partnerships, networks and alliances	<ul style="list-style-type: none"> • Outward orientation, looking beyond the school gates • Secures governor support, with some governors taking responsibility • Seeks and secures practical assistance from parents • Additional resources provided from funds outside school • Develops meaningful and reciprocal relationships with the local community, including local businesses 	<p><i>Larmenier and Sacred Heart Catholic Primary School</i></p> <p>The head identified champions at an early stage. The chair of governors, an architect, led the new build. A parent who was an artist and sculptor led the children in designing wall coverings and awnings</p>

Attributes	Characteristics of school leaders for sustainability	Examples
Futures-orientated: builds vision and sets direction	<ul style="list-style-type: none"> • Optimistic outlook • Sustainability is central to the curriculum and ethos • Uses strategic insights to create a broad vision balancing economic, social and environmental factors • Sustainable development is given a broad interpretation – not just the environment but also healthy living, social justice etc • Has a unifying vision of how sustainability can bring together agendas of <i>Every Child Matters</i>, extended schools etc • Has the ability to form and communicate a clear vision for education and the school environment, addressing the needs of the present with an eye to the future 	<p><i>Bristol Brunel Academy</i></p> <p>With the background of two failing schools, leaders envisaged a sustainable school with a communications specialism, plus world-class sports and leisure facilities for community use. Their vision incorporated a clear idea of what the curriculum and staffing structure would be like and attracted a construction company whose stakeholder engagement processes were first class</p>
Skilled communicator	<ul style="list-style-type: none"> • Inspires others and captures their imagination, using the power of the media and communicating by example • Communicates effectively with staff • Articulates his/her concept of sustainability to a wide audience both inside and outside the school • Successes such as awards and funds secured are celebrated and communicated to the local community • Conveys passion 	<p><i>Kingsmead Primary School</i></p> <p>The head conveys passion about sustainability and has made it central to the school's ethos. The building is a learning resource and its long-term management and maintenance are managed by an eco-council that includes pupil representatives. The ethos has been central to attracting staff</p>

Attributes	Characteristics of school leaders for sustainability	Examples
Consults, empowers and mobilises others	<ul style="list-style-type: none"> • Empowers and includes everyone through listening, communicating, influencing, inspiring, enthusing, facilitating • Fosters participation in decision making • Encourages staff and pupils to contribute ideas and to participate in decision making and action – through the school council, for example • Engages key stakeholders • Adopts an open, consultative and non-hierarchical approach • Distributes leadership and delegates effectively, ensuring time is allowed for continuing professional development (CPD) • Makes education for sustainable development the collective responsibility of all staff • Builds capacity and develops his/her awareness of sustainability • Good relationship management (including the realisation that some conflict is healthy) 	<p><i>St Francis of Assisi Academy</i></p> <p>The head set up an eco-council that has responsibility for raising awareness of and monitoring water and energy use and waste generation. A help desk has been set up in the school for the community to use, and awareness campaigns are conducted with the local community. One student member cites his motivation as “I want to address climate change and make the school a better place”</p>
Demonstrates integrity	<ul style="list-style-type: none"> • Provides a clear values proposition, ensuring a consistency of words and actions 	<p><i>Old Warren House Pupil Referral Unit</i></p> <p>Sustainability is woven into the curriculum – science, PSHE and citizenship. The visible aspects such as the wind turbine mean it has become a beacon for sustainability in the local community, which is creating much needed positive feedback for pupils who have been low achievers</p>

Attributes	Characteristics of school leaders for sustainability	Examples
Understands complexity	<ul style="list-style-type: none"> • Has an understanding of the wider world and the place of the school in it that s/he is able to communicate to others • Understands the interconnectedness of society, the environment and individuals within this context 	<p><i>Larmenier and Sacred Heart Catholic Primary School</i></p> <p>From the start, the school leaders wanted the philosophy of sustainability to inform children’s learning. They wanted the building to be a learning tool that would demonstrate how nature, art and science are interlinked. They specified an environment both internal and external that would act as a stimulus to thought and investigation, to make learning ‘a joy and an inspiration’</p>
Perseveres	<ul style="list-style-type: none"> • Determination, resilience and commitment • Maintains drive, focus and vision while aiming for long-term goals • Acts assertively in challenging times • Assesses and exploits opportunities 	<p><i>Kingsdale School</i></p> <p>The head, on taking over a school in special measures, saw the potential link between a state-of-the-art sustainable learning environment and better pupil attainment. He relentlessly pursued every funding avenue and critiqued the architect’s plans in detail to achieve his vision</p>
Adaptable	<ul style="list-style-type: none"> • Open-minded and ready to learn from others • Flexible: able to adapt his/her approach in the face of challenges • Prepared to take risks to bring about change 	<p><i>Bristol Brunel Academy</i></p> <p>The head was keen to learn as much as possible from others, and visited other new build schools with sustainability features. Coming into the project half way through, he had to identify what really mattered while adopting a flexible approach. The academy specialises in communications and the building has been designed with flexibility in mind in order to accommodate advances in technology</p>

Attributes	Characteristics of school leaders for sustainability	Examples
Profile	<ul style="list-style-type: none"> • Strong presence; maintains a high profile • Encourages, enquires and maintains momentum • Visible and approachable throughout the school 	<p><i>Whitecross High School</i></p> <p>The head was involved from day one in the PFI process and committed as much time as possible to the bidder/design team, with a clear understanding of what the bidder's drivers were. She maintained a high profile throughout, participating in weekly meetings prior to construction and fortnightly during the building phase. She ensured sustainability was kept on the agenda by "making a fuss about it". She was party to all decisions and reminded herself that in a room of professionals she was the one "representing 900 pupils"</p>
Outward-facing	<ul style="list-style-type: none"> • Connects school with wider community • Has an international outlook encompassing links with major national/international initiatives, particularly in relation to developing countries, leading to improved pupil understanding about global issues 	<p><i>Bideford College</i></p> <p>School leaders envisage the college as being the heart of the community and available 24 hours a day. They have conducted extensive community consultation on the new build. The college will provide a cinema, theatre and sports facilities for local use and is encouraging sports or community groups who wish to be based at the college. They commissioned the University of Exeter's Centre for Energy and Environment to identify the best orientation for the buildings to make use of natural light and heat capture. The synergy of science and sustainability will be displayed in a high-tech science theatre. Internet technology will enable the college to expand the current links with its 13 feeder schools to help boost teaching and learning</p>

Further resources

NCSL: www.ncsl.org.uk

NCSL is contracted by DCSF to provide training for groups of school leaders involved in BSF projects, with an emphasis on development of a transformational approach. In addition, they publish materials for leading sustainable schools such as:

NCSL, 2007, Leading Sustainable Schools

NCSL, 2008, Valuing our Future: A toolkit for developing sustainable schools
(www.ncsl.org.uk/leadingsustainableschools)

TeacherNet: www.teachernet.gov.uk/sustainableschools/

The Sustainable Schools area of TeacherNet is designed to support schools on their journey to sustainability, introducing the principles of sustainable development including the National Framework and offering guidance on how to embed these principles into the heart of school life. Includes resources and tools including the S3 – Sustainable Schools Self-evaluation tool.

DCSF: www.dcsf.gov.uk/

DfES, 2006, Sustainable Schools for Pupils, Communities and the Environment

DfES, 2006, Schools for the Future. Design of sustainable schools, Case studies, London, The Stationery Office

DfES, 2007, Strategic, Challenging and Accountable, A governors guide to sustainable schools

Eco-schools: www.eco-schools.org.uk

Eco-schools is an international award programme that guides schools on their sustainability journey, providing a framework to help embed these principles at the heart of the school community.

WWF: www.wwflearning.org.uk

One Planet Schools is a programme aimed at school pupils via teachers. It builds on the government's Sustainable Schools agenda and provides learning and teaching resources.

Bioregional, 2005, A One Planet Living School – Designing to support learning for sustainability, BioRegional Development Group, Surrey, unpublished. www.bioregional.com

Commission for Architecture and the Built Environment (CABE): www.cabe.org.uk

2007, Creating Excellent Secondary Schools: A guide for clients

Partnerships for Schools (Pfs): www.partnershipsforschools.org.uk

Pfs has overall responsibility for the delivery of the BSF programme and allocates a team of experts to work with authorities and schools.

2008 edition, An introduction to Building Schools for the Future

British Council for School Environments: www.bcse.uk.net

Practical advice on creating a sustainable learning environment.

2006, Sustainable Schools: Getting it right

Green Guide: www.thegreenguide.org.uk

The Green Guide to Specification is an easy-to-use publication, providing guidance for specifiers, designers and their clients on the relative environmental impacts of over 250 elemental specifications for roofs, walls, floors etc. It is part of the Building Research Establishment Environmental Assessment Method (BREEAM), an accredited environmental rating scheme for buildings and contains more than 1,200 specifications used in various types of building.

Heschong Mahone Group Inc

A Study of Student Performance and the Physical Environment

New Buildings Institute, 2002, Re-Analysis Summary, Daylighting in Schools. Prepared on behalf of the California Energy Commission PIER Program from the full report prepared by the Heschong Mahone Group.

Appendix 2: Case studies

Index

School	Location	Type of capital investment	Page
Larmerier and Sacred Heart Catholic Primary School	Brook Green, London	Primary new build	51
St Francis of Assisi Academy	Liverpool	Secondary new build	57
Townley Grammar School for Girls	Bexley Heath, Kent	Secondary re-model	66
Old Warren House Pupil Referral Unit	Lowestoft, Suffolk	Sustainability investment	74
Kingsmead Primary School	Northwich, Cheshire	Primary new build	77
Notley Green Primary School	Braintree, Essex	Primary new build	80
Bideford College	Devon	Secondary new build	85
Bristol Brunel Academy	Bristol	Secondary new build	89
Queen Elizabeth's School	Wimborne, Dorset	Secondary new build	92
Kingsdale School	Dulwich, London	Secondary re-model	96
Whitecross High School	Hereford	Secondary new build	100

Case Study: Larmenier and Sacred Heart Catholic Primary School

The new Larmenier School reflects the value of having a strong vision for sustainable learning. The school's vision was to create an integrated internal and external environment that would act as a stimulus for thought and investigation by its young pupils, making learning a joy and an inspiration. The challenges faced by the school leaders included amalgamating schools and seeing through the sustainability ethos on a very unpromising site along with budgetary constraints. The vision has been realised through the passion and leadership of both the headteacher and the architect.

1 Background

School type: primary (an amalgamation of separate junior and infant schools)

School size: 445 students and teaching staff

Location: Brook Green conservation area, Hammersmith, London

Site type: conservation area which includes two 120-year-old, 30-metre plane trees; these became the focus for the new school and symbols of a sustainable approach both to the building and to the children's learning

Total value: £7 million

Design start date: 2002

Completion date: spring 2007

Key team members

Overseers: headteacher and governors

Project managers: quantity surveyor

Architects: Studio E

Contractor: Galliford Try Construction

Mechanical and electrical engineers: Max Fordham

Structural engineers: Techniker

Quantity surveyor: Day & Johnson

Landscape architect: Fira

Client: Roman Catholic Diocese of Westminster, and Hammersmith and Fulham Council

2 Aims

The headteacher and chair of governors knew from the start of the project that they wanted a sustainable school. The aims for the new school, developed through extensive consultation with staff, parents and pupils, were that:

- The environment – internal and external – would act as a stimulus for thought and investigation, making learning a joy and an inspiration
- The boundaries between the building and the external space would be blurred
- The philosophy of sustainability would inform the children’s learning
- A language would be developed to unite nature, art and science
- The site would be a sustainability beacon within the community

3 Sustainability outcomes

The project has achieved a great deal. This section highlights some of these achievements and relates them directly to the eight ‘doorways’ of the Sustainable Schools National Framework.

Energy and water

Lighting

The need for good daylight levels had to be balanced with the requirements for technology such as computers. In order to provide as much natural light as possible in the classrooms, segment-shaped light wells capped by a skylight and bounded by glass partitions drop down vertically between the central corridor and pairs of classrooms. On the upper floor these are open to the corridor. On the lower floor they are screened by a head-height partition that provides extra teaching space in the adjacent classroom. These light wells have proved to be very effective in allowing daylight into the school, as well as allowing views out of all the classrooms to the sky and the central tree.

Light fittings have light-sensitive dimming controls to reduce unnecessary energy use.



Heating

The roof includes 80m² of photovoltaic panels that generate 10 per cent of the school's power, with any surplus sold to the national grid. The pupils can watch the performance of the panels on a display screen in the school hall.

Central heating is provided by low-energy, high-efficiency condensing gas boilers. Each classroom has its own heating controls.

Solar shading is provided by automatic awnings designed in consultation with pupils and by creepers that are being grown along guide wires on the outer south façade.

The energy consumption and whole-life costs of the investments are currently being monitored.

Thermal insulation

The structure of the main crescent-shaped building is reinforced concrete and heavy concrete block work – high-density materials that retain heat and so help to keep the building warm in winter and cool in summer.

Ventilation

All areas of the building are naturally ventilated:

- The upper classrooms through opening windows close to the ceilings
- The lower classrooms through vertical ducts which discharge through a number of adjoining but acoustically separated windows
- The central corridor and ancillary spaces by fresh air from underground ducts connected to pyramids in the playground shrubbery. The air from here is discharged through another set of windows close to the ceilings

Water

Low-flush WCs are included within the buildings to reduce demand for water.

Purchasing and waste

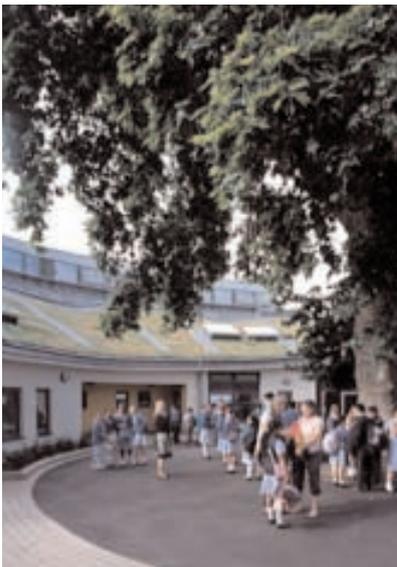
All paper is recycled, and kitchen waste is composted for use in the gardens.

Building and grounds

Preservation of the plane trees

The plane trees that were established on the site before the project started have become central symbols for sustainability both in the building and in the curriculum. The trees have determined the geometry of the building, which is a crescent of south-facing classrooms on two storeys, with one of the trees at its centre point. Ancillary rooms fan out on the inner side of the crescent.

Mathematics has been used to define the main circulation route through the building by applying the golden mean. This and other mathematical terms used in the project have been incorporated into the curriculum.



Materials

The use of timber was viewed as important, as it links the building to the plane trees. It has been used in the ancillary space structures on the inner side of the crescent.

An exposed, untreated timber frame and panelling were used, with laminated timber beams forming the curved roof. The beams, of which no two are the same, were prefabricated in Germany and then assembled on site.

The south façade of the building is clad with untreated larch boarding. This provides an organic interface between the interior and exterior. Timber has also been used extensively in internal fittings.

The BRE Green Guide was used to aid decisions on materials.

Green roof

The roof over the ancillary rooms is covered in sedum, linking to and 'embracing' the central plane tree.

Integration of internal and external spaces

The aim to integrate the internal and external areas has been realised by:

- Providing easy, direct access from the ground-floor classrooms to external areas
- All classrooms having windows with low sills
- Ensuring that the infants' toilets are accessible from the classroom and the external play area.

Inclusion and participation

The students and staff have been involved in the process and design from the outset. The building is now used as a learning tool, integrated strongly within the curriculum.

4 How we did it

The key people**Chair of governors**

The chair oversaw the whole process and managed the construction work. It helped enormously that he was an architect and an expert in building and construction.

Headteacher

The head provided the inspiration, passion and leadership skills to take the staff and students through the process. She saw her role as steering the direction of the project and needing to nurture participation. She felt that headteachers should to build partnerships within and beyond the school.

Architect

The architect established strong relationships with governors, staff, parents and pupils to seek their views, realising the inspirational design and seeing it through to completion.

Parent

A parent who is a professional sculptor, led much of the pupils' participation in the design.

The team

Two committees were established. One managed the new building and the other the temporary school, which was accommodated in the nearby convent run by nuns who were trustees of the school.

Efforts were made from the outset to involve everyone affected by the project. Governors, staff, parents and students took part in consultations throughout the project. 'Champions' from among the governors and parents were identified at an early stage. These included the chair of governors, the architect, a governor to lead the temporary school committee and a parent who is a sculptor (see above). The local education authority (LEA) was not greatly involved, as the Roman Catholic diocese managed the funding.

Five architectural firms were interviewed. The design team was appointed and initial concepts were completed by the end of 2002. The team were chosen in part because they demonstrated a holistic approach to sustainability.

The architect established a strong relationship with governors, staff, parents and pupils, and valued all views. Members of the design team attended governors' meetings as observers. The project was realised on the basis that the budget was fixed and the quality non-negotiable, but time was more flexible.

Procurement and contract negotiation were delegated to the design team, but two governors attended the contractor interviews. The contractor was appointed after a two-stage tender process and was appointed after a lengthy final negotiation. This enabled the contractor to understand the educational aspirations and actively contribute to the learning and participation activities of the pupils.

A senior project manager (quantity surveyor) oversaw the project throughout. The chair of governors managed the construction work. The internal fitting – which accounted for 10 per cent of the budget – was done by administration staff, who were employed for extra hours.

Trade-offs

The first bid for DfES (Department for Education and Skills) funding was refused. For the second bid the language was changed but the ideals were not compromised. Due to budget constraints some compromises had to be made:

- There is only one school hall rather than the two desired
- Rainwater harvesting could not be included
- A caretaker's flat could not be built as the DfES would not fund this



Linking into the curriculum – student voice

Senior teachers were responsible for integrating the new building work into the curriculum. The architect identified a series of opportunities for participation by pupils. These included site visits to observe demolition and construction work, student workshops featuring specialists who could talk about the sustainability features, and ‘junior open house’ events. The children also participated in the design. They designed sculptures for the external spaces, mobile structures for the stairwells, and motifs used on the internal and external awnings and on stained-glass windows.

5 Practical learning points

- All strategic and operational principles are important and intertwined
- Delivery to time and budget should determine how the principles are balanced
- All principles need to be considered from the beginning so that judgements can be made
- The plan for internal fitting should be made at the beginning of the project
- The budget for landscaping must be protected
- Energy systems must be easily used and managed

6 Leadership learning points

Key leadership skills

The case of Larmenier and Sacred Heart Catholic Primary School highlights a number of skills and competencies that school leaders need to deliver a sustainable school:

- Using strategic insights to create a broad vision and challenge the status quo
- Building partnerships and the ability to nurture participation both within and beyond the school community
- Consulting others
- An ability to empower and include the design team, pupils and staff through open communication, coupled with a willingness to listen
- Perseverance in using all available resources, taking advantage of opportunities, and keeping the project on track
- A willingness to identify and empower key ‘champions’ up front

Case study: St Francis of Assisi Academy

St Francis of Assisi Academy was built through a partnership between the local community of Kensington, the Anglican diocese and Catholic archdiocese of Liverpool and the then Department for Education and Skills (DfES).

The buildings include a multitude of sustainable features that reinforce the academy's environment specialism, and it took strong project management and engagement skills to realise them.

The challenge for the governors was to complete the job of creating a new school while ensuring that the sustainability vision remained intact. Securing the financial resources required and acquiring the necessary sustainability knowledge were among the biggest hurdles that the team overcame.

The process is now being used as a model for a new academy in St Helens.

1 Background

School type: academy with an environment specialism; a set number of places are available only to students baptised as Catholics, while other places are available to all within the catchment area

School size: 800 students and 100 staff

Location: inner-city area of Kensington, Liverpool

Work type: new build

Site type: brownfield – contaminated former council environmental depot

Total value: £20 million (total project cost)

Construction value: £16 million (build cost)

Design start date: 2001

Construction start date: May 2004

Completion date: September 2005

Key team members

Head:	Jim Burke
Chair of governors:	Rt Rev James Jones, Bishop of Liverpool
Consultants:	Cambridge Educational Associates (CEA) (representing the head prior to his appointment)
Architects:	Capita Percy Thomas
Managing consultant:	Mouchel
Main contractor:	Birse Build Ltd

2 Aims

The demand for a secondary school was identified in the Kensington area and acted on through a partnership between the local community, the Anglican diocese, the Catholic archdiocese and central government. The opportunity was taken to build the school as an academy with an environment specialism.

The project vision was for a school that would reflect sustainable stewardship of the earth's resources and integrate fully with the local community and environment. The resulting academy has proved to be a model school that continues to inspire students, staff and the local community alike.

3 Sustainability outcomes

The project team worked hard to ensure that the St Francis of Assisi Academy realised their vision. This section highlights some of the achievements and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Food and drink

The academy won an award for the quality of its food in a competition with all local food outlets. Students' views reflect this too, as the food was highlighted as one of their favourite features at the school in a recent survey.

The academy is looking to increase the use of seasonal and local produce for school meals, and is planning to involve Year 7 students in growing food on site.

Energy and water

Photovoltaic panels on one roof provide five per cent of the school's electricity needs in winter and 10 per cent in summer. The students can observe how much energy is generated through a monitor displayed in a public space.

Solar energy is used to preheat mains water before it reaches the boilers, thereby reducing the amount of additional gas heating required. In summer this system heats the water almost to full temperature, significantly reducing gas use.

A south-facing atrium maximises the natural light in the building, reducing the amount of energy required for lighting.

Louvres have been included in the design to maximise the potential for natural ventilation, reducing the need for electric air conditioning.

Rainwater is harvested from the roof. This feeds the toilets via a 5,000 litre tank within the building. A group of students has been established to explain the system to peers, and digital monitors display the amount of water collected.

Travel and traffic

Students have been involved in the writing and successful submission of a sustainable travel plan as part of the curriculum.

Purchasing and waste

Students and staff participate in various projects that aim to reduce waste and promote recycling.

The academy is hoping to invest in a large-scale composter for kitchen food waste (approximately £12,000).

Building and grounds

The building is concrete, clad in cedar from a sustainably managed source. It includes an area of roof planted with sedum.

Low VOC or water-based paints have been used throughout.



Inclusion and participation

Both the construction of the building and the way that sustainability is integrated into the curriculum helped the academy to involve staff, pupils and the wider community fully in this project. Communication between stakeholders is regarded as particularly important, so teachers help students to understand why sustainable development is important and older students mentor their younger counterparts. A number of students sit on an eco-council that devises plans for water, energy and waste.

During the planning stages, the project team made significant efforts to consult with the community and other stakeholders. Even though there was not a team of staff in place at the time, the views of teachers were gained through consulting with staff in other local schools.

The distinctive building and the media coverage it attracts have helped to ensure a high level of interest among potential applicants. In 2007 the academy received 300 applications for the 180 places available.

Future plans

A lodge refurbishment programme is being planned in order to create a better connection with the local community. Ideas for the use of the building and the surrounding space include:

- a local Connexions office
- a 'recycle a cycle' scheme, a social enterprise that would buy rejected bikes and repair and sell them
- a Saturday bike repair workshop
- a conference room for local community use
- IT suites for adult learning
- space for use by park rangers – students who help in the tree planting programme
- the only apple orchard in Liverpool.

Local well-being

Students communicate their learning about sustainable development to their parents. They lead by example in their community, taking practical action to reduce their impact on the environment in areas such as recycling waste and saving energy. This encourages adults in the community to join in, a trend that has real potential to increase community cohesion in an area where it has not traditionally been strong.

The new building has had a positive impact on regeneration of the local area, and the resulting publicity has contributed to a renewed sense of pride. Standards at the school are now rising.

4 How we did it

The key people

Chair of governors

Role: to convene and lead the strategic board, and secure funding. The Rt Rev James Jones, Bishop of Liverpool, has been active in helping to regenerate parts of the city. He has a personal interest in the environment and sustainability.

In his capacity as chair of governors the Bishop approached Lord Adonis at the DfES to ask for an extra £2 million to pay for the sustainability features incorporated in the design – and got it.

The Bishop became a strong chair for the strategic board – a group of stakeholders tasked with watching over the building project. He worked closely with sub-committees on key issues including landscaping and the curriculum.

Governors

Role: to guide the project. The governors' role was to oversee the whole project. Before a headteacher was appointed, the governors employed CEA as consultants to represent the perspective of a headteacher and to manage the project. The choice of this organisation was down to previous teaching experience within the team.

Paul Rooney, a governor at the academy, makes a distinction between constructing a new building and the more complex enterprise of creating a sustainable school. The use of the building, its inclusion in the curriculum and the way that the school integrates with the community all reflect well on the governors' ability to see a bigger picture.

One major leadership challenge for the governors was to ensure that environmental criteria were not 'diluted' while also getting involved in minutiae such as the type of cladding to be used on the building. There was a need both for strong strategic leadership and for attention to detail.

The governors had to be assertive in pursuit of their sustainability vision. For example, the local authority wanted the academy to provide more parking spaces than was proposed, as did some governors and staff. But the governors maintained their stance.

Headteacher

Role: to implement a sustainable school. Initial planning for the school started in 2001 and the St Francis of Assisi Academy opened in 2005. The headteacher, Jim Burke, was appointed in April 2004 – after the design stage had been completed and just as the foundations were being laid.

Armed with sustainability performance targets prescribed by the governors, the head's role was to keep sight of final use and required outcomes, to oversee the choice and instalment of the fixtures and fittings and to see the building through to commissioning and use. Ensuring that the staff took account of learning opportunities that the building could offer was key.



Headteacher representative role: to represent the views of a headteacher and manage the project. CEA was contracted to manage the building project. It was also tasked with ensuring that the views of a headteacher would be represented and considered until Jim Burke was appointed.

CEA worked closely with the architects, making important decisions about fabric and curriculum. Once the building work had started, the company ensured that staff were brought in to discuss the layout of the rooms.

Relationships

It was important to have a good relationship with the managing consultant, which allowed for regular meetings and open discussion.

Relations with the local community were positive from the start as there was a real demand for the school in the local area, and the environmental specialism met with general approval.

The approach taken to building the academy was deemed to be so successful that a new academy building project in St Helens used it as a model.

Leadership challenges

The fact that the headteacher joined the team after the project had begun was not a problem because the support team – particularly the governors – was strong.

But involvement in the controversial academies programme, the location of the school in a socially deprived inner-city area, and a new environmental curriculum were all factors that made this a particularly challenging project.

The board underestimated the time required to guide and interact with the project consultants, so it proved difficult to communicate effectively in the time available. There was some feeling that the results of the widespread consultation that took place were not listened to enough.

Although monitors are in place to show rainwater harvested and energy generated, a desire that the building should be better integrated into teaching has been expressed.

Materials and design outcomes

Unfortunately the design of the school does not give the impression of space. The classrooms and staffroom are thought by some teachers to be cramped and there is a lack of storage space. Some students feel that they would prefer more space.

Natural ventilation is generally good. However, air circulation is a problem, particularly around the main staircase as it is too narrow.

Before construction started, the costs of maintaining and renewing the site's sustainable features were underestimated. Consequently, the sedum roofs are proving more time consuming to maintain than originally anticipated. The good-quality paint required in general maintenance is expensive. Some of the carpet has been replaced with more durable vinyl.



Some financial difficulties led to a process of value engineering, which cut out a number of the sustainable features. For example, motors for the louvres were not included in the final design. They now have to be adjusted by hand, using long poles. Not being able to afford the most suitable glass meant that the atrium is too hot in summer, causing discomfort and costly problems with plaster coming off the walls.

These problems were compounded by commissioning the builder who gave the lowest quote. The push on profit margins for the builder led to the sourcing of materials below the quality of those in the architect's specification. This caused friction between the architect and the builder, leading to severe delays. So when evaluating tenders it is vital to ascertain that contractors can meet the specifications within their bids.

5 Practical learning points

Design and materials

- It is essential to develop a vision that everyone has bought into and that can be adapted when absolutely necessary
- To stimulate discussion around the vision, it is useful to take a long-term view – what will education look like in 10–15 years? This can be quite challenging for some teachers who are used to certain ways of teaching, and there is no central, clear guidance on this subject. However, it is essential to future-proof your design
- It is essential to anticipate the use, maintenance and management requirements from the inception of design
- Build in flexibility of space and ensure that there is enough of it to accommodate current and future levels of students and staff
- Think of the building as a learning tool from the start. Design in features that will tie in with the curriculum and provide a learning experience for the students, such as monitors and displays for electricity and rainwater. Use the construction phase as a learning opportunity for existing students
- Focus on energy efficiency, and build in recycling facilities
- Ensure that the design takes the feelings and social needs of pupils into account. It is essential for students to feel safe and to provide areas that facilitate communication and integration
- Students like a modern, attractive and sustainable building

Use

- Teachers need to be able to identify what opportunities a sustainable building offers in terms of curriculum links. Where the school has an environment specialism, this must involve all teachers in some way
- Teachers need thorough training on the technology used in the design
- The building will not get the message across on its own. There needs to be a communications plan. For instance, posters can be used to highlight aspects of the building, sustainability issues can be discussed at assembly and experts from nearby universities can be brought in to provide educational sessions. The academy held a climate week covering mitigation and adaption to climate change, using practical and visual tools such as flood maps
- Students must feel empowered to challenge and encourage the proper, sustainable use of facilities, by both peers and staff

6 Leadership learning points

The case of the St Francis of Assisi Academy highlights a number of essential skills and competencies required to lead a successful sustainable school initiative.

Key leadership skills

- Integrity, strong presence and assertiveness are important in the headteacher
- Good communication and an ability to engage others when appropriate are essential. It is important to recognise that consultation with stakeholders is not something that should be cut short. School leaders must be able to consider and include the views of others
- Developing a long-term vision that anticipates future educational needs
- Perseverance in developing and communicating the vision, but flexibility is also needed in the face of unforeseen issues
- Staying focused on the original aspirations, maintaining commitment and overall direction when facing challenges such as budget squeezes and time constraints
- An ability to assess others is needed to assemble a team with the appropriate balance of skills, attributes and knowledge to successfully drive the project
- Selecting a strong chair of the strategic board helps to engage all stakeholders and underpin the progress of the project
- Ensuring key team members have a certain amount of knowledge about sustainable development will improve the likelihood of success. This may require rapid capacity building
- An ability to keep the project and concept as simple as possible is important. Sustainability can seem complex, making it potentially difficult to manage
- The governing body needs to have an understanding of key issues, such as the sustainability imperatives
- The head should be capable of devolving aspects of budget and project management; bursars/school business managers are often able to take on project management responsibilities
- School leaders need to set performance management targets with sustainability elements for key staff, in order to ensure that sustainability is incorporated into the project
- An ability to articulate and illustrate the link between sustainability and improved standards in schools is helpful in getting broad support for the project vision

Relationships

It is important to identify and engage all stakeholders appropriately in the project:

- When a school is on a new site, consult with and take on board the views of teachers in nearby existing schools
- Parents must not only be informed of the project but also educated on its sustainability aspects
- The architect needs to work in partnership with the users and must listen to their views, not just consult
- Teachers must be kept up to date with what is happening on the project
- Students should be involved not just as consultees but also in meetings
- Governors are crucial – in particular the chair of governors – as they appoint the key staff and consultants such as architects
- The relationship with the builders is important

Case study: Townley Grammar School for Girls

The innovative design of the new performing arts centre, sports hall and science laboratories at Townley Grammar School provide an enhanced learning experience for pupils. The new facilities also underline the school's special status for performing and visual arts. In sustainability terms, its greatest success is having natural heating, cooling and ventilation in spaces that would traditionally be air conditioned. The key leadership challenge was developing the project management skills to organise construction. Much time and effort could have been mitigated by training the school's leaders in procuring and managing a complex building project.

1 Background

School type: selective grammar with special status for performing and visual arts

Work type: new build additions to existing campus, including a performing arts centre, sports hall, science laboratories, ICT facilities and art exhibition spaces

School size: over 1,400 pupils

Location: Bexleyheath, London

Procurement route: traditional

Value: £4.6 million

Funding sources: government sustainability grant: £2.8 million

Disability Discrimination Act accessibility: £50,000

Specialist school capital grant: £100,000

Devolved capital funds (DfES via LEA): £690,000

Completion date: 2007

Key team members

Head:	Linda Hutchinson
Architect:	Studio E
Contractor:	R Durtnell & Sons
Mechanical and electrical engineers:	Downie Consulting Engineers
Structural engineers:	Price & Myers
Quantity surveyors:	MPA
Landscape architect:	Jenkins and Clarke

2 Aims

Given the new special status of the school for performing and visual arts, the aim was to provide state-of-the-art facilities to enhance learning in these areas and meet future needs. A sports hall and new science laboratories were also badly needed. In addition there was a desire to integrate the different disciplines to encourage cross-communication and learning.

To achieve all this, the headteacher felt that it was essential to deliver something more than traditional rational design – buildings that would make a definite, positive statement.

The aim to make the new buildings as sustainable as possible was introduced by the architect during initial meetings after appointment. This was strongly supported by the head and the chair of governors, who is the environmental health officer for Greenwich.

The key strategic sustainability principles that were considered were:

- Positive social, economic and environmental outcomes
- Integrated approach
- Involving all stakeholders
- Long-term thinking

3 Sustainability outcomes

This section highlights some of the achievements and relates them directly to the eight ‘doorways’ of the Sustainable Schools National Framework.

Energy and water

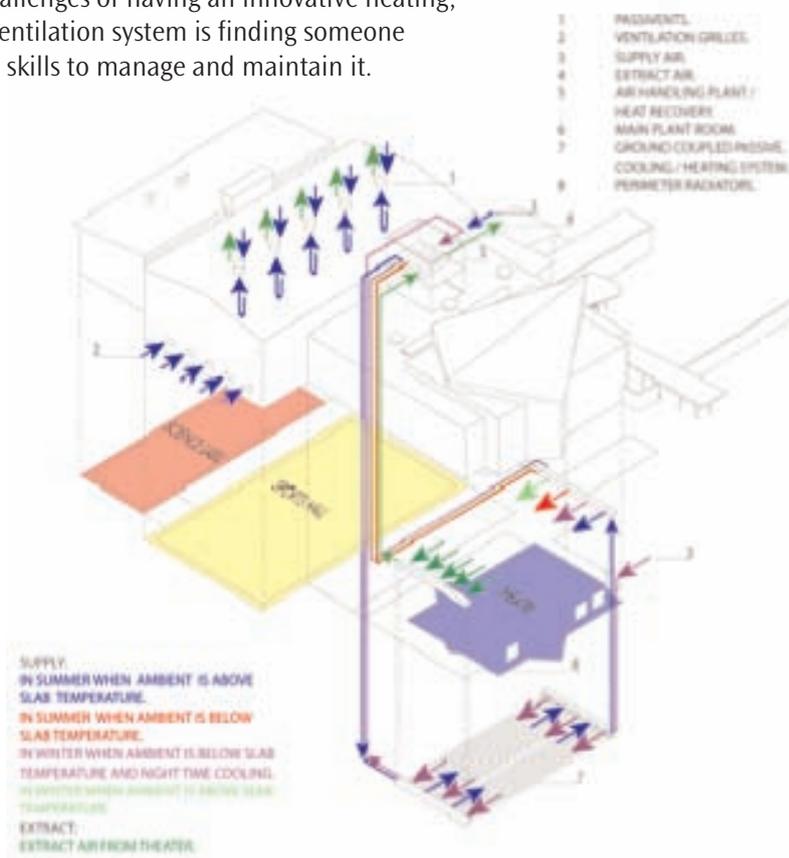
The main sustainability success is having no air conditioning in the buildings.

Heating and cooling for the theatre

Instead of full air conditioning, the school’s theatre has heating, cooling and ventilation based on a low-energy passive-solar system. A series of 500mm concrete pipes run the length of the building under the concrete floor, connected at each end by header ducts and surrounded by sand and cement fill. When the theatre space requires cooling, external air forced through these pipes is cooled by the surrounding ground mass and passes into the theatre space. Warm air is extracted at high level.

When the studio needs heating the same system is used with the air heated to 18°C. Perimeter radiators on the western wall provide top-up heat, if required, supplied by a modulating gas-fired condensing boiler. The performance of this system is being closely monitored and so far seems to be performing well, but the energy and cost savings have not yet been analysed.

One of the challenges of having an innovative heating, cooling and ventilation system is finding someone with the right skills to manage and maintain it.



Sports hall ventilation

For economic reasons and to accommodate a wide variety of sports, there are no windows in the sports hall. Rather than having a forced-air, mechanical-ducted system it was decided to have a purpose-designed system that uses the natural buoyancy of air movement and pressure differences caused by wind. This uses less energy and is more cost effective.

Air is introduced and extracted through four louvered ventilation towers (passivents) located along the ridge of the roof. The louvres are motorised and controlled by sensors. During the summer additional air can be introduced at low level through louvres in the north-facing external wall. As this air warms, it rises and is extracted through the passivents, drawing in more cool air.

Orientation and solar shading

Orientation was an important consideration in the configuration and design of the buildings. Trees have been planted outside the south-east façade of the science block to provide solar shading in the future.

Purchasing and waste

The excavated ground material was used in landscaping, providing curved banks and informal external spaces which soften the junction of the buildings with the external areas and provide spaces for pupils to meet.

Building and grounds

The key success of the new buildings is the responsive, spacious accommodation that they provide.

Design

Although juxtaposed with the older buildings, the new buildings are a complete contrast. Their innovative, exuberant design visually expresses their function for music, dance, drama, sculpture and painting, and contrasts boldly with the somewhat boring traditional rectangular design of the earlier buildings.

The theatre is two interlocking brick volumes: a cube with checkerboard cladding interlocked at 30 degrees with a lozenge-shaped space with outward-tilting walls, clad externally in larch boarding. The interlocking volumes provide balconies and recesses internally and interesting planar juxtapositions externally.

Internally the theatre provides a flexible, anonymous, windowless space that will enable directors to personalise it through their own productions and creativity. Externally the unusual design and the use of different materials ensure an eye-catching construction that reflects the new special status of the school.



The new sports hall has indoor sports facilities for a wide range of sports. The science laboratories provide state-of-the-art facilities. The new buildings are linked to the older buildings by curved canopies supported by bright yellow legs.

Feedback from staff and pupils has been very positive, and the pupils are proud of their new facilities. There has been no mistreatment or damage to the buildings, or the exhibited artwork. The feedback has resulted in some modifications and additions: a store in the theatre and another external covered space.

Green roof

The corridor linking the new buildings to the old science block has a small, flat, sedum roof.

Inclusion and participation

Integration between disciplines

The design of the new buildings – with wide, naturally lit corridors – has enabled them to be used as permanent exhibition areas for art and sculpture, and also informal meeting spaces for pupils. This means that all pupils using the facilities are exposed to art, even if this is not one of their subjects, and provides a good link between the arts and sciences.

Integration of external and internal spaces

A courtyard in front of the block completed in 2000 had already been transformed into a ‘piazza’ with different levels, planting and seating to make it into an attractive, external meeting and communication space for the pupils.

The new buildings provide another courtyard area, similarly landscaped with different levels and planting, which can be used for informal performances and for the pupils to eat their lunch. This concept was led by the pupils through their council, and their environmental committee had a significant input into the planting through visiting William Morris’s Red House and garden nearby.



New work experience links

The architect and site manager continue to participate in school activities. Work experience opportunities have been established through the project with the architects and the mechanical and electrical engineers.

Local well-being

The new buildings have been designed so that the community and other organisations can use them out of school hours.

Global dimension

The new buildings fit in with government policy and guidance both for extended schools and the *Every Child Matters* strategy.

4 How we did it

Key roles and responsibilities

Key people

The whole project was strongly led by the headteacher. The key person in delivering sustainability, in the opinion of the head, was the architect from Studio E. Sustainability was taken up and promoted to the governors and staff by the head. The chair of governors is the environmental health officer for Greenwich. The head involved the deputy head and her personal assistant (PA). The other staff selected to be closely involved were those who were going to be users of the new buildings.

The head led the project, managed all the funding, and attended all meetings with the architect and the contractor. The deputy head attended the initial meetings with the architect, contractor and school council. The chair of governors received regular updates and made visits to the site. Other staff who were going to use the building reviewed the design and checked all the fittings.

It worked, but with a huge sacrifice of time and effort that could have been mitigated by some training on procuring and managing a complex building project.

Selecting the design team

At the outset the head prepared a paper setting out the accommodation required, in order to apply for funding from the local authority. This paper was developed into a brief that was given to six architectural firms, five selected by the local authority and one put forward by the head. Four architects were interviewed by a selection panel comprising governors, the head and deputy headteacher and representatives from the pupils' council. The selected architect recommended the rest of the design team.

Stakeholder engagement

From the start there was consultation with the governors, the pupils' elected council, staff whose departments would be located in the new facilities and the Parent–Teacher Association. The staff contributed to and reviewed the design at each stage, and checked all the fittings.

Hurdles for stakeholder engagement

One hurdle that had to be overcome was convincing staff who would not be using the facilities that the expenditure was justified, particularly as it meant using the school's capital budgets up to 2009. Their buy-in was gained by keeping them fully informed.

The pupils had particular input into the external open spaces, the planting of the grounds and having opening windows in the classrooms. Community groups were also consulted in the early design stages. With hindsight the head feels that more could have been done to engage with the local community, as some of the neighbours are not happy with the appearance of the new buildings. In order to foster better relations with the community, an open day with senior pupils taking visitors round took place in 2007.

Local planners did not like the initial designs, one of the criticisms being a lack of windows. This caused some delays.

Managing the finances and operations

Although the local authority was legally the client, much was delegated to the head. This included managing the funding, which she found liberating as it enabled her to prioritise and make changes to the design that would save money. She established a good relationship with the local authority's finance officer and the building control officer, and had great support from her deputy and PA.

A traditional procurement process, using JCT80, was used. This allowed enough time for consultation with staff, pupils and the community. The construction work was managed jointly by the architect and the contractor, that saved the cost of a project manager. Monthly meetings between the architect, the contractor and the head were held (with the deputy head also involved in the early stages). As a result of careful design and excellent drawings, very few changes were made during construction.

The role of the site manager was particularly important. The site was alongside a functioning school, so safety was of paramount importance. Being a girls' school it was also important that the behaviour of site workers did not attract the girls' attention in any way. Strict principles were established on both sides from the start and there was only one incident that resulted in the individual involved being dismissed.

Compromises

Cost constraints caused a number of compromises to be made. The features that had been hoped for and had to be dropped included:

- Water harvesting and recycling – an idea from the pupils inspired by their link school in Delhi
- A biomass boiler – the cost proved prohibitive and there was no local facility to provide the fuel
- Windows in the sports hall
- A second storey over the corridor linking the new buildings to the science block
- Plastering of internal walls – these are now painted blockwork
- A new library intended for the old gym

Additional grants for sustainable features were applied for but the local authority was not able to support these.

Pupils were kept informed of progress through members of their council, who visited the site regularly and reported back. As the building work progressed, and the work was completed, the sustainable features were linked into the school curriculum in subjects such as geography. It was recognised that there is potential for more links, particularly in science.

The theatre's sophisticated sound and recording facilities enable the students to have training in lighting, production and technology. One of the results of having art exhibition spaces is that professionals now hang the artwork. The pupils learn from this, although it is an additional staffing cost for the school.

5 Practical learning points

According to the head, it was vitally important that her support team – the deputy head, her PA and the chair of governors – believed in the vision for the project and understood its complexity. However, she felt that headteachers and their key support staff do not have the necessary knowledge to procure and manage this kind of complex building project.

It is essential to consider the maintenance and use of new buildings from the very beginning. For instance, it is important to find a competent organisation that will be able to maintain innovative systems when they are in use.

The following were among the main lessons learned by the head through this project:

- Stick to what you believe is right and have the perseverance and courage to carry it through
- Choose the right architect and build up a good relationship
- Involve the local community early on, and as much as possible
- Convince the governors and school community of the benefits of sustainability features over the longer term, despite higher capital costs

Asked what she would do differently if she were to lead a re-modelling project with a sustainability focus again, she said she would research the issue of sustainability in schools prior to meeting with potential architects, and seek the advice of specialists in this area.

6 Leadership learning points

Key leadership skills

The case of Townley Grammar School for Girls highlights a number of essential skills and competencies required to lead a sustainable school project:

- An ability and willingness to challenge the status quo
- An ability to build partnerships: the relationship between the school and the local authority is important. It is also important to choose an architect that you can work with and who is able to share his or her vision with the school community and the governing body
- A capacity for consulting others – stakeholder engagement. The involvement of the entire school community and the governing body is crucial. The community and neighbours need to be involved early in order to gain their support
- Perseverance: it is important to stick to what you believe is right and have the tenacity to carry it through
- Communication skills: as school leaders are using public money, they must be able to justify what they are doing
- Good risk management is essential, although it pays not to be completely risk averse
- An ability to anticipate and plan for future needs, bringing a long-term perspective to bear
- Knowing how to procure and manage a complex building project. This was knowledge that the head and key support staff had to acquire during the project. Ideally, they should have undergone training beforehand

Case study: Old Warren House Pupil Referral Unit

Through the Eco-school scheme, Old Warren House has become a beacon for sustainability in the local community, receiving grants for a wind turbine and solar panels. Sustainability is woven into the curriculum. The enthusiasm and commitment of the staff overcame the challenge of securing planning permission for renewable energy sources.

1 Background

School type: pupil referral unit for Key Stage 4

Work type: sustainability investment

Funding sources: Eco-schools; Department of Business, Enterprise and Regulatory Reform (BERR)

School size: 24 full-time equivalent students and 11 staff

Location: Lowestoft, Suffolk

Total value: £12,000

Key staff

Head: Elizabeth Rodgers

Science teacher: Paul Shepherd

2 Aims

The aim of this project was to secure grants for sustainability features, such as a wind turbine, and put sustainability at the heart of the school's identity. The project has succeeded because the passion for sustainability of an individual teacher has spread to students and other staff.

3 Sustainability outcomes

This section highlights the main sustainability outcomes of the project and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Food and drink

The school has secured an allotment to help teach pupils about local sourcing and healthy food in a practical, hands-on way.

Old Warren House is a nationally accredited Healthy School.

Energy and water

Energy use has been cut by putting up signs that raise awareness and by using low-energy fittings.

Building and grounds

The school has erected a small wind turbine and photovoltaic panels have been installed. Together these should contribute 15–20 per cent of the building's electricity requirements.



Inclusion and participation

The pupils conducted an environmental audit that created much of the initial momentum. Pupils also participate in woodland skills workshops with Suffolk Wildlife Trust.

The high profile of the sustainability initiatives at Old Warren House is integral to developing a positive reputation for the school. This in turn creates a sense of pride in the students, increasing attendance levels.

Local well-being

The visible wind turbine and photovoltaic panels have created an opportunity for wider community education on sustainable development.

4 How we did it

Key roles and responsibilities and key people

The science teacher, Paul Shepherd, led the entire initiative, from securing the funding to finalising the design. The headteacher, Elizabeth Rodgers, supported Paul at every step. Her backing was crucial to the implementation of all features.

The beginning

Paul Shepherd introduced sustainability to Old Warren House by working with pupils to conduct a simple environmental audit of the building. This was woven into the curriculum in subjects such as personal, social and health education (PSHE), citizenship and science.

First success

After becoming aware of the Eco-schools grant scheme, Old Warren House successfully applied for a £5,000 grant for a small wind turbine. The challenges overcome during this process ranged from tackling a large volume of paperwork to getting telegraph poles moved. The installation of the turbine, applauded on a subsequent visit by the then junior environment minister, Ben Bradshaw, helped to create interest locally and win the school a bronze Eco-schools award.

The future

Old Warren House won a grant for a further £5,000 from Eco-schools, with £5,000 matched funding from BERR, for an array of photovoltaic panels. Planning permission has been gained and the panels have been installed, which should cover 15–20 per cent of electricity requirements.

5 Practical learning points

Paul Shepherd says that a strong personal commitment to sustainability, combined with self-motivation and perseverance, have been key elements in the success of Old Warren House with this project. The planning application had to be written twice, and Paul had to call BERR many times, so his determination to get a result was very important. He therefore described access to a telephone as a key factor!

Paul feels that he would not do anything differently if he could start the project again. On the whole, he believes it has been a success. He would, of course, have liked more money but he was constrained by what was available as well as by limits on his own time.

6 Leadership learning points

Key leadership skills

The case of Old Warren House Pupil Referral Unit highlights a number of skills and qualities that are needed to lead a successful sustainable school initiative:

- Passion, enthusiasm and commitment give momentum to the whole process, helping to bring others on board and bolster morale in the event of setbacks
- Self-belief and certainty in what you are doing are essential throughout the project – when putting forward a case for grant assistance, for example
- Perseverance: there were several times when it might have been easier to give up and take no for an answer
- An ability to understand complex issues and projects
- An outlook that embraces the wider community, with an ability to see the links and benefits
- Adaptability
- An ability to build relationships
- An aptitude for empowering others and ensuring that roles are assigned in line with professional or personal interest in sustainability

Case study: Kingsmead Primary School

Kingsmead is an exemplar of sustainable design and construction, but the real challenge for the head – who joined the school only six months before it opened – has been to capitalise on the building to embed sustainability into the curriculum and ethos of the school. Her success in inspiring others is such that Kingsmead readily attracts staff wanting to share in that ethos.

1 Background

School type: primary

Work type: new build

School size: 210 students, 25 staff

Location: Cheshire

Value: £2.3 million

Completion date: 2004



Key team members

Head: Catriona Stewart

School manager

School senior management team and governors

Architect: White Design Associates Ltd

Building contractor: Willmott Dixon, Birmingham

2 Aims

Cheshire County Council's aim was to build an exemplar of sustainable design and construction. The school aims to ensure that the building is optimally managed and maintained, and that sustainable development is incorporated into all aspects of the school.

3 Sustainability outcomes

This section highlights the main sustainability outcomes of the project and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Energy and water

Rainwater is harvested and grey water reused. Solar panels supply hot water and electricity. There are gauges to measure the solar gain in public areas.



Building and grounds

The building is sited to maximise the use of natural light. There are also ecological learning areas in the grounds.

The school building provides the flexibility essential for different teaching scenarios and also offers comprehensive IT solutions. Classrooms face the landscaped area, so everyone can benefit from the newly designed surroundings.

4 How we did it

Key staff and responsibilities

The head, Catriona Stewart, has a vital role in the current sustainability of the school, although the building was almost complete when she was appointed. Her role was to capitalise on the building and ensure that the sustainability aims were met during use. The school manager was important especially through the bursar role. The responsibility of budgeting mainly fell with the local authority.

The vision

Sustainability was incorporated into the vision by the county council right at the start of the process. The Sustainable Schools National Framework is central to the school's ethos: **a commitment to care for oneself, care for each other and care for the environment.** The school building is a central aspect of how the school achieves this, with the building being used as a sustainability learning resource. The importance of sustainability in the school has been a key element in attracting staff who share the school's values.

The long-term management and maintenance of the school is critical. Hence Kingsmead formed an eco-council comprising of the headteacher, a staff representative, a governor and elected student representatives. A key success of the council was achieving Eco-schools Green Flag status.



5 Leadership learning points

In order to ensure successful delivery of a sustainable school, the case of Kingsmead Primary School highlights a number of essential skills and actions:

- Developing a vision: a vision for a sustainable school with the building as the central learning resource
- Challenging the status quo
- Strong presence
- Communication skills, for example, choosing simple solutions that children can relate to

Case study: Notley Green Primary School

Notley Green Primary School was built to serve a newly constructed community in Essex. Essex County Council and the Design Council worked in partnership to realise the building of this school as a model of sustainability. The key challenge for the head has been taking over a school designed by others and serving an emerging community. In a number of ways the school design has not lived up to expectations, but the learning from this process has been invaluable.

1 Background

School type: primary

Work type: new build

School size: approximately 380 pupils currently

Location: Great Notley, Essex

Procurement route: joint competition by the Design Council and Essex County Council

Value: £1.2 million

Completion date: 1999

Key team members

Architects: Allford Hall Monaghan Morris

Structural engineer: Atelier One

Services engineer: Atelier Ten

Landscape: Jonathan Watkins Landscape Architects

2 Aims

The Design Council and Essex County Council had three main objectives for the building of Notley Green Primary School:

- build quality school facilities within a normal budget
- follow sustainability principles in design and construction, and
- share the learning from the process with other schools and interested parties to inform future projects

Instead of asking the short-listed bidders to provide specific details of their proposals, they were asked to provide information on their principles and how they would set about achieving the objectives following these principles.

3 Sustainability outcomes

This section highlights some of the achievements at Notley Green and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Energy and water

- Rainwater is harvested from the roof
- The triangular shaped rooms allow for an efficient floor-to-wall space ratio thus reducing heat loss as well as reducing the spatial 'footprint' of the building
- Natural ventilation is used ensuring that energy is not needed for air-conditioning
- The design aims to minimise the need for artificial lighting
- High levels of insulation lead to lower levels of energy consumption
- An external sunscreen aims to reduce over-heating in the summer

Travel and traffic

- Car parking was restricted on site to encourage more sustainable means of travel.



Purchasing and waste

- Recycled materials were used in work surfaces
- All materials were assessed for environmental impact, embodied energy, whole life cost and end-of-life treatment

Building and grounds

- Areas of the roof are planted with sedum.

Inclusion and participation

- A series of meetings were held with the local community in order to engage with stakeholders

Global dimension

- The design was showcased through a Design Council-sponsored exhibition that toured the country after a period at the Royal Institute of British Architects (RIBA).

4 How we did it

Challenges in implementation

The school has been planned for development in several stages to allow for the growth in student numbers to cater for expansion of the catchment community.

Problems identifying stakeholders

Notley Green Primary School was not built until homes within the surrounding community were constructed. As the numbers of homes increase, further phases of the construction project will continue. This responsiveness means that the school was not planned with a target student population in mind, with the result that the site will be under construction for nearly 10 years.

Furthermore, the first students from newly constructed homes went to another local school. This is still providing problems seven years later.

The staff at the school – including the headteacher – were not recruited at the beginning of the procurement or construction process. Because students were not in place, the normal stakeholder groups were difficult to identify such as families, Parent–Teacher Association, school governors etc. This made early governance of the project difficult.

Complications from the design

The school encapsulated a lot of new ideas within its design (unusual triangular frame and room shapes) and sustainability. This has meant that repair and maintenance has been very expensive because of the novel nature of the materials used. For example a glass window cost £12,000 to replace because it came from Germany.

The LEA and the planning authority were keen that the school have a ‘small footprint’. This has constrained options over time about location of buildings and open space.

Specific issues with materials and design

Design

The original design had no classroom doors. In practice, this made the school extremely cold. New doors had to be put on to remedy this problem and since they were not a standard size, proved expensive.

Although the room shape is imaginative and provides a creative space, it has, however, provided a few problems:

- The kitchen is too small
- No standard square furniture fits in the rooms so it had to be specially made
- The triangular shape is not good for cooling airflow
- Light is actually restricted resulting in a gloomy building
- There is very little storage space
- There are not enough cooling vents so fans are needed to cool rooms

Because there are no gutters and the roof water is directed to inaccessible underwater tanks, grey water cannot be used to water the trees on site.

Transport access to the school is problematic – the total staff when part-timers are included is 58, but there are only 14 parking spaces and public transport is inadequate.

Materials

- The recycled plastic worktops are now showing wear and fading, and no guidance has been given on how to maintain or refurbish them
- The environmentally friendly paint chosen for the project dissolves when it is washed so it cannot be cleaned properly
- The windows have limited opening to prevent heat escaping in the winter, but in the summer this means fans are needed to cool rooms
- The skylights do not let in enough light
- The bamboo flooring needs special cleaning materials, which take three days to dry, thus limiting access to the buildings

Lessons learned for Phase 3 development

The headteacher proposes the following learning points for the next phase of construction:

- Return to traditional square-shaped rooms while still keeping an interesting external frame – the shape and the sustainability within the design was seen as a useful recruitment tool because the pupils learn so much about sustainability from the school itself
- Include facilities for the local community
- Build in smarter air circulation options for cooling
- Install light sensors on the windows
- Change the roof to a cobbled or ‘brown’ roof

Learning points about materials and design

- It is essential to think about the use of the space when approving design. For instance, you need to know how to maintain the materials that are used and that furniture will fit within the classrooms
- Sustainability features only work where there is a suitable sustainable way of achieving your goals, for example, limiting car parking only works if there are other means of getting there which was not the case with Notley Green where public transport was lacking
- Even the architects admit that assessing the sustainability of each material and product used in construction is not easy. It is important to be aware of meaningless claims or ‘greenwash’
- Sustainability and good design attracts students and teachers to a school as they are learning tools in themselves

5 Leadership learning points

In order to ensure successful delivery of a sustainable school, the case of Notley Green Primary School highlights a number of essential skills and actions:

- Leaders need to challenge the status quo and see the school as part of an integrated network in the community – bridging the gap between the local authority, planners and developers
- The need to engage key stakeholders such as children and families at an early stage (if there are no existing pupils then use pupils from a nearby school)
- Building an effective partnership between the headteacher and the architect is crucial – ideally both need experience
- The knowledge and ability to make the right choices for the long term, in choice of materials, for example, washable walls versus noxious fumes from paint

Case study: Bideford College

This new build secondary school is still in the planning process and is part of the One School Pathfinder programme. The college has been awarded national demonstration status for sustainability and science, and, with its new buildings, will become a focus for the whole community. So far, the biggest leadership challenges have been around community engagement, delivery within prescribed project budgets and planning a new college to be built alongside the existing school.

1 Background

School type: secondary with current specialist science status and a project status as a national demonstrator for sustainability and science

Location: Bideford, Devon

Site type: existing school site

Total value: £46.4 million

Construction start date: summer 2008

Completion date: main building occupancy due April 2010, external sports facilities due summer 2011

Project team

College principal:	Veronica Matthews
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New college co-ordinator:	Mike Newby
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Lead designer:	NPS (SW) Ltd
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2 Aims

The first Devon County Council school to benefit from Building Schools for the Future (BSF) funding, Bideford is also part of the One School Pathfinder programme. It will be built on the existing campus with the college continuing to operate alongside, and will be ready for use by April 2010. Most of the old buildings will be demolished and the rubble used for foundations for new sports facilities. The contractor will be asked to engage local trades people and purchase from local companies.

The project team want to design a school that will be an educational centre at the heart of the community, and that will provide a service available throughout the day and night.

3 Sustainability outcomes

This section highlights some of the sustainability elements to be included in the project and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Energy and water

In order to minimise energy requirements from lighting and air circulation, teaching spaces will make best use of natural light, be well ventilated via a (primarily), passive ventilation system and will be housed in north-facing buildings utilising the site contours to best advantage.

A woodchip biomass boiler provides the main heat source for the new buildings. And a small micro-generation wind turbine will provide electricity to a new hi-tech science demonstration area.

A sustainable drainage system will contain rainwater on site to lessen the impact on mains drainage and help prevent flooding. This is designed to show students how water can be used as a teaching and learning tool through the use of ponds, channels and planting, as well as recycling of rainwater to use in flushing toilets.

Building and grounds

The school has been selected as a national demonstrator for sustainability and for science, and a display of the synergies of science and sustainability will be available in a hi-tech science theatre.

Students will build part of the proposed earth/science building. This will enable them to learn about a number of sustainable building techniques. These will include: using recycled timber and roofing materials; using straw bales, rammed earth and cob wall construction; and investigating how heat and electricity can be delivered from renewable sources.

The building will be a learning tool in construction and use. The sustainable drainage system, for instance, will provide a practical and very visual example of sustainability and science in action.



Inclusion and participation

As part of the college's award of national demonstration status for science, it will be required to actively communicate how science can be delivered in exciting and innovative ways, with the aim of increasing participation in GCSE and A level science subjects. One tool that will enable this is a new hi-tech demonstration area for renewable electricity and other sustainable technologies.

Internet technology will enable the college to expand current links with 13 feeder schools to help boost teaching and learning. Anyone with access to the internet can follow the progress of the construction via a web cam.

Local well-being

The college will provide a teaching and learning tool not only for students but also for the local area. The new facilities include floodlit pitches, a fitness suite, tennis courts, a cinema and a theatre, all of which will be available for public use. It is hoped that through these facilities, the school will become a focus for the whole community.

The building project, through the planned engagement with local trades people and businesses, aims to contribute to sustainable economic growth in the area.

4 How we did it

Key roles and responsibilities

The headteacher appointed a project manager, the new college co-ordinator, to manage the process. The governors' principal role was to consult and understand the viewpoints of community groups. The local authority and in particular, the client design adviser's role, was to ensure the team was focused. The architect and builders were also key. The project team were eager to learn from others' experiences and visited other PFI schools in the South West that have embedded sustainability into new build projects. As much as possible, the Sustainable Schools criteria were followed during the planning process.

In terms of finance, the Carbon Trust is providing a grant and has assisted with research into what it would cost to deliver sustainability. Through a local charitable trust, the Bridge Trust, a grant was received to enhance the construction of the main hall, with a stage and screen, which is capable of seating 350. Additional funding from the Department for Children, Schools and Families (DCSF) was granted in order to achieve national demonstrator of sustainability status and in particular to attain the project aims of BREEAM (Building Research Establishment Environmental Assessment Method) 'excellence' and Carbon Neutrality in operation along with additional DCSF money to assist in delivering bespoke facilities for science through Project Faraday.

The project team engaged the community and students from the outset. Students were consulted about the design of areas such as the toilets, recreational and sports areas, and on the landscaping.

The site itself provided a challenge in that it slopes with a rise of 23m rise in 200m across the site. The Centre for Energy and Environment at the University of Exeter has been an integral part of the design team, identifying how the buildings may make best use of natural light, heat capture, orientation and energy efficiencies.

Difficult decisions had to be made in order to meet Building Bulletin (BB) 98 guidance, in ensuring enough space for each occupant.

5 Leadership learning points

In order to ensure successful delivery of a sustainable school, the case of Bideford highlights some skills, knowledge and competencies leaders require:

- Building a vision, based on a clearly articulated aspiration
- Consulting others
- Creating capacity through distributive leadership, thus allowing the project to be 'managed' from within the school and design and new build to run alongside the day-to-day workings of the school, particularly where there are challenging circumstances or a significant agenda for improvement
- Ability to adapt in the face of challenges
- An outward-facing perspective
- Some knowledge of sustainability and the practical ways in which it can be implemented is essential, even if it is through selecting outside experts

Case study: Bristol Brunel Academy

The needs of the students were central to the design of Bristol Brunel Academy and the end result has certainly gained their favour. A ‘wall of wishes’ at the entrance includes ‘I wish more children could enjoy having a school like this’. The leadership challenges included: becoming part of the academy process midway, changes in leadership and the need for both strong prioritisation and project management to ensure delivery both on budget and on time.

1 Background

School type: secondary

Specialism: communications

Work type: new build

Procurement route: Bristol local education partnership (LEP) under BSF; LEP and Skanska are working on four schools in the area

School size: 1,080 students

Location: Bristol

Total value: £24 million

Completion date: 2007

Key team members

Head: Armando Di Finizio

Executive principal: David Carter (for both Bristol Brunel Academy and John Cabot school)

Director of finance

Architect: Wilkinson Eyre Architects

Construction: Skanska

Partnerships for Schools (PFS)

2 Aims

Bristol Brunel Academy, which replaced Speedwell Technology College, combines cutting-edge design, top ICT resources and world-class sport and leisure facilities. The school was keen to have a reputation for sustainability, and was built to BREEAM ‘very good’ standard.

3 Sustainability outcomes

This section highlights the main sustainability outcomes of the project and relates them directly to the eight ‘doorways’ of the Sustainable Schools National Framework.

Energy and water

The school makes extensive use of natural daylight and ventilation. It has a biomass boiler and uses rainwater tanks to flush the toilets. Flat screen televisions display energy and water use within the building.

Building and grounds

Visibility panels built into plant room walls and rainwater recycling facilities enable the building to be a learning resource for pupils, allowing teachers to easily incorporate sustainability into the curriculum.

The school has been designed to reduce opportunities for bullying with a central atrium or ‘street’ allowing passive supervision. Toilet facilities have been placed close to staffrooms and washrooms are open plan with the internal ‘street’.

The building has been designed to be both flexible and adaptable. With communications a speciality, design to allow wireless connectivity and spaces for access to the Managed Learning Environment was important.

Inclusion and participation

The wall of wishes, a public art installation showing pupil’s wishes, welcomes visitors to the school. Skanska held a number of workshops and briefings, allowing pupils to input into the design of the new school.

Local well-being

School open days, parents’ evenings and community meetings enabled the community to be involved in the design process. Skanska employed local labour on site. Dual-use leisure facilities will be available for community use.



4 How we did it

Key people and their responsibilities

The headteacher, Armando Di Finizio, and executive principal, David Carter, both arrived late on the process, once the project was up and running. Their main responsibilities were therefore managing the project and the transition from the old building to the new one.

The vision

The current leaders at Brunel highlight the original visioning process as key, despite only joining the school after the BSF process was well under way.

Prioritisation

During the BSF process, the school was earmarked to become an academy specialising in communications. This process lasted only eight months and had a profound impact on procurement and design. The leaders coped with this by prioritising the 'must-haves' and using strong project management, understanding that compromises needed to be made.

Good practice

The school leaders realised how important it was to be clear about aspirations and specification as early as possible. Visiting schools to get a feel for the buildings helped them to learn from those who gone through the process. An experienced director of finance with strong project management skills joined the school. The school leaders invested time in managing the relationship with Bristol LEP and the contractors.



5 Leadership learning points

In order to ensure successful delivery of a sustainable school, the case of Bristol Brunel Academy highlights a number of essential skills and actions:

- Developing a vision: a clear vision for teaching and learning is essential with sustainability as a key component
- Consulting others: learn from the experience of others and visit schools that have been through the process
- Futures-oriented: building in flexibility and adaptability is important
- Outward-facing: consulting the community and bringing them on board is essential
- Project managing: it is necessary to understand the principles and milestones, which might mean taking a more clinical look and prioritising as the project develops. All project team members need to be trained in project management

Case study: Queen Elizabeth's School

By making the eight 'doorways' of the Sustainable Schools National Framework central to their visioning process and consulting widely with students, Queen Elizabeth's School is on the way to building an exemplar school. Their challenge now is to manage the project successfully despite rising costs, to deliver on their aims.

1 Background

School type: secondary

Work type: new build on an existing site

Procurement route: One School Pathfinder

School size: 1,500 pupils

Location: Wimborne, Dorset

BSF Pathfinder proposal: November 2005

Start of design process: June 2006

Start on-site: July 2008

Completion date: due May 2010

Key team members

Head: Andy Puttock

School senior leadership group

Local authority: Dorset County Council

Project manager: Dorset County Council's Property Management Division

Concept architect: Fielden Clegg

Architect: Mouchel Parkman

2 Aims

Sustainability was one of four core elements that underpinned the development plan for the school. This focused on low energy design, renewables and developing a sustainability resource centre for use by the school and local community. The new school is being constructed alongside the existing (1950s) one.

3 Sustainability outcomes

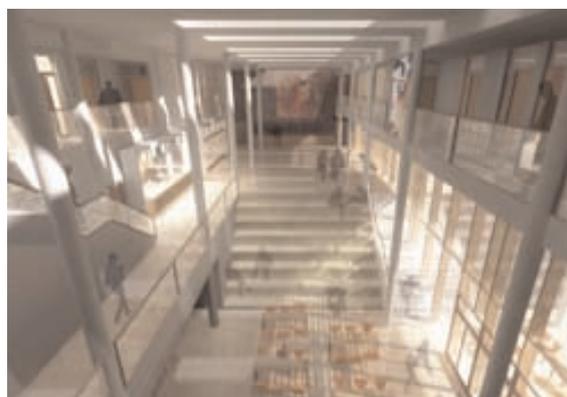
This section highlights the main sustainability outcomes of the project and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Energy and water

The site is aiming for a 95 per cent reduction in carbon emissions compared to average buildings. In addition, the school may export heat to other buildings nearby.

Travel and traffic

Access routes to encourage safe cycling are being investigated and the design team has already influenced local bus operators to adapt their routes to encourage and support community use of the building.



Purchasing and waste

There are possibilities for on-site composting as well as the demonstration of waste minimisation and recycling during construction. SITA are conducting a site waste audit. The segregation and storage of materials for recycling are being planned as well as opportunities for reuse and recycling of elements from the existing school, such as furniture.

Building and grounds

The school grounds will include varied landscapes and habitats to encourage biodiversity.

Inclusion and participation

The school leaders wanted every child to feel that they have contributed to the new school. The project team ran two festivals to consult students. The first was at the beginning of the visioning phase and the second during the project. This took the form of students forming small 'shadow' teams to mirror various stages/aspects of their school's design.

The high level of student consultation has meant that many aspects have been designed to serve pupils' needs. Particular focus will be on toilets and lockers, the restaurant, the grounds, provision of natural light and accessibility.

Local well-being

The project team aim to use local products. The local community will use the sustainability resource centre.

4 How we are doing it

Key people and their roles

The senior education officer, headteacher, pupil shadow team and project manager were all instrumental in developing the vision. The governors have taken on much of the responsibility for the project timetable and costing.

Developing the vision

The leadership team took a decision very early on that the principle of sustainability should be central to the whole life of the school. The vision for the school was assessed against the eight 'doorways', in the National Framework for Sustainable Schools. The leadership team had an aspiration for the school to be carbon neutral; however, a number of technical issues have been encountered which has affected this aspiration.

Whole life cycle assessment

Dorset County Council are looking to develop a whole life costing model for the school that would apply to all products used, for example ICT and biomass boilers. This modelling – which is a pioneering process for a council – should help in developing the business case for certain approaches.

Budget

Building and labour costs are significantly higher than projected, primarily due to the high demand for construction projects in the region. Maintaining the sustainability aspirations for the project has therefore been a constant challenge, which has demanded great commitment, including financially, from the school and county council.



5 Leadership learning points

In order to ensure successful delivery of a sustainable school, the case of Queen Elizabeth's School highlights a number of essential skills and actions:

- Futures-orientated: the vision is critical and the eight 'doorways' provide a powerful tool to develop a holistic approach; thinking long term and considering whole life costing issues
- Strong presence
- Perseverance: the challenge for the school's leadership is to stay committed to their original aspirations

Case study: Kingsdale School

The head, Steve Morrison, saw a direct link between physical infrastructure and educational achievement and was ahead of the BSF policy. The challenge he faced was to see his vision of a massive refurbishment through to reality and overcome funding obstacles along the way. The head's high expectations and attention to detail ensured a successful outcome.

1 Background

School type: secondary

Work type: re-model

Procurement route: funding from DfES (DCSF), local authority and Kingsdale School; investigating project to inform BSF

School size: designed for 1,200 (currently 1,100) students

Location: Dulwich

Phase 1: £12 million; refurbishment/development of designated areas of main building including central atrium, auditorium, main ICT suite, main library, first floor walkways, first floor

Phase 2: music school, sports hall, hospitality, catering and business studies suites, internet cafe, ground and second floors, external facades, all weather pitch and running track

Start date: 2002

Key team members

Head: Steve Morrison

Chair of governors: Norma Gibbes

Architects: Philip Marsh, Alex de Rijke, Sadie Morgan
of de Rijke Marsh Morgan, Architectural Foundation

Builders: Galliford Try

2 Aims

The aim of this build was to provoke a debate about the role of secondary school buildings in academic achievement. The project also explored how school buildings might have a direct relationship on school standards, shaping the possibility of teaching a curriculum that would equip pupils for the 21st century. There was also a plan to understand the less tangible but equally important, indirect effects of school buildings on the self-esteem, morale and pride of the pupils and staff who work within the school.



The project attempted to address how the school might create a sense of purpose and possibility among those who work there. It also wanted to create a sense of belonging and ownership among the community around the school, by working with them to agree how best to build, renovate and use school buildings in ways that might encourage life-long learning in the local area. At the heart of the project is a deep process of enquiry, which seeks to understand the inter-relationship between the structural and the social, thus improving attendance, behaviour and performance.

3 Sustainability outcomes

This section highlights the main sustainability outcomes of the project and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Energy and water

The courtyard provides central ventilation and is unheated. The roof makes full use of natural light.

Building and grounds

The refurbishment includes a covered atrium courtyard (which can house the whole school as well as provide space for break times), a pod-like auditorium and library. The courtyard is covered with the world's largest variable-skin ETFE (used in the Eden Project), light filtering, self-cleaning roof. Glass walkways replace corridors, cutting travel time between lessons. The use of translucent materials such as glass creates an environment based on passive surveillance and natural deterrence with consequential improvements in behaviour.

Inclusion and participation

A participatory approach was central to the design process. Good design and proper consultation with the students helped to make sure that they and their parents were proud of the final redesign.

The school build placed emphasis on the performing arts, which increased leverage to apply for a specialism in this area in 2002. Success improved access to specialist education and facilities for local children and residents.

Local well-being

Extensive research was conducted to discover the priorities for the local community. In this case it was the performing arts, and the pod-like auditorium was constructed with community use in mind.

4 How we did it

School building and behaviour

By the late 1990s, the 1950s-built school at Kingsdale was tired and run-down. After being placed under special measures in 1998, the incoming head looked at the effect of the building on behaviour, and conducted a time and motion study to identify problems areas. He found that 90 per cent of exclusions occurred in corridors when pupils were moving between classes.

Key roles and responsibilities

The headteacher worked hard to make sure he was informed of other refurbished schools' successes and hurdles. He ensured every aspect of new designs were examined in the light of effective learning space, for example the volume of noise created by rain on different roof coverings. Future maintenance costs were also included in this research to make sure the building was affordable in the long term.

Student voice

In the initial stages, students were asked what they would like and what would not they destroy and why. They were asked what they thought 'inspiring' and 'high quality' would look like. Answers that emerged included references to 'futuristic, ICT, mirrors and stainless steel'. Questionnaires were sent to other stakeholders such as parents, teachers and the surrounding community, to canvas views and experiences.

The research was properly resourced and took time. A project manager post was established within the school, in addition to the local authority project manager.



Relationship with the architect

The headteacher maintained control throughout the project and did not relinquish responsibility to the architect or hold back from critiquing their plans. The head's high expectations and attention to detail surprised the architects, but ensured a successful outcome.

Planning for change

The rate of change in technical aspects meant that decisions could become out of date quickly. In order to make sure this did not occur too soon and impact on the timeline, allowances were made in the plan to deal with deferred decision making that could incorporate future developments.

5 Leadership learning points

In order to ensure successful delivery of a sustainable school, the case of Kingsdale School highlights a number of essential skills and actions:

- Building a vision, which includes how the school will look and make people feel
- Confidence in own skills as a practitioner
- Delegating effectively while retaining control
- Building a team and ensuring clarity of roles and lines of communication
- Engaging key stakeholders: structure pupil consultation on design so that it empowers; giving them controlled choice, that is, choices have already been edited by school leaders
- Recognising that some conflict is inevitable and healthy
- Outward orientation: visiting other schools to talk to the users to learn from their experiences

Case study: Whitecross High School

Whitecross is a school with many leading sustainability features. The main challenge was to incorporate sustainability right at the start of the process. By continually championing sustainability, the head ensured that the new build stayed on the agenda. The adaptability of the building will ensure the school's changing needs are met well into the future.

1 Background

School type: secondary, comprehensive sports college

Work type: new build

Procurement route: private finance initiative (PFI) with collaborative procurement (partnering)

School size: 900 students aged 11–16 and over 100 staff

Location: Hereford

Site type: greenfield site

Construction value: £15 million

Design start date: May 2003

Construction start date: January 2005

Fully occupied: June 2006

Key team members

Head:	Denise Strutt
Local authority:	Richard East at Herefordshire County Council
Builders:	Richard Wakefield at Stepnell Ltd
Architects:	Haverstock Associates
Facilities management:	Integral

2 Aims

The brief required a highly energy efficient school – in the top 10 per cent of school buildings. The local authority commissioned three specialist reports on energy, water and materials, which were made available to the bidders. The successful scheme was fully priced to include life cycle, maintenance, cleaning and catering for a 25-year period. The consortium was awarded the project on the principles of value for money, quality of design and the way in which it met sustainability outcomes.



3 Sustainability outcomes

This section highlights the main sustainability outcomes of the project and relates them directly to the eight 'doorways' of the Sustainable Schools National Framework.

Energy and water

Water-saving measures, which were written into the PFI contract, included low usage toilet cisterns and self-closing taps.

An energy meter is installed in the entrance and information from it is used in lessons to educate pupils about sustainability. Planning permission has been obtained for a 15m tall wind turbine that will provide 10 per cent of energy needs.

Intelligent heating and lighting systems ensure 'as needed' heat and light.

Materials were sustainably sourced, for example the cedar cladding and non-vinyl flooring. Local sourcing of materials and labour was also important.

Building and grounds

Carpeted in sedum plants, the roof is able to absorb rainwater and reduce the amount of storm water discharged into the nearby brook. The covering also supports local birds and insects, improves humidity around the building and helps the school to blend into its environment. Having all services exposed so that students can see pipe work and cabling means students gain a better understanding of how the building works.

Inclusion and participation

The contractors liaised with the community during design and construction including open meetings, leafletting and a special website.

4 How we did it

Key roles and responsibilities

The head, Denise Strutt, was part of the project team and invested a large amount of time with the bidding team, working in partnership with the project manager from the local authority. Recommended actions from minutes had to be agreed with her and the LEA. She was involved in weekly meetings prior to the build, and fortnightly ones during construction. Financial aspects were generally handled by advisers. However, this involvement meant that the head was stretched to capacity. In retrospect, she would have liked the governors to have been aware of the time commitment and to have resourced an extra post within the school.



Writing the contract

The head was involved from day one in the PFI process. The school council, governors and the head wrote the bid for £21 million of PFI credit. The PFI contract was for 25 years. A specially created 'green team' researched commitments to sustainability – particularly water, energy and materials. This culminated in an outline specification and guidance paper for potential bidders, including targets but also extensive advice. Targets were set for water and energy usage with the aim of being in the top 10 per cent of schools. These were built into the PFI mechanism with the LEA undertaking the price risk, but the contractor retaining the risk on volume of use.



Design and construction

The successful bidder had the best design and credentials. The contractors took on the responsibility of liaising with the community during design and construction.

A key part of the success is working in close partnership with specialists to provide a total, managed solution that brings the benefits of 'best of breed' solutions to PFI initiatives.

Challenges

However, that is not to say the whole process went smoothly. The head did not realise the time commitment required and so did not make sufficient arrangements for the extra workload to be picked up. The builders were not the company responsible for facilities management, so the handover provided some problems.

Wider benefits for the school

The building is strongly linked with the school's vision and values, for example staff and students share the same entrance. A well-ventilated, well-lit space provides an effective learning environment. Ultimately, the adaptability of the building will ensure the school's changing needs are met well into the future.

5 Leadership learning points

In order to ensure successful delivery of a sustainable school, the case of Whitecross High School highlights a number of essential skills and actions:

- Futures-orientated: clearly articulate sustainability in the vision
- Strong presence: the head was always available to the team and attended meetings
- Communication skills: sending a consistent message to the contractors with clear sustainability requirements
- Perseverance
- Understanding complexity
- Integrity



Appendix 3: Survey questions

1. What position do you currently occupy?
2. What category of school is it?
3. What stage are you at currently in delivering a new or modified school building?
4. In delivering a sustainable school building, what strategic aspects do you think are most important? Please select your top three principles and explain your answers. (Multiple choice from a list of 16).
5. In delivering a sustainable school building, what operational aspects do you think are most important? Please select your top three considerations and explain your answers. (Multiple choice from a list of 22).
6. What environmental factors need to be considered in ensuring the learning environment is fit for the future?
7. What educational factors need to be considered in ensuring the learning environment is fit for the future?
8. Have you been/are you involved in a Building Schools for the Future (BSF) project?
9. Using the four generic stages in the BSF project process (developing a vision; developing a business case; planning and procurement; detailed design) please outline the key interventions you feel are needed to drive the delivery of a sustainable school building, for example, clear targets in outline specification, sustainability criteria and weightings in bidder evaluation, regular meetings about sustainability with the design team.
10. Please indicate who you think the key players are in delivering sustainable school buildings, and rate their importance.
11. For those that you have ticked 'key' and 'important', please comment on their role in the building of a sustainable school and the reasons why they are needed.
12. To be successful in delivering a sustainable school building, what core attitudes and skills should a school leader possess? Please select up to five that you feel are most important.
13. Please indicate your level of satisfaction with the sustainable elements of your school.
14. If you were to work on the sustainable schools building project again, what would you do, or see done, differently?

Appendix 4: English schools

UK schools		Management	Energy and CO2	Renewables	Ventilation	Light and daylight	Transport	Water	Materials	Waste and recycling	Land and ecology	Pollution	Inclusion & participation	Fair shares & employment
Academy of St Francis of Assisi	?	X	✓	✓	✓	✓	?	✓	X	?	✓	?	?	?
Bowbridge Primary	✓	X	X	X	?	?	?	X	X	?	?	?	✓	?
Coombes Infant and Nursery	?	X	X	X	?	?	?	X	X	?	?	?	?	?
Crispin School	?	X	X	X	?	?	?	X	X	?	?	?	?	?
Federation of Durham Community Business College	?	X	X	X	?	?	?	X	X	?	?	?	?	?
Fyndoune Community College	?	X	X	X	?	?	?	X	X	?	?	?	?	?
Glebe School	✓	X	X	X	?	?	?	X	X	?	?	?	X	?
Meare Village Primary	?	X	X	X	?	?	?	X	X	?	?	?	✓	?
Anns Grove Primary	?	?	X	X	✓	✓	?	X	X	?	?	?	?	?
Birchensale Middle (refurbishment)	X	X	X	X	?	✓	?	X	X	?	?	?	?	?
Bradley Stoke Community	X	✓	X	X	✓	✓	✓	X	X	?	✓	?	?	?
Brenzett Church of England Primary	?	?	X	X	✓	✓	?	✓	✓	?	?	?	?	?
Kingsmead Primary	X	✓	X	X	✓	✓	✓	✓	✓	?	?	?	?	?
Notley Green Primary	X	X	X	✓	✓	✓	?	X	✓	?	?	✓	?	?
Oakgrove Secondary	X	✓	X	✓	✓	✓	✓	X	✓	?	✓	✓	✓	?
Riverhead Infants	X	✓	X	✓	✓	✓	✓	X	X	?	?	?	?	?
Venerable Bede Secondary	X	✓	X	✓	✓	✓	?	X	X	?	?	X	?	?
Webley Primary	?	X	✓	✓	?	✓	?	X	✓	?	✓	?	?	?

Key: ✓ = Achieved the principle
 X = Did not address this in the building
 ? = No evidence available

Appendix 5: Overseas schools

From a literature search, four schools known to be active in the field of sustainability were chosen from four countries of continental Europe: Germany, Denmark, France and Norway. These are shown here in a table listing the same sustainability criteria as those used in our table of English schools.

Overseas schools				
Stuttgart-Plieningen Secondary, Germany (refurbishment)	?	✓	✗	Management
Enghøjsskolen, Hvidovre, Denmark (refurbishment)	?	✓	✗	Energy and CO2
Gambetta Professional High School, France (refurbishment)	?	✓	✗	Renewables
Kampden (Primary) School, Norway (refurbishment)	?	✓	✗	Ventilation
	✓	✓	✓	Light and daylight
	?	?	?	Transport
	✗	✗	✗	Water
	✗	✗	✗	Materials
	?	?	?	Waste and recycling
	?	?	?	Land and ecology
	?	✓	?	Pollution
	?	?	?	Inclusion & participation
	?	?	?	Fair shares & employment

Key: ✓ = Achieved the principle
 ✗ = Did not address this in the building
 ? = No evidence available

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