

# 21st Century Schools and Education Funding Programme

Guides to making your 21st Century Schools and educational  
facilities sustainable



## Guidance

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# 21st Century Schools and Education Funding Programme

## **Audience**

The education sector and the building industry.

## **Overview**

This best practice guidance aims to assist the education sector and the building industry in driving continual improvement and greater value for money throughout the 21st Century Schools and Education Funding Programme. It provides an overview of the key considerations for good design quality, building and energy performance plus sustainable outcomes that can be maximised for added value.

## **Action required**

None – for information only.

## **Further information**

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## **Additional copies**

This document can be accessed from the Welsh Government's website at

<http://21stcenturyschools.org/?lang=en>

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## Introduction

Welsh Government has commissioned Constructing Excellence in Wales (CEW) to develop a series of best practice guides to drive continual improvement and greater value throughout the 21<sup>st</sup> Century Schools and Education Programme. The four chapters outline advice on the following:

### **Building Research Establishment Environmental Assessment Method (BREEAM)**

This certification is a 21<sup>st</sup> Century School and Education Programme funding requirement: “all new schools and those requiring significant re-modelling meet appropriate standards for their build, including BREEAM ‘excellent’ and an Energy Performance Certificate (EPC) rating of ‘A’.”<sup>1</sup>

Feedback has been taken from a variety of projects delivered to-date through Band A that completed BREEAM 2008 and 2011 assessments, to hear how teams succeeded or struggled in securing a BREEAM excellent rating. BREEAM assessors and accredited professionals have also canvassed for their advice for BREEAM 2014. This guide presents a credit-by-credit set of suggestions as well as useful references and organisations to help your team give early and timely consideration to the BREEAM certification process.

### **Climate Change readiness**

In undertaking an investment in our built environment, it is critical that the industry now make efforts to assess a project’s climate change readiness. A variety of new build, refurbishment and extension projects in Band A have been reviewed to assess what consideration client and design teams had given to climate change. The findings have been incorporated into this guide, along with useful references and pertinent questions to discuss with your design team and contractors.

### **Community and out of hours use**

Whether your 21<sup>st</sup> Century School and Education project is a new build, extension or refurbishment, it is worth giving serious consideration to the opportunities for your building to generate an income and benefit in other ways from community use. This guide outlines how to manage out of hour lettings, what management teams may wish to consider prior to implementing any lettings; as well as useful references and links to organisations who can help.

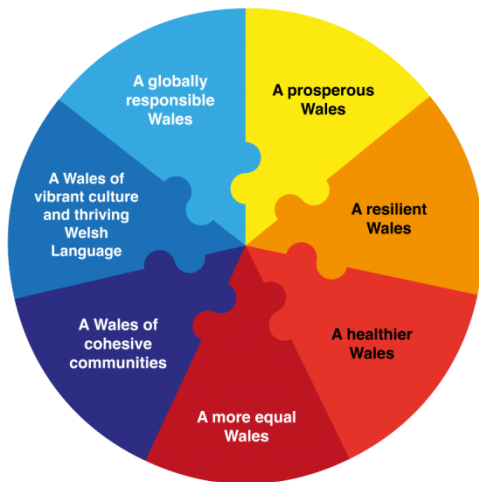
### **Building performance - avoiding rising energy costs**

Whilst your new or refurbished building design will seek to be energy efficient and low maintenance, increasingly evidence is pointing towards an ever increasing “performance gap” between the design intent for a building and the actual operation when the building becomes occupied. This can mean that energy bills are higher than anticipated and remedial works have to be undertaken. This performance gap issue is not restricted to the education sector and there are useful processes and prompts

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<sup>1</sup> Page 48, Energy Efficiency in Wales, Feb. 2016 <http://gov.wales/docs/desh/publications/160223-energy-efficiency-in-wales-en.pdf>

presented in the guide to help you discuss this issue with your design team and contractors.



Through the guides we hope that you will be able to identify ways that your project can support your commitment to the seven goals of the [Wellbeing Future Generations Act 2015](#)

The Act aims to improve the social, economic, environmental and cultural well-being of Wales. Welsh Government have developed a series of resources to help introduce the act:

A [short animation](#) explaining the positive impact the Well-being of Future Generations Act will have; and a short guide 'The [Essentials](#)' which outlines the seven wellbeing goals

This Act is a key framework to the 21<sup>st</sup> Century School and Education Programme

We are keen to expand the 21<sup>st</sup> Century Schools and Education Programme best practice guides collection, if you feel there are other topics which should be considered, then please contact the team at [21stcenturyschools@gov.wales](mailto:21stcenturyschools@gov.wales)

## **BREEAM 2014**

This guide provides all members of the project team (whether a head teacher, designer or facilities manager) with an introduction to BREEAM 2014 and what opportunities the scheme can provide to help your team. Such as:

- Consulting and discussing the building and site's design at key stages;
- Ensuring a sustainable design, appropriate to your community's needs;
- Discussing operational costs as part of your design reviews; and
- Achieving the necessary BREEAM score as part of your projects funding requirements as cost effectively as possible.

### **What is BREEAM?**

BREEAM is a leading sustainability assessment method for master-planning projects, infrastructure and buildings. It is possible to complete a BREEAM assessment for a building that is a new construction, refurbishment or already in-use. The BREEAM assessment process evaluates the procurement, design, construction and operation of a development against targets that are based on performance benchmarks. Assessments are carried out by independent, licensed assessors and developments rated and certified on a scale of Pass, Good, Very Good, Excellent and Outstanding.

The requirements for projects receiving funding from Welsh Government are:

- New buildings with floor area between 250m<sup>2</sup> to 1000m<sup>2</sup> will require Part L+10%.
- -New buildings with floor area between 1000m<sup>2</sup> to 2000m<sup>2</sup> will require BREEAM 'Very Good' (with 'Excellent' for Energy Credits -ENE01).
- -New buildings with floor area over 2000m<sup>2</sup> will require BREEAM 'Excellent'.

The BREEAM process awards credits in weighted topics. The topic weighting means that, for example, securing one credit in management is not worth the same as one credit in energy. The BREEAM topics are shown below, weights indicated are for a fully fitted out new-build assessment:

- Management (12%)
- Health & Wellbeing (15%)
- Energy (15%)
- Transport (9%)
- Water (7%)
- Materials (13.5%)
- Waste (8.5%)
- Land use and Ecology (10%)
- Pollution (10%)
- Innovation (10%).

The 21<sup>st</sup> Century Schools and Education Programme is currently utilising BREEAM 2014, which has significant changes to credit evidencing and procedures with BRE –

Environmental Assessment Method, compared with BREEAM 2008 and 2011 assessments. We are aware that there have been changes, which we are flexibly including in our programme.

The current policy requirements for non domestic buildings are based on floor area: - [Sustainable Building Standards](#)

<b>Building floor area</b>	<b>Policy Requirement</b>
<=250m <sup>2</sup>	Exempt
251-1,000m <sup>2</sup>	No BREEAM Required Part L+10%* Required
1001-2000m <sup>2</sup>	BREEAM 'Very Good' With 'Excellent' for Energy Credits (ENE01)
2001+m <sup>2</sup>	BREEAM 'Excellent'

The Welsh Government's [Planning for Sustainable Buildings](#) – Practice Guidance is also a useful resource that complements BREEAM.

## Examples of management credits

The management section seeks to ensure best practice in terms of the projects design, construction, commissioning, handover and aftercare. Many of these credits can help your project run smoothly and are worthwhile as they will help guide discussions with your design team and the contractors who will be building your new facilities.

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Man 01	Project brief and design	4	Stakeholder consultation covering project delivery and relevant third parties.	<p>Conducting stakeholder consultation with a variety of users of the new facilities will help to inform your design. Develop a stakeholder list at the earliest opportunity and a “schedule of proposed consultation”. BRE will require registers and documents to evidence who has been consulted and how. At the start of your project, work up a list of all the groups you wish to consult with and a strategy for how this will be carried out and recorded. Include groups such as procurement, furniture, fixtures and equipment (FF&amp;E) and Information, Communications Technology (ICT) so you understand whether assets will be moved into or be replaced in new facilities.</p> <p>Appointing a BREEAM Accredited Professional (AP) will also help guide the BREEAM assessment and approaches to sustainable design.</p>
			Sustainability champion appointed to facilitate the setting, monitoring and achievement of BREEAM performance target(s) for the project.	
Man 02	Life cycle cost and service life planning	4	Recognising and encouraging the use of life cycle costing and service life planning and the sharing of data to raise awareness and understanding.	The lifecycle costing required by BREEAM can be onerous but are beneficial if completed at the beginning of a project, revised frequently and used to inform decision-making processes. Otherwise, the exercise can remain un-

				used/have a limited impact on the project. The capital costing report (1 credit) can be secured by most projects.
Man 03	Responsible construction practices	6	The principal contractor demonstrates sound environmental management practices and consideration for neighbours across their activities on-site.	A minimum of two credits should be achieved here through the <a href="#">Considerate Contractors Scheme</a> .  Be sure to document any site visits that your education facilities undertake, with learners monitoring the site progress and taking part in consultation.  Innovation credits may be achievable, so review these on a site-by-site basis.
			Site related energy, water and transport impacts are monitored and reported to ensure ongoing compliance during the Construction, Handover and Close Out stages and to improve awareness and understanding for future projects.	
Man 04	Commissioning and handover	4	Schedule of commissioning including optimal timescales and appropriate testing and commissioning of all building services systems and building fabric in line with best practice.	At least two credits should be secured here, with all four credits being targeted. Following the criteria of these credits will help reduce the performance gap of the building (the gap between designed energy use and actual energy use) and ensure that you are aware of how to correctly operate any building services and other systems installed. As a minimum, the school's head teacher and caretaker, or further education equivalent, should be involved with these activities so that they understand how the building services should operate. You should also check that what you want to know is included within the Building User Guide (BUG) that will be created by the team in line with BREEAM requirements.
			Inspecting, testing, identifying and rectifying defects via an appropriate method.	
			Provision of a non-technical Building User Guide and user/operator training timed appropriately around handover and proposed occupation.	

				The <a href="#">Government Soft Landings</a> approach could also help with this work.
Man 05	Aftercare	3	<p>Provision of the necessary infrastructure and resources to provide aftercare support to the building occupier(s).</p> <p>Seasonal commissioning activities will be completed over a minimum 12-month period, once the building becomes substantially occupied.</p> <p>The client or building occupier commit to carrying out a post occupancy evaluation (POE) exercise one year after initial building occupation and to disseminate the findings in terms of the building's post occupancy performance.</p>	<p>All three credits should be targeted (alongside those in Man 04) as these will also help with the handover process and ensuring the building operates as anticipated. You can find out more about the anticipated operating costs for your project by using the <a href="#">CarbonBuzz</a> platform (CarbonBuzz is a Royal Institute of British Architects (RIBA) and Chartered Institute of Building Services Engineers (CIBSE) platform for benchmarking and tracking energy use in projects from design to operation. The platform allows users to compare design energy use with actual energy use, side by side to help users close the design and operational energy performance gap in buildings).</p> <p>The 21st Century Schools and Education Programme project completion surveys monitors projects for their first five years of operation will also assist with achieving these credits. Following the completion of post occupancy evaluation (POE) workshops, an action plan should be drawn up to make any changes or improvements necessary.</p>

### Examples of health and well-being credits

This section enables the designers to consider how occupants will experience the new accommodation, to ensure that the teaching environment is comfortable, safe and provides a healthy place to work and study.

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Hea 01	Visual comfort	Up to 6 (but 5 credits max for education)	Potential for disabling glare has been designed out of all relevant building areas.	The decision to purchase blinds will depend on the location of classrooms and building orientation. Other design features may overcome glare in a more cost effective manner.
			Good practice daylighting levels have been met.	Maximising natural daylight is important, but the credit criteria are extremely vigorous and will require you to revisit compliance as the design develops.
			Floor space in relevant building areas has an adequate view out to reduce eyestrain and provide a link to the outside.	Depending on the size of your project, this credit may not be achievable for all schemes.
			Internal and external lighting systems are designed to avoid flicker and provide appropriate illuminance (lux) levels.	The requirements of these credits should be incorporated into your client's brief as the details ensure your lighting design uses best practice as well as being zoned and controlled appropriately.
			Internal lighting is zoned to allow for occupant control.	
Hea 2	Indoor air quality	5	Minimising sources of air pollution through careful design specification and planning.	This credit can prompt discussion around specific room location and sources of pollutants. Some sites will restrict a project's viability to achieve this credit.
			Building ventilation strategy is designed to be flexible and adaptable to potential future building occupant needs and climatic scenarios.	Thermal modelling undertaken by your design team will test how the new accommodation will perform in summertime conditions with current and future weather files, appropriate for your site location.
			Innovation credits - two additional credits minimising volatile organic compound (VOCs) further	Aspirational credits, which may be achievable depending on the materials and finishes, selected.

Hea 03	Safe containment in laboratories	2	Production of an objective risk assessment of the proposed laboratory facilities.	Through consultation, determine how many and what sort of labs are required and what equipment could be transferred to the new/refurbished accommodation. Where new science labs are to be installed, these credits should be incorporated within your brief. For refurbishment projects, the credit requirements should be reviewed to see if the credits can be achieved.
			Containment devices such as fume cupboards meet best practice safety and performance requirements and objectives.	
			Containment level 2 and 3 laboratory facilities to meet best practice safety and performance criteria where specified.	
Hea 04	Thermal comfort	3	Thermal modelling carried out to appropriate standards.	All three credits should be achievable for most schemes. Thermal modelling undertaken by your design team will test how the new accommodation will perform in summertime conditions with current and future weather files, appropriate for your site location.
			Projected climate change scenario(s) considered as part of the thermal model.	
			The thermal modelling analysis has informed the temperature control strategy for the building and its users.	
Hea 05	Acoustic performance	up to 3 credits	The building meets appropriate acoustic performance standards and testing requirements in terms of:	Does your project have any specific acoustic design requirements? For example, open plan teaching areas, Special Educational Needs (SEN) pupils, and specialist areas such as performing arts that the design team should be aware of. The client team should ensure that an acoustician is appointed at an early stage so that they are able to help review the site selected and inform the building design as it develops.
			Sound insulation	
			Indoor ambient noise level	
			Reverberation times	

Hea 06	Safety and security	2	Provision of effective measures that support safe access to and from the building.	<p>Reviewing the requirements for this credit as elements (such as locations of bins to reduce risk of arson) may be of use to your design. To ensure safe access, review a site plan layout and mark-up routes for pedestrians, cyclists, cars and deliveries. <a href="#">Sustrans</a> have a number of design resources that may help and a BREEAM assessor can also help you review the credit criteria for safe access.</p> <p>Some elements and evidence required for the Building Research Establishment (BRE) criteria may not be suitable for all projects, depending on input from your Police Architectural Liaison Officer (ALO).</p>
			Security needs are understood and taken into account in the design and specification.	

## Examples of energy credits

This section encourages the specification and design of energy efficient building solutions, systems and equipment. Credits seek to improve the inherent energy efficiency of the building, encourage the reduction of carbon emissions and support efficient management through the operational phase of the building's life.

Recent legislative changes mean that these energy credits should be considered within this new legal framework:

The [Environment Act](#): requires the Cabinet Secretary for Education to report on carbon emissions created by the built environment estate within their portfolio.

In February 2016, Welsh Government launched the [Energy Efficiency Strategy for Wales](#). This outlines the Government's commitment and sources of support to improve and refurbish existing buildings to reduce carbon emissions.

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Ene 01	Reduction of energy use and carbon emissions	12	Recognise improvements in the energy performance of the building above national building regulations in relation to heating and cooling energy demand, primary energy consumption and carbon dioxide emissions.	5 credits are mandatory for an excellent rating and your project should seek to achieve the maximum credits viable for your project. Targeting 7 credits would be reasonable for most schemes. Achieving 12 out of 12 credits would require a building to have a significantly reduced energy demand and zero net regulated carbon emissions, meaning that all building services (heating, cooling, hot water and lighting) would need to be generated from on-site renewables. The innovation credits require further use of renewable technologies to provide sufficient energy for "unregulated" use for ICT, lifts, science labs and other occupier controlled devices.
			Encouraging steps taken to reduce energy demand through building design and systems specification.	
			Innovation credits - 4 for zero regulated carbon, 5 credits for carbon negative	
Ene 02	Energy monitoring	2	Energy metering systems are installed to enable energy consumption to be assigned to end uses.	This 1 credit (sub-metering) is mandatory for a rating of excellent and should be specified for all projects. Through consultation, determine what

				<p>you would like to do with this data and how this could be used as an educational resource. Consultation will also help you determine what sub-metering may be needed to monitor community use.</p>
			<p>Sub-meters are provided for high-energy load and tenancy areas.</p>	<p>This second credit is not applicable to primary schools, but should be specified on all larger schemes where sub-metering could aid energy use once the school becomes occupied. Consider what is relevant and useful to be monitored at your school or educational building, and what use you can make of the data.</p>
Ene 03	External lighting	1	<p>Specification of energy efficient light fittings for external areas of the development and controls to prevent use during daylight hours or when not needed.</p>	<p>Energy efficient lighting and controls should be specified, this will provide operational savings at minimal capital cost increase.</p>
Ene 04	Low carbon design	3	<p>Analysis of the proposed building design/development is undertaken to identify opportunities for and encourage the adoption of passive design solutions, including free cooling.</p>	<p>All projects should be starting with passive design principles. More information on this is available within chapter 5 of <a href="#">Planning for Sustainable Buildings Guidance</a>. Request clarification from your project team that passive design principles have been applied.</p>
			<p>A feasibility study has been carried out to establish the most appropriate on-site/near-site low or zero carbon (LZC) energy source(s) for the building/development and is specified.</p>	<p>Your project may need renewable energy systems to pass building regulations. You should discuss this with your designers at an early stage so that they understand what technologies are acceptable to you and for your site. There is sufficient knowledge within the industry now to best advise client teams on LZC technologies. This report should not be an additional cost to the project but integrated</p>

				within design delivery.
Ene 05	Energy efficient cold storage	Credits may not be applicable to your education buildings		
Ene 06	Energy efficient transportation systems	3	<p>An analysis of the transport demand and usage patterns is undertaken to determine the optimum number and size of lifts, escalators and/or moving walks.</p> <p>Energy efficient installations are specified.</p>	Where applicable, the requirements of these credits should be specified. They ensure that the lifts selected are in line with end-user requirements. Energy efficient specification provides operational savings.
Ene 07	Energy efficient laboratory systems	5	<p>Client engagement to determine occupant requirements and define laboratory performance criteria to optimise energy demand of the laboratory facilities.</p> <p>Specification of best practice energy efficient equipment and measures as appropriate.</p>	These credits are only applicable to secondary schools that are having new laboratory facilities installed. Through consultation determine how many and what sort of labs are required and what equipment could be transferred to the new/refurbished accommodation.
Ene 08	Energy efficient equipment	2	Identification of the building's unregulated energy consuming loads that have a major impact on the total unregulated energy demand.	As the energy demand of building services reduces, the unregulated energy use of occupant devices (e.g. small power equipment such as PCs, tablets) becomes increasingly important. Clients should make use of the guidance provided within CIBSE <a href="#">TM54 Evaluating Operational Energy Performance of Buildings at Design Stage</a> and utilise this methodology as evidence for BREEAM. Through consultation you can complete an

			<p>Demonstrate a meaningful reduction in the total unregulated energy demand of the building.</p>	<p>FF&amp;E audit. This will help determine what equipment will be transferred and what will be provided as new equipment. Early engagement with catering contractors is also advisable. The energy consumption of a kitchen can become a significant element of the building. The guidance in CIBSE <a href="#">TM50 Energy Efficiency in Commercial Kitchens</a> can help frame discussions between the various parties and provide evidence for BRE's credit criteria.</p>
Ene 09	Drying space	Credit not applicable to education buildings		

## Examples of transport credits

This section encourages better access to sustainable means of transport for building users to reduce traffic congestion and CO<sub>2</sub> emissions associated with travel to and from the site over the lifetime of the building.

Achieving credits within the transport section will largely be determined by the site selected for the new building or the existing site being extended/refurbished. The credits below may therefore not always be possible, practical or cost effective. That said, there are plenty of resources to support your project team in demonstrating a consideration of active travel, with more information available from:

Welsh Government's [Active Travel Act](#) and their [Active Travel Action Plan](#) (2016) both outline how active travel routes are to be provided and improved across Wales.

The charity "Sustrans Cymru" has a number of useful resources for schools as part of their [support for schools](#) and include their advice to [transform school travel](#).

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Tra 01	Public transport accessibility	Up to 3 credits (+1 credit)	Recognition for developments in proximity to good public transport networks, thereby helping to reduce transport-related pollution and congestion.	Up to 3 credits awarded depending on the score your site achieves on BRE's accessibility index. One additional credit is available for a dedicated bus service.
Tra 02	Proximity to amenities	1 credit	Recognition of developments in close proximity of, and accessible to, local amenities that are likely to be frequently required and used by building occupants.	
Tra 03	Cyclist facilities	Up to 2 credits	Provision of compliant cycle storage spaces and facilities to encourage safe and healthy cycling	In addition to the BREEAM criteria, it is recommended that you review the Welsh Government's <a href="#">Active Travel design guide</a> also.

Tra 04	Maximum car parking capacity	Credit not applicable to education buildings		
Tra 05	Travel plan	1	To promote sustainable reductions in transport burdens by undertaking a site-specific travel assessment/statement and developing a travel plan based on the needs of the particular site.	As part of your consultation work, complete a transport assessment to determine where your staff and pupil's currently travel to school and how that may change at the new site/building. Accessibility and disability access needs should also be incorporated into your review. Think about how your travel plan will be used and implemented during the operation of your building. It should remain a live policy and be reviewed annually.

## Examples of water credits

This section encourages sustainable water use, reducing the demand on potable water within the operation of the building over its lifetime.

Welsh Government has a number of strategies that need to be considered alongside the requirements of the following BREEAM credit: In August 2015, the [Water strategy for Wales](#) was launched and outlines aspirations for the next 20 years.

The Government's standards for Sustainable Urban Drainage are available [here](#).

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Wat 01	Water consumption	5	<p>Reducing the demand for potable water through the provision of efficient sanitary fitting, rainwater collection and water recycling systems</p> <p>Innovation credit - exemplary performance 65% savings</p>	<p>The requirements for this credit should be discussed with the staff, caretaker and estates team to ensure that suitable water-efficient equipment is being selected. Discuss also whether you would like rainwater harvesting to be used and if it is suitable for your site and building.</p> <p>1 credit is mandatory to achieve an excellent rating but projects should achieve at least 3 credits here.</p>
Wat 02	Water monitoring	1	<p>Specification of a water meter/s on the mains water supply to encourage water consumption management and monitoring to reduce the impacts of inefficiencies and leakage.</p>	<p>Mandatory criteria for excellent and also enables monitoring of water use. This can also be used to create educational resource for the school curriculum.</p>
Wat 03	Water leak detection	2	<p>Recognition of leak detection systems capable of detecting a major water leak on the mains water supply</p>	<p>This credit offers operational savings over the lifetime of an educational building. The leak detection system specified should be reviewed by your site caretaker and estates team to ensure you are satisfied with the system being</p>

			Flow control devices that regulate the supply of water to each WC area/facility to reduce water wastage.	installed.
Wat 04	Water efficient equipment	1	Identify a building's total unregulated water demand and mitigate or reduce consumption through systems and/or processes.	Selecting water efficient equipment ensures water efficiency (and associated energy) is considered in unregulated water use. This credit should be discussed with your catering specialist as part of your discussion on credit Ene 08. A strategy for irrigation (provision, no provision or rainwater harvesting to be used) should be discussed with your design team and facilities team.

## Examples of materials credits

This section encourages steps to be taken to reduce the impact of construction materials through design, construction, maintenance and repair. The credits focus on the procurement of materials, sourcing in a responsible way and having a low embodied impact over their life including extraction, processing and manufacture and recycling.

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Mat 01	Life cycle impacts	Up to 6	<p>Reductions in the building's environmental life cycle impacts through assessment of the main building elements.</p> <p>Innovation credits - Green Guide Specification and Life cycle assessments</p>	This credit requires a design team meeting at an early stage. A minimum of 3 credits should be targeted initially and is within reach of most projects.
Mat 02	Hard landscaping and boundary protection	1	Reductions in the environmental life cycle impacts through assessment of the hard landscaping and boundary protection elements.	The requirements for this credit are straightforward and should be specified.
Mat 03	Responsible sourcing of materials	4	<p>Materials sourced in accordance with a sustainable procurement plan.</p> <p>Key building materials are responsibly sourced to reduce environmental and socio-economic impacts.</p> <p>Innovation credit - where 70% of the available reasonably sourced material credits are achieved</p>	A procurement plan/report should be developed and a minimum of one credit achieved for responsible sourcing of materials. The BRE's <a href="#">Green Guide to Specification</a> can help you review materials.
Mat 04	Insulation	1	Recognition of the use of thermal insulation that has a low embodied environmental impact relative to its thermal properties.	This credit should be specified and is achievable at little additional cost. Consideration should be given to materials used and their impact upon the environmental lifecycle. E.g., some materials have legacy impacts beyond the life of a building.

Mat 05	Designing for durability and resilience	1	<p>The building incorporates measures to reduce impacts associated with damage and wear-and-tear.</p> <p>Relevant building elements incorporate appropriate design and specification measures to limit material degradation due to environmental factors.</p>	<p>This credit should be discussed in a workshop with credit Mat 01. The project architect should inform material selection and assess for resilience in future climates as well. Consultation with your staff and caretaker could help inform this credit. Think about what finishes you would like? What maintenance regime do you want? What areas need protection from pupils? Consider this for both internal and external elements of your building. Consideration should be given to the end of life impacts as well as <a href="#">Design for deconstruction</a>.</p>
Mat 06	Material efficiency	1	<p>Opportunities and measures have been identified and taken to optimise the use of materials.</p>	<p>This credit needs to be discussed at the earliest project stage. More information on how to design out waste is available from Waste and Resources Action Programme (WRAP) <a href="#">here</a> and Construction Excellence in Wales (CEW) <a href="#">here</a>. Evidence is required for each design stage, so it is possible to determine what efficiency has been possible.</p>

## Examples of waste credits

The waste section encourages sustainable management of construction, operational waste and waste through future maintenance and repairs associated with the building structure. This section also seeks to reduce future waste as result of the need to alter the building in the future for a different use and in response to future changes in climate.

More information on Welsh Government's 'Towards zero waste' strategy is available [here](#).

For more information on managing construction waste, designing for deconstruction and support to help your project manage construction waste click [here](#).

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Wst 01	Construction waste management	4	Development of a construction resource management plan.	<p>These credits should be discussed during the materials workshop. Projects should aim to secure a minimum of 2 credits.</p> <p>To support your team you may wish to refer to Welsh Government's <a href="#">Voluntary Code of Practice Site Waste Management Plan</a></p> <p>The Construction and Demolition sector needs to reduce waste by 1.4% (of the 2007 baseline) each year to achieve the one planet goal for 2050. The industry should be mindful of previous projects and ensure that your project is using best practice techniques. Welsh Government has the target of zero waste to landfill (excluding asbestos) by 2050.</p>
			Reducing construction waste related to on-site construction and off-site manufacture/fabrication.	
			Diverting non-hazardous construction (on-site and dedicated off-site manufacture/fabrication), demolition and excavation waste (where applicable) generated by the project from landfill.	
			Innovation credit - exemplary level of diversion from landfill achieved	

Wst 02	Recycled aggregates	1	Percentage levels of recycled or secondary aggregate specified against set targets.	<p>The criteria for this credit should be reviewed at an early stage, as grant conditions require that in all new buildings at least 10% of the total value of materials used should be recycled or reused materials or products.</p> <p>Guidance Recycled Aggregate for Minor Schemes (RAMS) Specification  <a href="http://www.cewales.org.uk/files/8814/4370/1170/specification.pdf">http://www.cewales.org.uk/files/8814/4370/1170/specification.pdf</a>  <a href="http://www.cewales.org.uk/current-programme/waste-archive/">http://www.cewales.org.uk/current-programme/waste-archive/</a></p> <p>WRAP have published a <a href="#">procurement guide</a> and have identified a number of quick wins.</p>
			Innovation credit - exemplary level of recycled content used	
Wst 03	Operational waste	1	Provision of suitable space and facilities to allow for segregation and storage of operational recyclable waste volumes generated by the assessed building/unit, its occupant(s) and activities.	<p>This credit should be discussed during consultation. What are your current recycling and waste policies? How would you like these facilities provided in your new/refurbished school? Who will be managing waste from your school and does this effect how you separate waste? How would you like to link your waste and recycling rates into your curriculum? This credit can be specified and the requirements incorporated into the project design.</p>
Wst 04	Speculative floor and ceiling finishes	Credits not applicable to education buildings		
Wst 05	Adaptation to climate change	1	Encourage consideration and implementation of measures to mitigate the impact of more extreme weather conditions arising from climate change over the lifespan of the building.	<p>A specific workshop on climate change and the potential risks and impacts it may have on the site and building should be held with all the design team and client representatives.</p> <p>The innovation credit can be secured, so long as</p>

			Innovation credit - requires other credits to be achieved ensuring adaptation possible.	the following credits have also been achieved: Hea 04 Thermal comfort, Ene 01 Reduction in energy, Ene 04 Low carbon design, Wat 01 Water consumption, Mat 05 Designing for durability and resilience and Pol 03 Surface water run-off.
Wst 06	Functional adaptability	1	Encourage consideration and implementation of measures to accommodate future changes to the use of the building and its systems over its lifespan.	This credit should be discussed through consultation. For example, are you providing flexibility for changes in teaching methods, break out areas, out of hours/community use? This credit can be evidenced by a set of marked up drawings indicating how the building could be adapted if required in the future. For example, Wi-Fi will provide more flexibility for future changes than hard wiring in ICT provision.

## Examples of land use and ecology credits

The land use and ecology credits encourages sustainable land use, habitat protection and creation and improvement of long term biodiversity for the building's site and surrounding land.

The Wildlife Trust Wales provides guidance on green infrastructure within a site and building which could assist with securing credits within this section, copies of their guidance is available [here](#). The following organisations could also help provide design advice:

[EcoSchools Wales](#)

[Forest School Wales](#)

Royal Society for Prevention of Cruelty to Birds ([RSPB](#)).

Credit	Issue name	Credits	Credit summary	Guidance for client teams
LE01	Site selection	2	Recognition of the reuse of previously developed and contaminated land where appropriate remediation has taken place.	The land use and ecology credits available to a project will vary greatly depending on the site chosen and its current ecological value. Through consultation you should determine what external teaching spaces you would like, what habitats you can maintain and what is currently used within your curriculum? Can pupils and staff assist in developing the landscape design? The client team should appoint an ecologist at the earliest opportunity to help inform decisions on site selection (if possible), building location on site, minimising impact and in the long-term biodiversity plan for the educational establishment
LE02	Ecological value of site and protection of ecological features	2	Recognition of the use of sites of 'low ecological value', and the protection of existing features prior to and during site operations.	
LE03	Minimising impact on existing site ecology	2	Recognition of steps taken to avoid impacts on existing site ecology.	
LE04	Minimising impact on existing site ecology	2	Recognition of steps taken to avoid impacts on existing site ecology.	
LE05	Long term impact on biodiversity	2	The production of a long-term landscape and habitat management plan to encourage measures that improve the sites long-term biodiversity.	

				and site.
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## Examples of pollution credits

This section assesses the prevention and control of pollution and surface water run-off associated with the building's location and use. The aim is to reduce the building's impact on surrounding communities and environments arising from light pollution, noise, flooding and emissions to air, land and water.

Credit	Issue name	Credits	Credit summary	Guidance for client teams
Pol01	Impact of refrigerants	3	Avoidance or reduction of the impact of refrigerants through specification and leak prevention/detection.	It is possible to achieve all three credits by designing out the need for cooling. One credit should be achieved, the additional credits may be achievable depending on the leak detection system specified and installed.
Pol02	NO <sub>x</sub> emissions	Up to 3	Reduction in emissions of Nitrous-oxides (NO <sub>x</sub> ) arising from the building's space and water heating systems.	If your project is using gas boilers then three credits should be secured. For projects using biomass, the credit requirements may not be achievable. These credits may not be possible for refurbishment/extension projects where no boilers are being replaced.
Pol03	Surface water run-off	5	Development of sites with a low probability of flooding where the design minimises the impact of flooding through careful master planning.	The two credits available will vary according to the site selected. Credits can be achieved, but will depend on site conditions, the surface water run-off design and provision to deal with pollutants. Welsh Government's statutory standards for sustainable
			Surface water run-off is managed to be no worse than the pre-development scenario.	
			Watercourse pollution prevention systems are in place.	

				drainage Guidance (SuDS) is available <a href="#">here</a> .
			Innovation credit - for simple buildings only	
Pol04	Reduction of night time light pollution	1	External light pollution is eliminated through effective design or the removal of the need for unnecessary external lighting.	This credit is achievable and requires lighting controls to be specified and installed in-line with BREEAM criteria. This topic should be part of your consultation with local community groups who may wish to use facilities out of hours and your site neighbours.
Pol05	Reduction of noise pollution	1	Measures to reduce the likelihood of disturbance arising as a result of noise from fixed installations on the development.	Your acoustician will help provide advice for this credit. It is generally achievable and should be included in specifications.

## Climate change readiness

Consider what could help your new school/college assets to be future proofed for climate change.

When investing in a new build school/college or in refurbishing existing school/college accommodation, a consideration must be given to the building's performance for the long term. As well as considering changes in approaches to teaching and pedagogy, it is important that your building can withstand changes to the future climate.

Good design can take into account such climate adaptation needs over the planned life of the building and reduce adverse impacts on the school/college fabric and internal classroom environment, as well as on its energy demands. This guidance sets out useful references and case studies to help clients and design teams to review their project in terms of climate change readiness. This note focuses on:

- Overheating;
- Water efficiency;
- Construction and construction materials; and
- Flood risk.

### Why?

Economic appraisals for your school/college project are likely to use a series of whole life costing periods, with the building expected to last for at least 60 years. It is therefore important to ensure that consideration is given to what our climate may be like in the future. Where practical, provide provision for adaptation or, ideally, integrate a climate change readiness approach within your design from the start.

### Overheating

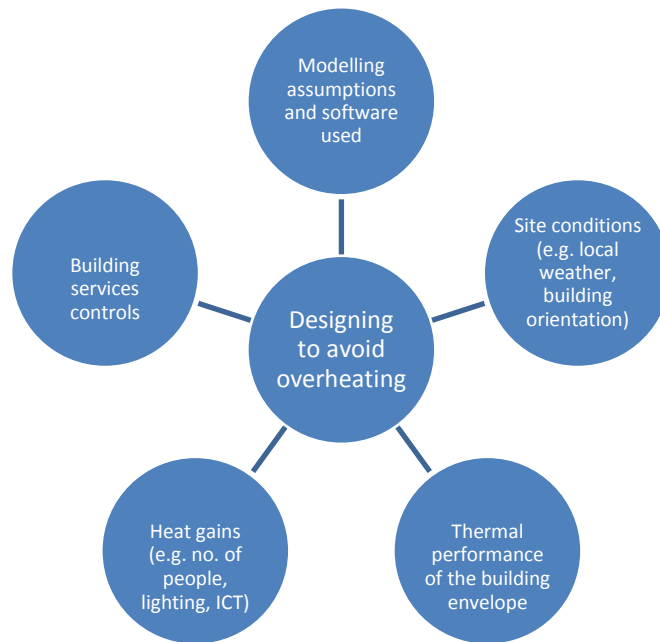
Ensuring a classroom is a comfortable environment in which pupils are able to learn should be a key outcome for your project. Weather extremes and a changing climate will also affect how your building performs and the energy bills created.

Today, with around 30 pupils and staff within a classroom, frequently the space becomes stuffy, the air quality poor and temperatures warm. It is therefore important that overheating assessments modelled for your new or refurbishment project are holistic and consider future climates as well as making use of the historic weather files used as part of standard design processes. Chartered Institution of Building Services Engineers (CIBSE) publishes future weather files for 14 locations across the UK<sup>2</sup>.

When designing for overheating, there are a number of variables that need to be considered, as shown in the graphic below:

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<sup>2</sup> <http://www.cibse.org/knowledge/cibse-other-publications/cibse-weather-data-current,-future,-combined-dsys>



Be sure that you consider each element in order to limit summertime overheating and that you understand what assumptions your design team have made when evaluating their designs and through the value engineering process.

As part of your discussions with the design team to provide adequate ventilation and avoid overheating, you will need to make a decision on the level of automation you want on windows and other features (such as louvers, chimneys and high level windows). In teaching spaces you may wish to integrate a CO<sub>2</sub> monitoring system (see image). This allows teachers (or the Building Management System if you chose an automated approach) to monitor the CO<sub>2</sub> levels within their teaching spaces and then open or close windows to avoid stuffy and poor air quality.



## Water efficiency

Establishing links between your building and the school/college curriculum can help make lessons dynamic and bring to life topics to enhance pupil's educational experiences. Water cycle and water efficiency is one such opportunity. Funding requirements for BREEAM will

prompt 21<sup>st</sup> Century School and Education projects to maximize water savings by selecting water efficient sanitary ware and implementing a good metering strategy.

Discuss with your head teacher, caretaker and estates teams the preferred water efficiency kit for the site and establish what has been standardised across your authority.

Useful guidance to help inform your discussions is available from:

- Dŵr Cymru Welsh Water's (DCWW) – their “Living & Learning with water” website<sup>3</sup> has lots of useful resources to help complete a water audit of your school, lesson planners and assemblies amongst other resources
- Construction Industry Research and Information Association (CIRIA) – “Sustainable water management in schools”<sup>4</sup> is a comprehensive guide to considering water efficiency within your building
- Eco Schools – the Eco Schools<sup>5</sup> programme considers how sustainable a school is in its day-to-day operation and provides resources to help with monitoring utility usage.

## Construction and construction materials

Material selection should be led by whole life cycle assessment, which will consider the maintenance and repair costs and frequency. Ensuring the materials selected are robust enough to withstand heavier and more intense rainfall, higher wind speeds and other extreme weather events should be part of your assessment too.

You may also wish to consider how flexible your building is to allow classrooms to be subdivided or combined. Approaches such as Designed for Deconstruction<sup>6</sup> could also be applied to your project.

Increasing material resource efficiency within your design during the selection of construction materials, and once your project is underway on site, can help reduce the carbon impact of your project. Completing a whole life cost assessment can help with material selection, ensuring that costs include a consideration for repairs and maintenance as well as the initial capital investment. Whole life cost assessments should remain live documents throughout the duration of your project and be revisited as the project is reviewed as part of any “value engineering”.

## Flood risk

As with water use within the building, rainfall and water management across the site is an important issue and provides great opportunities to enhance the teaching environment. The site flood risk level and the run-off rate to be targeted will be determined by the relevant planners and consultees, but opportunities to maximise water attenuation on site should be discussed with your project team. Welsh Government's Sustainable Urban Drainage (SuDS) guidance<sup>7</sup> outlines standards to integrate SuDS within your site.

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<sup>3</sup> <http://www.livingandlearningwithwater.com/>

<sup>4</sup> <http://www.susdrain.org/resources/ciria-guidance.html>

<sup>5</sup> <http://www.keepwalestidy.org/eco-schools>

<sup>6</sup> [http://www.cewales.org.uk/files/6514/4370/1168/Design\\_for\\_Deconstruction.pdf](http://www.cewales.org.uk/files/6514/4370/1168/Design_for_Deconstruction.pdf)

<sup>7</sup> <http://gov.wales/topics/environmentcountryside/epq/flooding/drainage/?lang=en>

SuDS can help manage rainfall on your site as well as providing safe biodiversity and amenity areas for your school community. SuDS can also become a valuable teaching resource. Frequently, well designed SuDS schemes have been developed for cheaper capital and maintenance investment, rather than a traditional “engineered” solution. The CIRIA publication “Sustainable water management in schools”<sup>8</sup> provides useful case studies and advice.

## Other useful references

There are other useful references that approach climate change and the built environment that you may wish to make use of, these are:

- Design for future climate: [Adaptation strategies for the learning environment, Worcestershire County Council](#) – an excellent resource outlining how one Council approached extending existing primary schools framed by climate change
- Chartered Institution of Building Services Engineers (CIBSE) guide: Design for future climate: case studies, (TM55: 2014) – this includes school case studies as well as other building types
- CIBSE’s guide: Climate change and the indoor environment: impacts and adaptation, (TM36: 2005)
- [Innovate UK project: Design for Future Climate](#) – includes a variety of case study examples, reports and design advice.

A checklist has been developed to assist project teams in the review of their designs at OBC and FBC stage. It is recommended that on passing SOC stage that the project team review this checklist periodically. It provides a series of prompts for clients to consider and tasks for design teams to complete. It is important that the school estate continues to build in resilience for climate change and increasing energy costs / security. Furthermore, early consideration of these topics can frequently identify cost-effective features, which can then be used as teaching resources for the education curriculum.

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<sup>8</sup> <http://www.susdrain.org/resources/ciria-guidance.html>

## Climate change readiness checklist

Ref	Design consideration	Project response (OBC)	Project response (FBC)
<b>Overheating</b>			
01	Thermal modelling completed using future weather files. Results used to inform design.		
02	CO <sub>2</sub> monitoring within teaching spaces.		
<b>Water efficiency</b>			
W1	Water efficiency kit approved by school staff and estates teams.		
W2	Location of water meter(s) identified and approved by school staff and estates teams to enable curriculum use.		
W3	Landscape design uses rainwater harvesting for irrigation or has selected plants that require no irrigation.		
<b>Construction and construction materials</b>			
C1	Whole life costing assessment undertaken.		
C2	Lean design approaches applied.		
C3	Design for deconstruction applied.		
C4	Material analysis undertaken using BIM.		
<b>Flood Risk</b>			
F1	Site drainage design incorporates sustainable urban design features.		
F2	Landscape design has incorporated sustainable urban		

	design features and enables curriculum use.		
Innovation			
	<i>The 21<sup>st</sup> Century Schools team are keen to hear of any innovation your team have incorporated into your design / delivery to ensure the building and site is climate change resilient.</i>		

## Building performance – avoiding rising energy costs

Increasingly, the construction industry is delivering projects with a “Soft Landings” support package; this means that contractors and the design team are usually on hand for at least the first year of your new school/college accommodation being used. Through the Soft Landings framework, this support is extended beyond the first twelve months to allow for the building’s performance (energy use, maintenance regime, robustness) to be assessed and any issues remediated.

### Why?

By being aware of the performance gap and the soft landings approach, both project design teams and the end user delivery teams can ensure that the design is developed to meet a comprehensive brief and all the relevant parties from the project team are involved with the handover. The rush to complete a project onsite can often mean that the time allocated to commissioning and handover periods becomes compressed. Ensuring that your new school/college accommodation operates within the maintenance and operational budgets allocated is crucial to avoiding unexpectedly high utility bills and the disruption of having contractors onsite at a live school/college site.

*“There has been a growing awareness for some time that many ‘low energy buildings’ use more energy than the designers thought they would. As energy costs have risen, this awareness has started to spread to building owners, who hear much about low energy buildings and subscribe to programmes that rate the design of the building, only to find that their ‘low energy design’ turns out to be have a typical energy bill. The performance of low energy designs is often little better, and sometimes worse, than that of an older building they have replaced, or supplemented.” CIBSE (Chartered Institution of Building Services Engineers)*

Research by the construction industry continues on the performance gap but has shown that the gap is significant, particularly at a time of constraining budgets when we really need our built environment to operate as anticipated.

...

Category	Mean Design Total Heat Consumption (kWh/m <sup>2</sup> /yr)	Mean Actual Total Heat Consumption (kWh/m <sup>2</sup> /yr)	Factor Change Design to Actual - 'Performance Gap'	Mean Design Total Electricity Use (kWh/m <sup>2</sup> /yr)	Mean Actual Total Electricity Use (kWh/m <sup>2</sup> /yr)	Factor Change Design to Actual - 'Performance Gap'
<b>Office</b>	46	73	1.59	71	121	1.71
<b>Education</b>	57	84	1.48	56	106	1.90

Taken from: CarbonBuzz paper - <http://www.carbonbuzz.org/downloads/PerformanceGap.pdf>

### How?

So how can clients work with delivery teams to shrink the performance gap? Below we provide some suggestions to provide a framework to your discussions.

### CIBSE guidance

In 2013, CIBSE launched their guide “[Evaluating operational energy performance of buildings at design stage](#)” (TM54). This guide clearly sets out a framework for clients to consider a set of questions around how they propose to operate the building(s) and to provide more detail to the design team than may have been considered in the past. The various steps are shown in the graphic below\*\* and indicate the level of information required for the dynamic simulation modelling (DSM) to be undertaken by your design team.

Taken from: CIBSE TM54

Undertaking this level of modelling can also enable designers to use future weather files to consider the impact of climate change on your building. Sensitivity analysis can be undertaken to consider a number of different scenarios, for example, little or no community/out of hours use, through to full 24/7 operation of your school/college accommodation. This then allows a more informed maintenance budget to be developed in parallel to the design process.

## **Post-occupancy evaluation**

The 21<sup>st</sup> Century Schools and Education Programme has established a five-year evaluation process. This seeks to gather feedback and learning from schools/colleges who have received Welsh Government funding. More information on these project completion surveys is available below. This new completion survey process will be used to evaluate the reduction in the performance gap from the school/FE estate over the five-year monitoring period. The completion surveys will combine energy performance data, educational attainment and feedback from staff and pupils.

### **Other references**

InnovateUK Building Performance Evaluation project – (BPE) was a four-year study into how real-world buildings perform. It provides a series of reports and recommendations that could assist your design and delivery teams.

<https://connect.innovateuk.org/web/building-performance-evaluation>

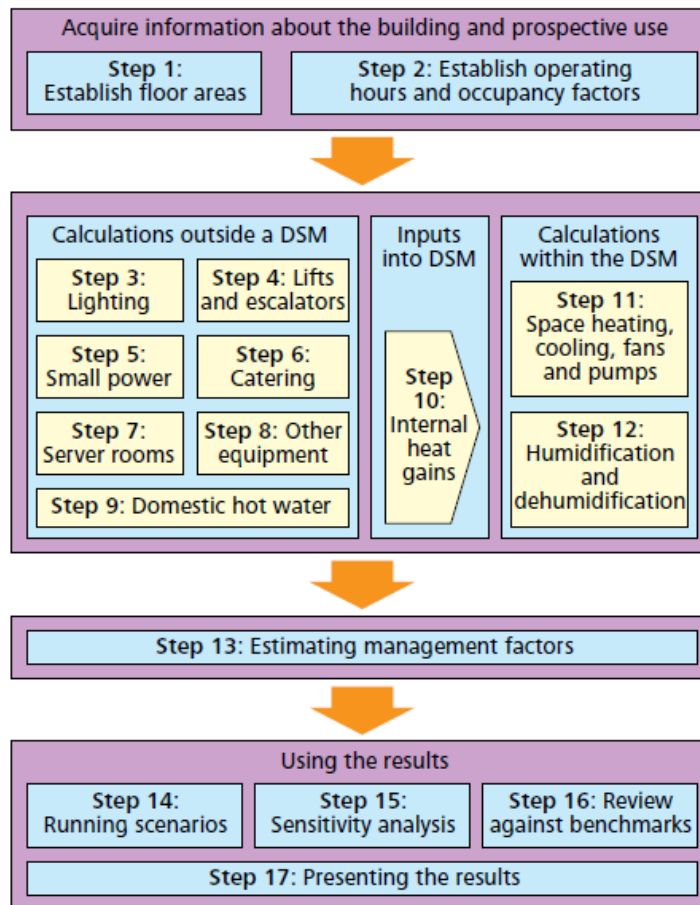


Figure 5 Methodology for evaluating operational energy use at the design stage

## CarbonBuzz

The construction industry is changing and becoming more integrated and joined up. One significant example of this collaboration is [CarbonBuzz](#), with the Royal Institute of British Architects (RIBA) and the Chartered Institution of Building Services Engineers (CIBSE) developing an online resource for the industry.

*“CarbonBuzz emerged from a realisation that the construction industry suffers from a poor awareness of the link between CO2 emissions and the energy use of buildings...”*

*“...CarbonBuzz provides a platform to share and publish building energy use data, on an anonymous basis, in order to increase the evidence base for low energy design solutions. It is an ongoing research initiative, but is already in a position to become an important component of the building design process.”*

Discuss with your design team how your project can make best use of this valuable resource and database. Perhaps you can even become a contributing project, helping the industry continue to improve and reduce the performance gap.

## Soft landings guidance

Building Services Research and Information Association ([BSRIA](#)) describe the new approach of soft landings as...

*“Soft Landings means designers and constructors staying involved with buildings beyond practical completion, to assist the client during the first months of operation and beyond, to help fine-tune and de-bug the systems, and ensure the occupiers understand how to control and best use their buildings”*

BSRIA have developed a number of [freely available guides](#) to help clients, designers and contractors collaborate and apply soft landings. They have also published “[Soft landings for schools – case studies](#)” as another useful resource.

## Community use of school facilities

Whether your 21<sup>st</sup> Century School and Education project is a new build, extension or refurbishment, it is worth giving serious consideration to the opportunities for your school to benefit from enabling the building to be shared with the wider community.

### Why?

School buildings and facilities, if only utilised during school hours (Monday to Friday and in term-time) may only be used for approximately 30% of the year. By sharing your school facilities with the local community outside of the school day, a number of benefits can be realised:

- Increased community awareness for your school – reducing vandalism, littering and anti-social behaviour;
- For secondary schools, increased community use can also help prepare pupils for moving to “big school” and raise the schools profile in the community;
- Income generation – through hiring facilities income generation can help fund additional activities and resources for your school; and
- Raising your school profile more widely can help with additional fundraising, donations and sponsorship from the local community and beyond.

### How?

Schools are currently managing their community lettings in a variety of ways. Consider which approach is best for your school staff and facilities.

**Figure 1: How are you managing your community lettings?**



**Figure 2: When are you prepared to have lettings?**



## What to consider

What facilities your school decides to hire out will depend on a number of factors, not least:

- What quality standards your facilities are designed to? For example, for sports facilities to be hired out by clubs they will require particular standards of lighting or pitch quality (e.g. all weather surfaces). More information is available from Sports Wales<sup>9</sup>;
- How do you wish to manage the bookings for community use? With a few spaces to hire, you may be able to manage bookings yourselves. Alternatively, if you're a large secondary campus site, you may wish to use a third party who can manage bookings and help promote your facilities more widely, including an online advertising and booking system;
- Access and security – are you able to provide staffing, with your caretaker opening and closing the school for each booking? Would it be cost effective to have a third party staffing community bookings? If you are hiring out several different areas, you may wish to have a receptionist present to direct people;
- Security and insurance – however you decide to manage your facility lettings, it is important that you review the security and insurances required for each letting. Do you wish to provide additional CCTV to any areas of your site? Always check that the organisations hiring your facilities have their own public liability insurance cover;
- Whole-life costing – if facilities are going to be used by a variety of users, it is important to consider the increased use in your operational and maintenance budgets. Whole-life costing should consider a variety of scenarios to help you analyse the benefits of community use;
- Managing funds – will the income generated from your site be retained by the school or shared with the local authority?
- Charging – do you wish to offer fixed prices, a discount to charities and community groups or vary prices through the week/weekend?
- Refreshments – do you wish to provide refreshments to those hiring the space? Is this via vending machines or a staffed café?

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<sup>9</sup> <http://sport.wales/research--policy/policies/planning.aspx>

