network 21 for the 21st century

A Practical Guide to Creating a Sustainable Community Building

- February 2005 -

Front cover photographs

Top - Ardross Village Hall, Easter Ross; designed by David Somerville Architect © David Somerville
Centre - Sgoil na Coille, Sunart, Lochaber © Sunart Oakwoods Initiative
Bottom - Garbh Eilean wildlife hide, Loch Sunart, Lochaber © Sunart Oakwoods Initiative

network 21 for the 21st century

Network 21 is a partnership of the Highland Wellbeing Alliance involving public bodies from the Highland Community Planning Partnership (The Highland Council, Scottish Natural Heritage, Highlands and Islands Enterprise and NHS Highland) and the voluntary sector (Voluntary Groups – East Sutherland and Voluntary Action Lochaber). Between 2002 and 2005, the Network 21 project received grant support from the Scottish Executive's Rural Strategic Support Fund.

Network 21 aims to:

- **Encourage sustainability to be embedded in community development support in the Highlands**
- **Encourage community action on sustainable development**
- **Provide a range of support and advice on sustainable development**
- **Promote best practice on sustainability.**

This guidance was produced for Network 21 by Campbell Consulting (Highland) Ltd in association with David Somerville Architects.

A pdf version of this guidance can be downloaded from the Highlands and Islands Enterprise website. Hard copies are available from:

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Introduction

What this Guide covers

This Guide provides an overview for community groups that wish to incorporate sustainability practice within their plans for a new or renovated community building. It outlines the main sustainability issues and choices that you will come across, and have to make decisions about, in the design and construction phase.

The Guide is based on experience of communities, professional developers and the agencies. Whilst not aiming to be totally comprehensive, it signposts communities to guidance and advice sources which can be tailored to individual project and community circumstances.

Be aware that sustainability is a vast subject area and an evolving specialism, and options available for communities are likely to change. The Guide is based on information available at the time of writing and circumstances may subsequently change. Whilst periodic updates to the guide may be made, it is the user's responsibility to apply information appropriately.

A community construction project will require consultation with professionals, especially as every organisation has its own quirks and special needs. The trick is only doing this when necessary and with enough background knowledge so as to reduce the chargeable time.

This Guide does **NOT** cover the early and important stage of assessing community needs, creating a community profile and establishing an appropriate organisation to manage the project.

See the reference section *Where to go for further information*, for other sources of guidance on these issues.

The Guide starts with an overview of the purpose and principles of sustainable construction practice in the Highlands. Subsequent sections go on to illustrate how these can be applied in the three main stages of creating a community building:

Stage 1 Getting Started: the Building Feasibility Study

Stage 2 Developing Your Proposal: the Scheme Design Study

Stage 3 Construction and Completion

The guide describes the steps you need to undertake at each stage, highlighting the sustainability issues and options to be addressed and some of the choices that will face you.

The final section provides a series of Subject Guides – these are tools to help you in your decisions, including checklists, practical action points and quick digests. These can be copied for reference use by your project committee as the project progresses.

A Sustainability Tick List (**Guide 10**) is included as a practical tool to help you monitor your sustainability progress as you design your building. This is intended as a guide – rather than an exact science – to be used together with the team of building professionals that you are working with. Some elements listed may not be appropriate or feasible for your building.

Introduction

So firstly, what do we mean by a sustainable community building?

All buildings have an impact on the sustainability of their immediate surroundings and the global environment. In both the design and construction process of a building there is a series of choices to be made, each of which can result in a negative or positive contribution to sustainability – either immediately or in the longer term use of the building. A sustainable building is designed (most obviously) to minimise the negative **environmental impact** of the building, but equally importantly to maximise positive **social and economic impacts** including future management and costs:

Minimising Negative Environmental Impact- by adopting design and construction methods that minimise adverse impacts on the environment and protect and enhance the diversity of nature. For example: reducing or minimising energy consumption and related CO_2 production; careful selection of materials used; minimising waste created during the design, construction and lifetime of the building.

Maximising Social Impact- by providing buildings that enhance the quality of life for everyone living in the community, actively supporting social inclusion. Buildings that integrate sustainability principles create better and healthier living and working environments. They attract greater use by voluntary and community groups which gain value and support from each other.

Sustainable buildings demonstrate and promote good practice in both construction and use, providing ideas for others to apply elsewhere. They can also provide opportunities for therapeutic uses of the building and the surrounding land.

Maximising Economic Impact - by designing and constructing buildings that are more cost-effective to run, have high quality working environments, which lead to greater productivity, and provide local employment and development of skills in design, construction and use. Sustainable buildings also promote the use of local supply chains and may influence job creation in the forestry, farming and recycling sectors by promoting the use of renewable and, where possible, locally-sourced materials, e.g. sustainable timber products; natural or recycled insulation materials.

Network 21 has produced a sustainability checklist (**Guide 12**) that itemises the components of the three areas above and how they can be applied to development projects with broader objectives than a community construction project.

Introduction

Why incorporate sustainability into the design of a community building?

In Europe, approximately half our energy is used in buildings, the largest share of which is for heating. Global warming, driven primarily by CO_2 emissions, requires a change in our current patterns of energy generation and use. So working with buildings provides an excellent opportunity to act to reduce CO_2 emissions by planning for high levels of energy efficiency in their design, construction and use.

Increasingly stringent requirements are being introduced into building regulations, to contribute towards national environmental targets to lower CO_2 emissions. These set a minimum standard for energy efficiency, however, which communities should ideally aim to exceed.

Buildings that are designed to exceed basic Building Regulation requirements can deliver significant benefits to communities, because they:-

- Save on running costs through efficiency measures and use of renewable energy sources.
- Maximise local economic impact during construction, by sourcing materials and labour locally.
- Reduce the negative environmental impact of construction, through minimum site disturbance and waste.
- Promote best practice to other local developers who may be building in the community.
- Support and encourage the development of products and systems with good environmental credentials, which could potentially be produced in the Highlands.

The planning and design stage of a building is the key time to identify which sustainability aspects will have the greatest impact, are achievable in your building, and how to incorporate them. Solutions will vary in different situations. This booklet provides step by step notes on applying sustainability practice to the building process, along with the other vital considerations of community need, cost, space requirements, and building regulations. As a starting point, **Guide 1** gives a summary of the key sustainability issues to consider.

STAGE 1
Getting started: the building feasibility study

Purpose:
This stage examines the feasibility of your idea. Having already defined your community needs, you will:

- research broad sustainability options and begin to set out the sustainability priorities for your construction project.
- begin dialogue with professionals.
- assess potential sites.
- explore fundamental planning issues in relation to your chosen site.

Getting Organised

Prior to thinking about building design, you need to carry out preparatory work in the community, including:-

- Identifying the community need and creating a community profile
- Establishing a formal organisation to manage the project
- Research on and study visits to examples of sustainable community buildings

Identifying the community need and creating a community profile

Your Local Enterprise Company (LEC) and Council of Voluntary Service (CVS) are recommended as the first port of call in helping to carry out an initial community needs exercise or assessing the business planning or financial viability of the project. They will be able to guide you on, and possibly provide funding for, this early consultation process. This may include input, if required, from a community economic development consultant – who may well continue to work alongside the community and any building professionals (architect / engineer / quantity surveyor) engaged, in due course, to prepare a feasibility study.

These building professionals do not get involved, however, in the initial assessment of community need, financial viability or business planning.

Remember to canvass community views on what they consider the most important local sustainability issues. Make sure that you include specific sustainability questions in your survey or consultation process e.g. travel modes, recycling facilities, renewables *etc*. Your community group can then use this information in your prioritisation of sustainability aspects in the building design.

Separate useful guidance has been produced on the process of community project management, from creating a new group and defining your project, through to business and general management. This Guide focuses on the sustainability considerations of a community building project, and we suggest that you use it in conjunction with one of the publications listed in “Where to go for further information” under “Sources of community support”.

STAGE1
Getting started: the building feasibility study

Establishing a formal organisation to manage the project

Once your organisation is formed, appoint a **lead community contact for the construction project.** This does not have to be the Chair. The greater the distribution of tasks between group members, the more sustainable your management! Ideally, a **second community person** should be appointed to work in parallel and **lead on the sustainability agenda**. At this early stage, your community group can progress the project considerably at your own hand, such as making initial contact with the regulatory bodies to obtain site specific guidance and complete the necessary permissions. This can contribute considerable savings on the hire of professionals, but will depend on the time availability and confidence within your group. Carry out background research – the section on "Where to go for further information" provides contacts and web sites that you can investigate. The more you understand about the issues and the clearer you are about what is required from your design, the more effective you'll be in communicating this to your designer and achieving your goal.

Research on and study visits to examples of sustainable community buildings

Site visits to view good practice in sustainable community buildings are **highly recommended** at this stage. Refer to the section in this Guide on *Examples of best practice in sustainable construction*. Local agencies (for example, your Local Enterprise Company, the Council's Planning and Development Service, SNH, CVS) may also be able to suggest relevant projects you can contact within your area. A chance to talk to other groups with prior experience of the process is invaluable, including dilemmas and difficult decisions they have faced. It is worth bearing in mind, however, that community projects are usually managed by volunteers and it is important to make efficient use of the limited time they have to share knowledge and experience with you.

By this stage you should have established and written down your **initial summary of project requirements** (e.g. number and size of rooms required, activities to be catered for etc) based on the community survey and committee discussions. **Guide 2** provides an overview of the "who, what and when" in the process you are about to embark on of developing your community building.

How to Find an Architect and Design Team with Sustainability Credentials

Contracting an architect and design team with prior 'sustainability' track record and expertise should be a high priority for your project. They can provide proactive ideas and suggestions based on their previous experience and knowledge. You may wish to balance this, however, with using relatively local professionals who are able to meet with your group regularly. As environmental and sustainability concerns rise up the political agenda and public awareness increases, more professionals are taking an active interest in the subject. However, the number of professionals with in depth experience is still limited.

STAGE1
Getting started: the building feasibility study

There are three main sources of information on such professionals:

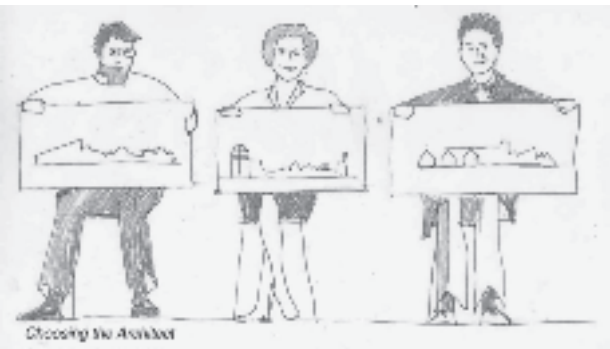
The Royal Incorporation of Architects in Scotland (RIAS) recently launched an accreditation scheme for sustainable building designers enabling architects with a proven track record to qualify and register. A similar RIAS accreditation scheme already operates to identify expertise in historic buildings. There are different levels of accreditation based on project size. For more information contact the RIAS, Tel 0131 229 7545; E: stombs@rias.org.uk; Website www.rias.org.uk.

The Scottish Ecological Design Association (SEDA) is a voluntary organisation of professional members that advocates ecological design, providing information, advice and raising awareness through events, site visits, study tours and publications. It is working to establish a web gateway on sustainable design and building materials. www.seda2.org ; E: seda@freezone.co.uk

The Association of Energy Conscious Builders (AECB) lists its members from a range of professions (architects, building contractors, energy assessors, engineers etc) at www.aecb.net/seekf.htm. Go to *"seek members"* and select from drop down menu *'Highland'* (or required area) and *'all professions'* to get a full list.

Ideally, consider 2-3 architects to assess how each would approach the project and their attitude to sustainability issues. Provide them with your initial summary of project requirements and invite them to make a presentation to the committee on their proposed approach. It is vital that your community group is comfortable with the architect's style, communication and flexibility. You will be stuck with this once you start – it is expensive to change adviser at a later stage.

The architect should be involved to provide guidance as early as possible in the feasibility stage. Remember your community group can still carry out some of the tasks at your own hand, if desired, to reduce professional fees eg. liaison with planning and Scottish Environmental Protection Agency (SEPA) requirements.



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Getting started: the building feasibility study

The architect acts as the lead consultant of a **Design Team** of building professionals, which means that the community interface will be with the architect. The architect may recommend engagement of other professionals as appropriate, in consultation with you, and will instruct and liaise directly with them. Each design team member enters into a separate contract with your community group. **At the feasibility stage the Design Team is likely to consist of:-**

- **Architect:** to ensure good design, technical standards and effective management of the project, and coordinate the work of the design team.
- **Quantity Surveyor:** to provide elemental costings, and advise on the cost of sustainability choices
- **Landscape architect:** often neglected at the early stage of a project because there is a common perception is that landscaping is an issue for post-construction – but input at this stage will ensure that the building maximises opportunities on the site and fits into the landscape.
- **Surveyor or Structural Engineer:** to provide a level survey of the site, and arrange for trial pits to be dug to evaluate ground conditions if required.
- **Planning Supervisor:** to oversee implementation of Health and Safety aspects in both design and construction, including Construction Design Management (CDM) regulations. This appointment is required by law for most construction projects. The community client is responsible for appointment of the Planning Supervisor, on the recommendation of the architect.
- **Mechanical (heating and ventilation) and Electrical Services Consultants:** may be required depending on the size and complexity of your project. Your architect will make a recommendation regarding this.

When creating a sustainable building project, you are better off employing professionals with a sustainability track record than those who can ease cash flow management but have little or no experience in sustainability issues. With early input, an experienced design team can provide good sustainability returns for relatively little cost. Do not shy away from engaging additional professional input arising from cost worries. The cost of the feasibility study is usually agreed in advance at a fixed price – some building professionals may conduct this as a loss leader (not invoicing for work at this early stage, in the hope that they will get the main contract, when they will recoup their costs). However, this should NOT be an expectation and funding should be sought to carry out the feasibility study.

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Getting started: the building feasibility study

Developing the Project Brief and Incorporating your Sustainability Requirements

You – the community committee or Board – are the client and will be employing professionals to carry out work on your behalf. It is your job to communicate the needs of the community project to the design team and to ensure that they have good clear instructions. To start the ball rolling you can write an initial, short brief, defining the physical, space and amenity requirements of the design. This should be developed into the Project Brief, which is a clearly defined statement of your requirements for the building, based on your community research and consultation. The Project Brief develops systematically through an iterative process involving dialogue between the community and design team that allows your design requirements to take firmer shape. This dialogue progresses throughout Stages 1 and 2 of the building project. The Project Brief will usually be finalized by both parties by the end of Stage 2 and will provide the basis for the preparation of the Tender Documents.

Architectural design decisions directly influence the sustainability performance and encourage "greener" management of the finished building. As the client you can specify selected sustainability objectives for the building in your Project Brief. The design team will suggest design options that will deliver your requirements. It may help you to produce an overall Mission or Sustainability Design Statement to map out the extent that you wish to incorporate sustainability in the design. **Guide 11** provides discussion points to explore the extent of your community aspirations to incorporate sustainability objectives in the construction project. Your architect will be able to guide you through the sustainability issues and choices – amending the detail of the Project Brief during Stages 1 and 2, as you fine tune your requirements with the design team.

Site Selection and Best Use

Selection of your site is a fundamental decision that will determine future sustainability potential of a number of aspects of your building. It is vital that time is invested in site considerations. Once the site, and positioning within it, is determined the scope for some other options will be fixed. The location of your building is unlikely to be an open choice, and indeed may be pre-determined if it is a refurbishment. Different constraints will apply in urban and rural locations, but the sustainability issues in **Guide 3** should be considered when making your decision.

STAGE1
Getting started: the building feasibility study

Meeting Essential Planning Requirements

Examination of a number of statutory planning requirements is an essential part of the early feasibility study, which will be guided by your architect. This will establish whether or not the project is indeed possible and practical on any specific site, and whether there are any problematic aspects that need further consideration. Assessment needs to be made for:-

- **Road access and parking** - refer to your Local Authority (eg The Highland Council) Roads Department.
- **Sewage and waste water management/surface run off** - refer to Scottish Environmental Protection Agency (SEPA) requirements.
- **Water and other utility requirements** - check connection feasibility with Scottish Water, telecom service providers etc
- **Access for All** - legal disabled access requirements are now built into the building regulations.
- **Land ownership issues** - ownership and legal boundaries need to be clear and defined by legal documents.
- **Future expansion** - future needs, and the scope for meeting these within the site, must be considered carefully, to ensure the selected site is suitable for medium to long-term goals.
- **Planning permission** - Outline planning permission is only required if a project is likely to be controversial, with possible objections or doubts about the ability to go ahead. The temptation is for a full planning application to be lodged at this stage, based on the architect's initial proposal. Be aware, however, that early planning approval will limit further changes you are able to make as you refine your sustainability and design requirements, although it may enable you to proceed with funding applications to some bodies. Many groups proceed on this basis to enable them to submit capital funding bids based on planning approval. Planning permission will fix your building footprint - size, shape and height and a number of other features e.g. the management of surface water drainage (SUDS requirements)

Indicative Costs

One of the outputs of Stage 1 will be an elemental cost analysis. This will be conducted by the QS (Quantity Surveyor) based on the architect's design assumptions, and made with the community input. Design costs should be allocated to specific elements of the building to enable accurate adjustments at a later stage if assumptions change eg. if you change the material specification for a certain part of the building. This analysis will provide indicative costs which may increase or decrease as you refine the design and sustainability specification during Stage 2.

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Getting started: the building feasibility study

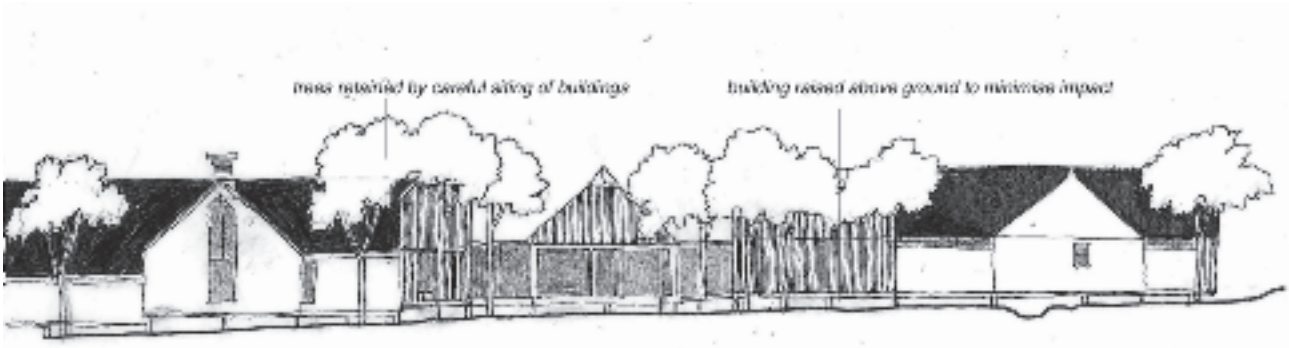
Funding Issues

Plan ahead for your funding for Stages 1 and 2 – as financing these early planning studies can sometimes cause a dilemma. Most communities need the security of confirmed funding before committing to spending on professional fees. A fixed fee is often negotiated for the Building Feasibility Study, to include approval of planning consent. As mentioned above, this means that the planning permission is based on the architect's initial proposal and sketch design in Stage 1 – which cannot subsequently be materially altered. This may pre-empt or compromise later sustainability decisions.

Stage 2 fees are usually charged by professionals as a percentage of the final contract value – the percentage will be lower for larger projects. Your community group and/or your local funders may not be comfortable about proceeding to Stage 2 without planning permission in place. Be aware of this and discuss with your architect and local funding agencies to find the best solution.

You will not be in a good position to submit funding applications for capital costs until your design is refined and more accurate total costs are clear. However, you should research and make contact with potential funders at this stage to cover any additional costs of sustainability features.

Remember that, with good design advice and careful choices, **investment of additional money in the capital build stage can be repaid by savings in the running costs of your building** – and most community groups find that one-off capital funding is easier to source than ongoing revenue support. Some grant funding is available specifically to meet the higher installation costs of environmentally-friendly systems and sustainability features (see **Guide 10**). Check out your eligibility for such funds to help you with your cost decisions.



Glencoe National Trust Visitor Centre

STAGE1
Getting started: the building feasibility study

What you should have achieved by the end of Stage 1

As a community group, you will have:-

- appointed a lead person for sustainability issues from your community group.
- selected and appointed your professional team (architect, QS, landscape architect, surveyor and others).
- communicated all your preparatory work to your architect, including community needs and profile, sustainability aspirations, and feedback from study visits.
- written an initial Project Brief laying out the scope of the project and requirements in sustainability and quality standards.
- confirmed the acceptability of your chosen site with regard to basic planning requirements, confirming that there are no “fatal flaws”.
- agreed the optimum use and layout of the site, with particular reference to the level survey, landscaping aspects and orientation of the building.
- received an initial design and outline proposal prepared by your architect ready for further development – including sketch design (elevations and plan section) suitable for planning application.
- received an estimate of the likely capital costs based on the draft specification and plan.
- identified eligible funding sources to contribute to any additional sustainability costs in your building.
- received a Feasibility Study report from the design team, which documents all the above.
- [approval of planning permission if you have chosen to submit an application at this stage – see note above].

STAGE 2
Developing your proposal: the scheme design study

Purpose:
This stage undertakes what is sometimes referred to as the 'Scheme Design Study', revisiting in more detail some aspects from Stage 1. Your community group will:-

- refine the Project Brief by examining a range of sustainability issues and options in more detail with your architect.
- make a series of design decisions with sustainability implications which will not be easily altered at a later stage – some of the benefits, drawbacks and cost options are outlined in this section.
- play a vital questioning role, as the community client, to ensure that the building keeps in line with community needs and expectations, although input at Stage 2 will largely be by the professional team.

Healthy and Comfortable Buildings

Achieving sustainability in your community building includes maximising the health and comfort of building users. There are a number of cross-cutting quality issues that you will need to consider from a users' perspective in all your design decisions. Don't compromise on performance and quality where these issues are concerned:

Heating
Rooms need to be warm at the time people are using them, with a degree of temperature control to maintain background heating when not in use. Insulation is one of the key methods for achieving thermal comfort efficiently in a building. For example, at the new village hall in Ardross (Ross and Cromarty), high levels of insulation combined with underfloor heating (a series of pipes warming the floor surface) and solar roof panels deliver an effective and cost-efficient heating system. This provides a warm background temperature, avoiding the need for early arrival at the hall to pre-heat the building in advance of use. Heating costs are lower than for the smaller "old" hall. Alternatively, responsive heating can be used, which is capable of raising or lowering temperatures quickly. As this is applied only when the room is required, it results in the building being cold when not in use; each time a room is heated the temperature has to be raised from ambient level.

Air Quality
Achieving the correct balance between energy conservation and adequate ventilation is the key to good indoor air quality. Insufficient ventilation can lead to:

- High levels of indoor pollutants emitted gradually from synthetic materials and finishes (eg certain paints and floor coverings) over the course of their lifetime;
- Excessive humidity that encourages dust mites, which are a big problem for asthma sufferers.

Light
Careful design should make full use of natural lighting wherever possible, supplemented by artificial lighting. This will enable people to work and use the building without eye strain. Design should eradicate glare from sunlight, which is of particular importance for older users of your facility.

Acoustics
Sounding proofing between rooms is essential to attract bookings for simultaneous use of the building by different types of users. This will encourage good use of the building, contributing to financially sustainability. Areas that are to be used for performance will need to be designed with spaces and materials that lend themselves to good acoustics.

Construction Method

A choice of construction techniques could be applied to your building, although this is likely to be determined by cost, practical considerations and the size and complexity of the building. Some new or unconventional construction methods associated with sustainable building practice are at an early stage of development, not fully tested or proven and may not be advocated for use in large buildings. In the Highland climate, the durability of a structure against the weather is a major consideration – and timber is often the most suitable sustainable building material.

Some illustrative construction methods that you may come across are outlined in **Guide 4**. The construction options and approach appropriate to your site and building should be discussed in detail with your architect.

Key sustainability considerations in choosing a construction method:

- Plan the construction process to be resource-efficient i.e. to minimise waste, manage disposal of waste and to prevent land and water contamination during the building process.
- Select a construction method for which you will be able to find construction expertise locally or relatively easily. Refer to the issues raised under “Use of Sustainable Materials”, as the construction method will determine some of the building materials to be used.
- Aim for a design and construction method that is flexible enough to adapt for projected future usage.
- Take account in the design of the future financial and environmental cost of disposing of components and materials at the end of their useful life, and maximize the potential for reuse and recycling.

STAGE 2
Developing your proposal: the scheme design study

Energy System Options

Operational energy requirements of the building (space heating, water heating, cooking, powering of equipment, lighting etc.) represent one of the biggest areas where your sustainability decisions can make an impact. Good quality, well insulated construction, using the site's aspect for passive solar gain, results in a building that requires minimal space heating, so reducing energy costs considerably. A community building looks for both reliability and low operational costs in its power supplies. Running costs will be determined by:-

- The thermal design of the building, including insulation standards
- The source of energy
- The efficiency and degree of control of the heating system you select.

Minimising energy use: control systems and insulation.
In tandem with effective heating, lighting and ventilation systems your building should be designed for efficient energy use and energy conservation. In Europe, heating energy accounts, on average, for 40-60% of energy use in a building. Heating energy demand can be reduced at a competitive cost by 30-50% in existing buildings and by 90-95% in new builds, compared to the current average, using widely available technology and design knowledge. Two key ways of achieving this are through effective controls and good insulation. Purchase of energy efficient (retailed as "A" category) models of appliances also helps. A unit of energy saved is as good as or better than a unit of renewable energy generated.

Building regulations set a minimum standard for energy efficiency, which ideally you should be aiming to exceed.
You should discuss the potential for setting the project's energy consumption with your design team. These could be based on the design team's estimate for total annual energy costs. Recognised industry standards exist for residential buildings and for offices premises, but as yet there is no standard calculation available for public or community buildings.

Control Systems
The range of control systems available is changing constantly, and at a basic level includes:

- Electronic timers or programmers
- Room thermostats or thermostatic radiator control valves
- Separate thermostatic control on hot water system

It is important that you select control methods appropriate to your building design and heating system. Your design team will advise on this. Information on control systems can be found on the National Energy Foundation website **www.natenergy.org.uk.**

Insulation
Insulation is a very important part of good thermal design. It offers potential energy savings in both refurbishments and new build, given that many buildings, including new build, are insulated below optimum levels. Although insulation standards are set by Building Regulations, additional benefit is given by insulating in excess of these standards.

One of the most important characteristics of an insulation material is it's longevity of performance over the lifetime of the material and building – most buildings do not have insulation replaced during their lifetime. Different insulation materials will achieve the same performance applied at different thicknesses, so select a material that will last and maintain a high performance.

Key sustainability considerations to minimise energy use (See Guide 6 for checklist):

- Specify sufficiently high levels of insulation – these may often be higher than Building Regulation requirements. Don't skimp on insulation during construction.
- Choose an insulation material with long life and durability.
- Minimise heat loss by controlling airflow and maximising air tightness and draft exclusion e.g. at doorways and windows.
- Choose an insulation material which is produced in a sustainable way i.e. the manufacture process does not produce any ozone damaging chemicals such as CFC and CO_2 (These materials are said to have 'zero ozone depletion potential' - ZODP). Refer to your design team for options.

Alternative approaches to insulation and ventilation are being developed, although some are in early stages and have not been proven in the UK climate. Your design team will advise on appropriate options.

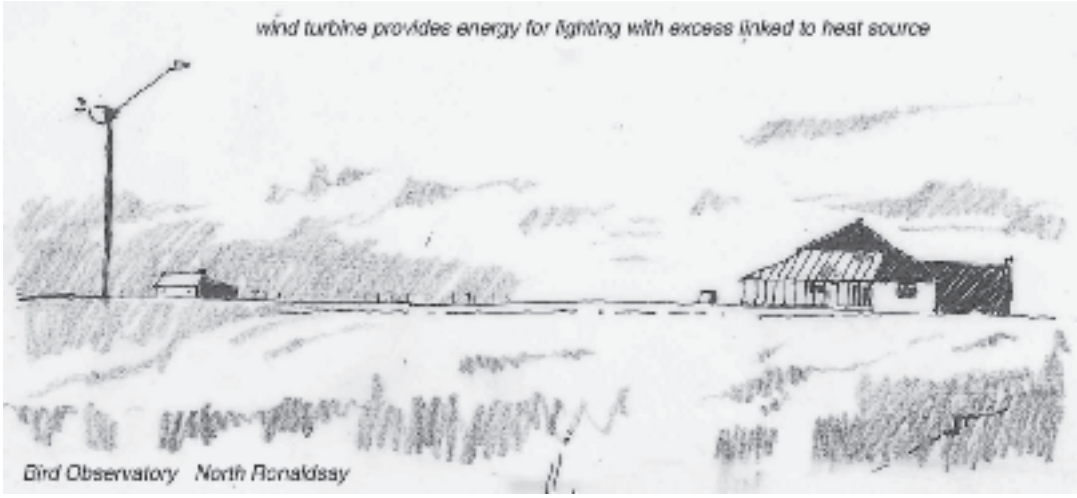
Choosing your Energy Source
Ideally, your sustainability aims should accommodate some use of renewable energy within your construction project. The majority of the UK's energy comes from burning fossil fuels (coal, gas, oil), which produces high levels of CO_2 contributing to the greenhouse effect, with renewables accounting for only about 3%. Renewables offer a range of technologies with differing

installation and running costs – harnessing essentially inexhaustible energy sources of the sun, the wind, flowing water, the heat of the earth and replaceable fuels such as plants. A summary of the main options for use of renewable energy and their application to community buildings is given in **Guide 7**.

It is common for renewables to contribute towards a part of a building's energy needs, supplemented by conventional sources – as illustrated by the growing number of community buildings in the Highlands and Islands adopting this approach. Two different renewable technologies can also be combined in a hybrid system.

Key sustainability considerations in choosing an energy source:

- Reduce dependency on non-renewable energy (coal, gas, oil and electricity from a non-renewable source) through good design and insulation, combined with use of renewables.
- Choose an efficient heating system, lighting and appliances with low production of CO_2 and other greenhouse gases.
- Make use of renewable resources wherever possible and cost effective – this can be for part, rather than all, of your power needs if appropriate. You don't need to make a commitment to run the entire building on renewable energy, although this is entirely possible.
- Promote the creation of new jobs in renewable energy industries by using renewable technologies.



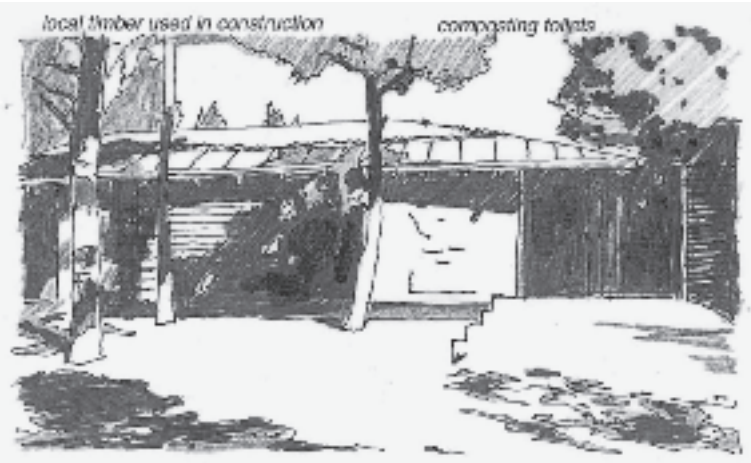
STAGE 2
Developing your proposal: the scheme design study

Use and Specification of Sustainable Materials

Some of the materials that you use will be determined by the chosen construction method - but you can still specify in your Project Brief a minimum quality or sustainability characteristics that you require. Discuss with your architect the extent to which it is appropriate to specify sourcing requirements – your architect will later write these into the tender document which building contractors are obliged to follow. Be aware that your choice of specification is likely to have cost implications, on which your Quantity Surveyor will advise. There are a number of suppliers that observe environmental policies for manufacturing and sourcing their goods and 'Green Purchasing' guides are available in the trade. If your architect is experienced in sustainable design, he/ she will be able to advise on these.

Key sustainability considerations in using and specifying materials (see Guide 7 for detail):

- Source building materials locally wherever possible to cut transport requirements and boost the local economy:- this will not always be practical particularly when sourcing 'environmentally sound' components, fittings and finishings. In particular, local sourcing of heavy or bulky materials can provide environmental and cost advantage - the geographic remoteness of many parts of the Highlands usually results in higher than average construction costs.
- Use sustainably-produced materials wherever possible i.e. materials from a renewable source, whose production or manufacture make minimal use of energy
- Use recycled or salvaged materials wherever possible e.g. maximise the use of building products manufactured from recycled material and re-use materials such as timber (eg beams / doors) and stone.
- Be aware of the adverse effects of most timber preservative treatments, and toxins released from synthetics – aim to specify for the least harmful and most environmentally friendly options in discussion with your architect.
- Consider the decommissioning costs of the different construction materials as part of the overall building cost (i.e. the cost of dismantling and disposal at the end of useful life). This involves identifying which construction materials can be recycled, and those that will result in costly landfill. This may seem remote from your immediate project costs, but is part of the sustainability equation.



Loch Garten RSPB Visitor Centre

Minimising Waste Water and Managing Sewage

Saving on the use of mains water, which is now metered in all community halls, offers an immediate cost saving. More efficient water use also decreases the demand for treated mains water – treatment processes have environmental impacts, as does the treatment and disposal of waste water. Some basic water conservation methods can be employed in both a new build or a refurbishment. (Refer to **Guide 8**).

SUDS (Sustainable Urban Drainage System) is a Scottish Environmental Protection Agency (SEPA) regulation which despite its name applies to rural areas too. It requires that surface water run off from a site is at the same rate post-construction as pre-construction, to avoid water logging and flooding. This is enforced during the planning application process and can have quite high cost implications if, for example, installation of storm water holding areas is required. Surface run-off can be controlled or reduced by incorporating a holding pond within the site, or recycling rainwater.

Key sustainability considerations in minimising waste water and managing sewage (see Guide 8 for suggested actions):

- Reduce overall water demand in the building without affecting users' comfort.
- Incorporate systems which recycle rain and grey water where possible for non-drinking purposes.
- Select drainage systems which use materials that are manufactured sustainably e.g. fire clay products rather than PVC drainage pipes.
- Treat sewage sustainably.
- Design for effective management of day to day waste e.g. recycling facilities for bottles and paper.

Access for All and Parking

Legal requirements for disability access are now incorporated into the Building Regulations for all new build, on which your design team will advise. However, access issues encompass more than physical access and the checklist in **Guide 9** should be used to ensure all aspects have been considered.

Although access to buildings by **public transport** is a planning priority, this is challenging and often impossible in remote rural areas and **car access and parking** will be needed in many Highland settings. Open-air car parking will have to be partly tarmac-surfaced to allow access from vehicles to the building for wheel chair users and those having walking difficulties. However, consideration should be given to using the remaining car parking space as a rainwater soakaway facility. Graded aggregate could be used to surface the area allowing water to drain naturally rather than having to build storm drains to meet statutory standards. This would be a means of potentially reducing water charges to the site/building and meeting SUDS requirements as described above.

STAGE 2
Developing your proposal: the scheme design study

Planning Consent and Building Control

The completion of Stage 2, the scheme design study, is the ideal time to gain planning consent if funding considerations allow you to wait till this stage (if not approved at the end of Stage 1 - see earlier note). Applying for planning permission at this later stage allows your application to be based on your architect's detailed design proposal, rather than the initial proposal.

The building warrant must be in place before the construction contract can be let. This requires submission of an application in an approval process completely separate to planning consent. It requires technical detail to be supplied by the design team, additional to the information submitted in the planning application.

What you should have achieved by the end of Stage 2

You will have:-

- An assessment and prioritisation of the full range of sustainability issues to be incorporated in the building. You will have undertaken this as a community group, with guidance from the design team. It should have included consideration of construction methods, material specification, energy sources and systems, water and waste management and access for all.
- A completed Scheme Design Study report (the term used by the National Lottery's Community Fund), based on the refined Project Brief. This will incorporate design, material specifications, and cost breakdown in sufficient detail to formulate the tender document which will be prepared in Stage 3.
- Full planning permission approval.
- Building warrant approval.
- Funding applications submitted and full funding confirmed.

STAGE 3
Construction and completion

Purpose:
This stage moves from the design into the construction phase, through the tendering process to let the construction contract. Your core sustainability decisions will have been made by now, and construction concerns should be focused on tight management and on-site monitoring and quality control.

Listed below are the main steps that take place after Stage 2 through to completion. Your professional team will advise you on the detail and legal requirements of each step. If you would like a more detailed description, please refer to the SCVO publication which is based on community experiences of building halls and centres:- *'The Brass Tacks - Guidance Notes for 21st Century Halls: managing community projects'. SCVO 2000.*

- **Preparation of the tendering contract document:** your architect will produce this formal document using the details agreed in Stage 2. It will be used as the basis to select and engage building contractors.
- **Tendering building contractors:** your architect will issue a number of building contracting firms with the tendering contract document and invite them to submit a competitive bid to undertake the contract. Once the bids are submitted, your community group, with your architect's guidance, will select the building contractor. Ideally select contractors who can provide evidence of experience and commitment to sustainable building practice. Again, you may wish to balance this with selection of a locally based firm. Price may also be a deciding factor in awarding the contract if there is a large discrepancy between bids.
- **Letting the contract:** the contract will be awarded to your preferred bidder and will be a direct contract between the community client and the building contractor. Your architect's continued involvement will be in an inspection role to ensure that the building contractor is delivering the work to specification.
- **On-site management:** ideally one community contact person should be nominated to liaise with the building contractors. This will involve responding to day-to-day management queries and decisions, referring these to the community group as and when required.
- **Project hand-over, snagging and building maintenance issues:** The handover of responsibility for the building from the contractor to the community group takes place when the ***Certificate of Practical Completion*** is issued by your architect. This usually takes place alongside the release of the ***Completion Certificate*** that is part of the building control process managed by the local authority. Your full building insurance must be in place at this point, as the building contractors insurance liability ceases once hand-over has taken place.

STAGE 3
Construction and completion

- **Final completion:** during the next 12 months, the contractor is still liable for correction of most hidden defects. It is only at the 12-month point that ***Final Completion*** can be certified by your architect, who conducts a final building inspection and draws up a 'snagging' list of faults to be addressed.

What you should have achieved by the end of Stage 3

You will have:-

- Received a tender document, prepared by your Design Team based on the Project Brief and Scheme Design Study content.
- Appointed a building contractor with some experience in sustainability issues.
- Completed all stages of building construction, including compliance with all legal requirements and procedures.
- Completed the formal building hand over, with your community organisation having taken over full responsibility for the building from the contractor.

Where to go for further information

(NOTE: Funding sources for specific sustainability costs listed in Guide 11)

Useful Contacts

Association for Environmentally Conscious Building (AECB) is the leading environmental trade organisation in the UK, with the objective of facilitating environmentally responsible practices within buidling. Publishes an excellent, informative and practical quarterly magazine 'Building for a Future'. E: admin@aecb.net Tel: 01559 370908 www.aecb.net

Building Research Establishment (BRE) is the UK's leading centre for research, development and consultancy for all aspects of the build environment, including sustainability and environmentally responsible practices. Some useful reports provided free or through on-line bookshop. E: enquiries@bre.co.uk Tel: 01923 664000 www.bre.co.uk/sustainable

Building Services Research and Information Association (BSRIA) is the association for building services research which assists the building services industry and its clients to improve the efficiency and quality of its products and services. Some useful environmental practice publications. E: bsria@bsria.co.uk Tel: 01344 426511 www.bsria.co.uk

Centre for Alternative Technology (CAT) A centre in Mid Wales promoting and demonstrating alternative energy and sustainable living. Run courses and information service. Over 80 practical factsheets, publications and a magazine. E: info@cat.org.uk Tel: 01654 702400 www.cat.org.uk

CIRIA is a UK-based research association concerned with improving the performance of all involved in construction and the environment. E: enquiries@ciria.org.uk Tel: 0207 222 8891 www.ciria.org.uk

Community Self-Build Scotland provides information, education, advice, assistance, training and development services to Self-Build Groups in Scotland. http://www.selfbuild-scotland.org.uk/

Department of Trade and Industry (DTI) promotes Sustainable Construction through its website www.dti.gov.uk/construction/sustain

Earthship Biotecture shares international experience in building and using "earthship" construction, through it website www.earthship.org

Energy Efficiency Best Practice Programme (EEBPP) is a UK government programme to help organisations cut energy bills by 10-20%. Provides independent advice to private and public sector, including a good list of case studies. Tel: 01923 664258 www.energy-efficiency.gov.uk

Energy Saving Trust is government funded to promote efficient use of energy. Largely targeted at domestic homes and general public. Tel: 0207 931 8401 www.est.org.uk

Energy 21 promotes research into sustainable energy systems, water systems, waste management practices and building methods. Based in Glouscestershire. E: info@energy21.org.uk Tel: 01453 752277 www.energy21.org.uk

ENTRUST is the sole regulator of the Landfill Tax Credit Scheme. Essential if you are applying for grants for environmental projects under the Landfill Tax Scheme. Tel: 0161 972 0044 www.entrust.org.uk

Highland Energy Efficiency Advice Centre provides advice and leaflets on energy efficiency as the local office of a national network of Advice Centres. Largely targeted at domestic residences; grants available are mainly for domestic upgrades. Housed in

Where to go for further information

The Highland Council's Property and Architectural Services, Kinmylies Building, Leachkin Road, Inverness, IV3 6NN.
E: Debbie.McCrum@highland.gov.uk
Tel: 0800 512012

Low energy lighting information can be found at www.natenergy.org.uk/cfl-save.htm

National Energy Foundation (NEF), based in Milton Keynes, was set up in 1990 to help UK citizens address energy conservation through practical advice and help in installing energy saving measures and implementing appropriate renewable energy sources. www.natenergy.org.uk

NEF Renewables is a department of The National Energy Foundation (as above). Its aim is to encourage use of sustainable and green sources of energy, by promoting renewable energy and providing information and advice. www.greenenergy.org.uk

Royal Incorporation of Architects in Scotland (RIAS) is the foremost architectural professional institute in Scotland dealing with architecture and the built environment. It has charitable status and offers a wide range of services and products for architects, students of architecture, construction industry professionals and all those with an interest in the built environment and the design process. The RIAS recently launched the world's first accreditation scheme for sustainable building designers. E: info@rias.co.uk Tel: 0131 229 7545
www.rias.org.uk

Royal Institute of British Architects (RIBA) is the UK equivalent of the RIAS and is increasingly interested in sustainable development. Web provides directories of RIBA practices, members, a bookshop and product selector and links to 1000 architectural websites. E: info@riba.org.uk
Tel: 0207 580 5533 www.riba.org.uk

Scottish Community Renewables Initiative (SCRI) is a one-stop shop for communities interested in renewables, providing advice, project management and funding support. Jointly delivered by the Energy Saving Trust and Highlands & Islands Enterprise. www.est.org.uk/scri or www.hie.co.uk/community-energy.html. For advice and application assistance in Highlands and Islands contact:-

Inverness and Nairn Enterprise Moray Badenoch and Strathspey Enterprise
Eric Dodd, CEU Manager
Eric.Dodd@hient.co.uk Tel 01463 234 171
Highlands and Islands Enterprise, Cowan House, Inverness Retail and Business Park, Inverness IV2 7GF

Caithness and Sutherland Enterprise
Ross and Cromarty Enterprise
Jon Priddy
Jon.Priddy@hient.co.uk Tel 01408 635 102
Caithness and Sutherland Enterprise, Station Road, Golspie, Sutherland KW10 6SN

Lochaber, Skye and Lochalsh
Robert Lees
Rab@alienergy.org.uk Tel 01397 704 326
Allenergy, Lochaber Enterprise, St Mary's House, Gordon Square, Fort William PH33 6DY

Shetland
Sandy Macauley
Sandy@smpower.shetland.co.uk
Tel 01957 711 838
SM power Services, Hagdale Industrial Estate, Baltasound, Shetland ZE2 9DS

Orkney
Sam Harcus
sam.harcus@orkney.com Tel: 01857 677790
Westray Development Trust Cotterochan, Westray, Orkney

Western Isles
Henk Munneke
Henk.Munneke@hient.co.uk Tel 01851 707 343
Western Isles Enterprise, St James Square, 9 James Street, Stornoway, Isle of Lewis HS1 2QN

Where to go for further information

Argyll and Islands
enquiries@alienergy.org.uk
Tel 01631 562 125
ALIenergy, Kilbowie House, Gallanach Road, Oban PA34 4PF

The Scottish Executive's energy efficiency website has information on grant applications for the "Scottish Clean Energy Demonstration Scheme". www.energy-efficiency.org

Scottish Ecological Design Association (SEDA) is a voluntary organisation of professional members that advocates ecological design, providing information, advice and raising awareness through events, site visits, study tours and publications. It is compiling a Directory of Members which should be ready by June 2004. It is also working to establish a web gateway on sustainable design and building materials. Contact Gill Pemberton, SEDA Membership Secretary, The Library Wing, Abbey St. Bathans Duns, Berwickshire TD11 3TX. E: seda@freezone.co.uk and www.seda2.org

Scottish Natural Heritage is a Non-Departmental Public Body that works with Scotland's people to promote the care and improvement, appreciation, and sustainable use of Scotland's natural heritage now and for future generations; more information is available at http://www.snh.org.uk

Shell Better Britain Campaign - Although currently closed, this programme supports sustainable community action by awarding grants to local groups and innovative research projects. A new programme is expected to be launched in Autumn 2004; more information is available at www.sbbc.co.uk

Solar Century is a commercial company set up to promote the use of, advise on and install solar photovoltaic energy systems. www.solarcentury.co.uk

Sustainable Communities Network Scotland (SCNS) is a charity founded in 1998 to promote the development of sustainable community projects in Scotland.
E: info@scns.org.uk Tel: 0131 557 8611
www.scns.org.uk

UK Solar Energy Society (UK-ISES) provides comprehensive links to solar and renewable energy websites through its own website, SOLEIL (**S**ustainable **O**n-**L**ine **E**nergy **I**nformation **L**isting). The site is maintained by Oxford Brookes University.
www.brookes.ac.uk/other/uk-ises/soleil.html

Wind Energy Network promotes wind energy projects across the UK. E:
enquiries@windsupporters.net
Tel: 0870 1343430 www.windsupporters.net

Technical References

Designing for Sustainability in the Highlands: The Highland Council's Draft Development Plan Policy Guidance on Sustainable Design, available from the Council's Planning and Development Service.

The Real Green Building Book. Free with AECB membership (see Useful Contacts). An excellent Directory, listing and summarising activities of all members of AECB across building trades, professions and suppliers.

Green Building Products and Services Directory. Hall, K. and Warm. P. 4th Edition. Published by the Green Building Press, Nant-y-Garreg, Saron, Llandysul, Carmarthenshire, SA44 5EJ

Green Building Handbook. A guide to building products and their impact on the environment. 1st Edition 1997. Published by T J International, Padstow, Cornwall.

Where to go for further information

***Scottish House**, Gaia Research, 2001.* A review of recent experience in building individual and small groups of houses with a view to sustainability, the use of traditional and new materials, and innovative design. Published by The Stationary Office, 71 Lothian Road, Edinburgh (tel. 0870 6065566) and available to download off the Scottish Executive's website: http://www.scotland.gov.uk/cru/kd01/orange/shar-00.asp

Timber Cladding in Scotland, Davies, I., Walker, B., Pendlebury, J., 2002. ARCA Publications Ltd. ISBN 1 904320 00 7. Technical information on the sustainable use of external timber cladding in construction that is specifically relevant to Scottish conditions. Available to download off the Scottish Executive's website: http://www.scotland.gov.uk/library5/housing/tcis-00.asp

Sustainable Housing Design Guide for Scotland. Stevenson, F and Williams, N, 2000, prepared for *Scottish Homes* (now *Communities Scotland*). Guidance for housing providers on dealing with specific issues of sustainability and housing. A web version is available on the following website: http://www.official-documents.co.uk/document/deps/cs/shdg/index.html

Sources of Community Support

Councils of Voluntary Service located throughout the Highlands, providing local advice on all aspects of running a voluntary organisation and developing projects.

They may also be able to put you in touch with your local Federation of Village Halls. The most up to date contact details are available at : http://www.cvsscotland.org.uk/locations/index.htm

Local Enterprise Companies located through out Highland, provide support and funding for community organisations. The most up to date contact details are available at:
http://www.hie.co.uk/Local-Enterprise-Companies.htm

Inverness and Nairn Enterprise Community Toolkit website covers advice on a number of relevant areas: click on Enter Site; select 'Information'; select 'Advice Notes Index' – and you will be offered a drop-down menu of topics (includes Working with Consultants; Feasibility Studies; Business Planning, Bid and Application Writing; Fundraising) *www.communitytoolkit.org.uk*

Skye and Lochalsh Community Toolkit provides useful web-based information on Project Planning (community consultation, feasibility studies and business planning). Other relevant sections to browse include Fundraising, Organisational, and Good Practice (select Community Halls) www.slcvo.org.uk/toolkit

The Scottish Council for Voluntary Organisations (SCVO) produces a number of publications and provides advice on all aspects of setting up and running a voluntary organisation in Scotland including:

The Brass Tacks – Guidance Notes for 21st Century Halls: managing community projects'. *Scottish Council for Voluntary Organisations, 2000. www.scvo.org.uk*

Examples of best practice in sustainable construction

MAKE BEST USE OF THE SITE

Astley Hall, Arisaig, Lochaber:
This village hall is a listed building that was recently repaired, upgraded and extended by Simpson & Brown Architects. Substantial improvements in energy efficiency were achieved through the introduction of insulation to the walls and roof. Other sustainable design features include the use of homegrown timber for external cladding to the new extension. Work was completed in 2001.
http://www.simpsonandbrown.co.uk/

Birnam Institute and Beatrix Potter Centre, near Dunkeld:
This redevelopment was designed by MacMon Architects to complement the existing building and local town environment. Its most striking feature is the timberclad extension, which contrasts with the Victorian stone and slate of the original building, connecting the two with a fully glazed link. New foyer, café arts workshop, mezzanine gallery and multi-purpose hall have been created.
Birnam Institute, Station Road, Birnam, DUNKELD, PH8 0DS
Tel: 01350 727674
Email: admin@birnaminstitute.com http://www.birnaminstitute.com/contact.htm

National Trust for Scotland Visitor Centre, Glencoe:
This Visitor Centre was designed and constructed to have minimal negative impact on the natural environment. The site has a wastewater management system designed to support and enhance biodiversity. To minimise disturbance to the ground below, the timber frame walls are suspended on a framework of steel beams, which rest on concrete pad foundations. 'No go' areas were established during the construction phase to prevent building activity, storage and traffic from harming nearby wildlife, plants and habitats. Other sustainable design features include the use of locally-sourced woodfuel for heating. Fuel consumption is minimised by high standards of insulation and energy efficiency. All timber used in the construction of the building is home grown and free of preservative treatment. This includes softwood for the timber frame and exterior cladding, oak for windows and doors and sycamore for flooring. Windows and doors were manufactured in the Highlands. Construction work was completed in 2002.
www.gaiagroup.org/Architects/Glencoearticle web.pdf - detailed article
www.gaiagroup.org/Architects/tourism/Glencoe/index.html - short summary

Assynt Community Sports Centre, Lochinver, Sutherland:
Assynt Leisure, a registered charity, commissioned Gaia Architects to carry out a feasibility study on the potential to provide an indoor sports, recreation and general community facility for the local community, which is spread across a wide geographical area. The building was designed by Gaia Architects within tight site constraints, applying the principles of: flexibility and adaptability; quality and durability of specification; energy conservation and efficiency incorporating passive solar design; accessibility for all; high standards of indoor air quality; minimising the negative impact of the development on the wider environment. http://www.gaiagroup.org/Architects/sport/assynt/index.html

Examples of best practice in sustainable construction

USE LOCALLY-SOURCED/ SUSTAINABLE MATERIALS

RSPB Osprey Observation Post, Loch Garten, Strathspey:
This bird observation centre designed by Bell Ingram Ltd makes use of homegrown softwood for all structural timber, external cladding and roof shingles. Located on an artificial island in a bog that is highly sensitive to changes in ground water levels, the centre was designed to avoid adverse environmental impact from drainage installation. Apart from rainwater disposal, drainage was avoided through the use of composting toilets. The centre was completed in 1999.
Tel: 01479 821409
Tourist info: 01479 810363
E-mail:abernethy@rspb.org.uk

Field of Dreams, Findhorn Foundation, Forres, Morayshire:
The Findhorn Foundation is a community that has developed approximately 50 private houses in the period since the 1970s to achieve a large-scale demonstration of ecological building practice. The buildings demonstrate widespread use of timber-clad, timber frame construction and some examples of alternative methods such as straw bale and "earthship" construction. Locally sourced materials and suppliers are used where ever possible.
http://www.ecovillagefindhorn.com and select 'ecological building'

MINIMISE ENERGY USE AND MAKE BEST USE OF RENEWABLES

Kinlochleven Community and Sports Centre, Lochaber:
This centre, designed by Gaia Architects, comprises a main hall, and changing facilities, a Learning Resource Centre for the University of the Highlands and Islands, snooker room, fitness suite, kitchen and several general purpose community rooms. It demonstrates very high standards of energy efficiency and is heated entirely by locally-sourced woodfuel, making it "carbon neutral". A sweeping roof light in the slate roof brings daylight into the centre of the building. Dynamic insulation is used throughout, whereby air is drawn into the building through a permeable insulation layer in order to recover heat that would otherwise be lost by conduction. Natural paint finishes are used internally. The centre was completed in October 2001.
www.gaiagroup.org/Architects/sport/kinlochleven/index.html

Hofn Youth Centre, Westray, Orkney: This award winning community centre is primarily used as a drop-in for, and managed by, the young people of Westray. A wind turbine has been installed to generate power to meet the majority of the building's heating requirement.
http://www.hie.co.uk/community-energy.html and click on pdf file at bottom of page.

Examples of best practice in sustainable construction

Bettyhill Swimming Pool, North Sutherland: This swimming pool is run by a local community company, Tongue and Farr Sports Association Ltd, and is supported by The Highland Council. The facility is well used by the local community and visitors, with around 10,000 users/year. The building was recently converted to a biomass (wood fuel) heating system, replacing an expensive oil-fired system with renewable energy for both swimming pool and space heating needs. Despite the building's remote location, it has been possible to source adequate supplies of wood fuel. The oil-fired boiler has been retained as a back up.
http://www.energy-efficiency.org/casestudies/sceds/biomass.jsp and select the Bettyhill case study.
Jim Johnston, Tongue and Farr Sports Association
Tel: 01641 521217
E-mail: JJohn20432@aol.com

Ardross Village Hall, Easter Ross: This new-build village hall was designed by David Somerville Architect and constructed on the site of the old hall. It combines passive solar design with active solar heat collection through roof panels, to optimise energy use.
David Somerville. E-mail: somerville.abriachan@btinternet.com
http://www.network-21.info/htm/pdf/Ardross%20Village%20Hall.pdf

McLaren Community Leisure Centre, Callander, Perthshire: This community sports facility by Gaia Architects is an example of the large-scale use of healthy materials and a unique method of energy efficient ventilation that results in a fresh and healthy indoor environment. As for Kinlochleven Community and Sports Centre (3.1), dynamic insulation is used throughout, whereby air is drawn into the building through a permeable insulation layer in order to recover heat that would otherwise be lost by conduction. The centre was completed in 1998.
http://www.gaiagroup.org/Research/RI/DI/
http://www.gaiagroup.org/Architects/sport/mclaren/index.html

DESIGN TO CONSERVE WATER

Loch Garten RSPB Visitor Centre, Speyside – visitor facilities include composting toilets and waterless urinals (see previous entry).

Abriachan Forest Trust, Inverness-shire: A composting toilet and reed bed were recently installed as part of community-led developments to encourage visitors to use and take and interest in the local woodland (see entry below).
Contact David Somerville. E-mail:somerville.abriachan@btinternet.com

ENVIRONMENT-CONSCIOUS WASTE DISPOSAL

Gatliff Hebridean Youth Hostel Trust, South Uist:
Living Water designed a wetland for this hostel for the treatment of septic tank effluent.
http://www.livingwater.org.uk/client.asp

National Trust for Scotland Visitor Centre, Culloden Battlefield, Inverness: Living Water designed a wetland treatment system for sewage from the café and Centre facilities.
http://www.livingwater.org.uk/client.asp

Examples of best practice in sustainable construction

EXAMPLES OF COMMUNITY WOODLAND PROJECTS

Sgoil na Coille, Sunart Oakwoods Initiative (SOI), Lochaber:
Sgoil na Coille was constructed as part of the SOI's rural development programme to provide some degree of shelter for woodland education classes and workshops. The building is an open-sided structure made of local larch that uses the round pole construction method. Removable wall panels may be added later.
Jamie McIntyre, Project Manager (Forestry Commission)
Tel: 01967 402165
www.sunartoakwoods.org.uk/ruraldev/woodschool.htm

Milton Community Woodland Trust, Easter Ross:
A purpose built log-building is planned for the Milton Community Woodland, constructed from local timber. This building will provide a venue for display of information on the woodland, storage of tools, and woodland related workshops.
http://www.nhft.org.uk/milton.htm

Abriachan Forest Trust, Inverness-shire:
This community-owned and managed woodland offers facilities for locals and visitors. A number of small wooden buildings have been constructed to complement woodland footpaths and car parking with BBQ stands, all led and developed through community participation. These include tree houses, a bird hide, and a composting toilet.
George Hawco, Chair, Abriachan Forest Trust
Tel: 01463 861257
E-mail: g.hawco@btinternet.com
www:http://members.tripod.com/Abriachan

Subject guides

The following guides provide further information on the issues covered in the main text.

Guide 1: Key considerations for sustainable design in a community construction project

Principle	Aim and Practical Application
1. **Meeting Community Needs**	■ Ensure active participation by the community in the design and management of the building project. ■ Ensure that the building is well used and financially sustainable by making sure it can be used by all sectors of the community, both now and in the future. ■ Support the local economy by sourcing materials and employment locally where possible.
2. **Working with the Highland Landscape & environment**	■ Ensure that the building location and design protects natural and archaeological heritage and minimises adverse impact on landscape, natural habitats and species. ■ Link to local features, enhance biodiversity, and encourage access to and enjoyment of heritage. ■ Ensure durability of construction in the Highland climate, taking account of conditions becoming wetter and warmer in the future as a result of climate change.
3. **Providing Access for All**	■ Accommodate access and usage needs of all types of user group, exceeding legislative requirements, so the whole community can benefit and the building is fully used. ■ Encourage sustainable transport use, making access easy by foot, cycle and public transport.
4. **Healthy Buildings**	■ Ensure that the building design minimises the use of noxious materials and provides high environmental standards for its users in terms of air quality, ventilation, heating, lighting and acoustics.
5. **Minimising Energy Required in Construction**	■ Re-use buildings or land where the opportunity arises. ■ Use efficient construction methods that minimise the energy used in material manufacture, transportation and installation (referred to as "embodied energy"). ■ Design out and manage waste produced by the construction process.
6. **Use of Sustainably Produced Construction Materials**	■ Source materials as locally as is practical, thereby decreasing the environmental cost of transport. ■ Maximise the use of materials with low environmental impact e.g. materials that are recycled, reused, renewable or unprocessed. ■ Maximise the use of sustainably produced materials e.g. homegrown or certified timber (not all homegrown timber is certified, but virtually all is managed sustainably due to the high standards of regulation in the UK forestry) ■ Avoid the use of materials that release CO_2, acid gas or CFC during manufacture ■ Avoid materials that release ("off-gas") toxic chemicals during their lifetime e.g. certain paints, carpets and floor coverings.
7. **Minimising Energy Use in Building Operation**	■ Ensure that design makes best use of passive solar features in the aspect and orientation of building. ■ Examine "Whole Life Costing" at the design stage:- analysing not only construction costs, but the maintenance and running costs over the life of the building; and the cost of demolition/ disposal of materials at the end of the building's useful life. ■ Select efficient systems that can be controlled to minimise energy wastage and costs. ■ Insulate the entire building to standards well in excess of those set by the Building Regulations. ■ Make use of a renewable energy source for part or all of the building's energy requirements.
8. **Minimising & Managing Waste Sustainably**	■ Reduce water usage and make use of water recycling. ■ Maximise the recycling of day to day waste (e.g. from catering and activities in the building) by incorporating on site recycling facilities such composting facilities and storage for segregated waste. ■ Consider environmentally sound alternatives to soakaways for sewage disposal.

Guide 2: WHO, WHAT & WHEN: An overview of steps in creating a sustainable community building

NOTE: the following table is merely intended as a guide - your design team may suggest some variation.

KEY: Who is responsible for input at different stages

* Points at which Key Sustainability Issues/Decisions arise

PROJECT DEVELOPMENT STAGES	Community Client	Architect	Landscape Architect	Surveyor/ Engineer	Quantity Surveyor	Building Contractor
Community Needs Assessment and Profile	*					
Establishing an organisation to manage the project						
STAGE1: GETTING STARTED: THE BUILDING FEASIBILITY STUDY						
Developing the Project Brief	*					
Selecting an Architect with sustainability credentials	*					
Site Selection and Best Use	*	*	*	*		
Meeting Essential Planning Requirements						
Indicative Costs and sustainability cost choices	*	*			*	
Funding sources for sustainability aspects						

Guide 2: WHO, WHAT & WHEN: An overview of steps in creating a sustainable community building

PROJECT DEVELOPMENT STAGES	Community Client	Architect	Landscape Architect	Surveyor/ Engineer	Quantity Surveyor	Building Contractor
STAGE 2: DEVELOPING YOUR PROPOSAL: THE SCHEME DESIGN STUDY						
Healthy and Comfortable Buildings	*	*				
Construction methods	*	*	*	*	*	
Use and Specification of Sustainable Materials	*	*			*	
Energy System Options	*	*				
Minimising waste water and managing sewage	*	*	*			
Access for All and Parking	*	*	*			
Planning consent						
Building Control/Warrant						
STAGE 3: CONSTRUCTION AND COMPLETION						
Preparation of Tendering Contract Documents						
Tendering building contractors						
Letting the Contract						
On Site Management	*	*				*
Project hand-over, snagging and building maintenance issues						

Guide 3: Key issues in site selection and making the most of your site

New build vs. re-use of existing buidings

Re-use of existing buildings, and consequent use of existing service infrastructure, can offer savings in comparison with a new build. A concept know as Whole Life Costing calculates the cost of a building over its lifetime, including hidden costs such as:-

- Energy stored in the existing building and its materials (energy used in manufacture, transportation and installation - referred to as "embodied energy").
- Demolition costs and location of disposal of the debris.
- The degree and efficiency with which sustainability aspects can be incorporated into the old building in conversion and extension. For instance a re-used building may be less energy efficient than a new build.

A new build in an urban or rural location offers the potential for maximum use of the latest sustainable concepts in design, construction and operation – but may not present the most sustainable, efficient overall solution once the above factors have been accounted for. If you face a choice of re-use or new build, your architect can advise on these issues.

Value Added Tax (VAT): The cost implication of VAT is also a major consideration in the decision to re-use or build new. The current tax regime is not sustainability-friendly: VAT is not charged on any new-build construction costs (materials and contractors) but all refurbishment/ re-use costs attract VAT at 17.5% and a building extension is VAT-exempt *only* if it is considered to be "stand-alone" annex. As a general guide, if a refurbishment costs more than two thirds of the comparative new build, it is usually more cost and energy efficient to go for new build.

Brownfield vs. Greenfield Sites

Brownfield sites usually consist of land of low ecological value, where there has been previous development such as buildings or industrial activity. Planning and sustainability principles generally favour the use of brownfield sites because they make use of existing services and infrastructure, are likely to have provision for public transport access, and are often suitable for mixed-use developments because they are commonly close to other developed land. A brownfield site may be redundant and causing an eyesore in which case its redevelopment can support regeneration. Care should be taken to check out any possibility of ground contamination.

In the Highlands, however, brownfield sites are not widespread outside small urban settlements, and new development tends to take place on **greenfield sites** by default, especially in rural areas. Where development is necessary in the countryside, planning preference is for in-fill, extension or conversion of existing buildings. If a greenfield site is the only option, it should be readily serviced by public transport.

Guide 3: Key issues in site selection and making the most of your site

Safeguarding and enhancing wildlife habitats, species and plant life

Sites of environmental importance and special interest are protected by statutory designations (eg Sites of Special Scientific Interest (SSSI)), that place constraints on development. At an early stage you need to check whether any potential sites you have in mind are not high natural or archaeological heritage value. **To do so contact your local Highland Council Planning Officer.**

The building should be designed to have minimal negative impact on the surrounding environment, including the ground that it will stand on. For example, The National Trust for Scotland Visitor Centre at Glencoe in Lochaber has been built on stilts to minimise the need for earthworks on a sloping site, and also to minimise negative impact on the natural environment.

Although initially a construction site, with appropriate preparation your project can be designed to stimulate biodiversity, as well as minimise negative impact on landscape and habitats. Reference to Local Biodiversity Action Plans (LBAPs) can assist you to take an ecological approach to landscape design, planting and other features in the area surrounding your building. Eight LBAPs have been prepared for the Highlands and are available for reference at The Highland Council Service Points and libraries. The Highland Council's draft Planning Guidance *Designing for Sustainability in the Highlands* contains advice on how to safeguard and enhance biodiversity in the development of a building project.

Efficient approaches to site development and landscaping

Disposal of discarded earthworks from a site is expensive, especially in west coast locations and rock subsoil is costly in energy and cash to extract. During the feasibility phase, a level survey by a professional surveyor and the use of trial pits by the structural engineer to assess sub-soil conditions will help avoid hidden costs and plan for sustainable disposal of excavated materials.
During the construction phase, work on the site should be planned and managed to minimise "site intervention" i.e. the level of physical disruption and soil works on the site. One option is to consider a building on stilts which can compensate for site slope, rather than excavation. The need to dispose of excavated materials from foundations should also be minimised by their re-use for infill, car parking surfaces or landscaping.

Public access routes

Current figures show that transport is responsible for almost one third of the UK's CO_2 emissions. Site selection should provide the best possible links to public transport to discourage personal car use where possible – e.g railway station in walking distance, bus stop nearby, access by dedicated cycle routes. These considerations become more difficult in rural settings where car dependency is high, but should still be incorporated into plans where possible.

Guide 3: Key issues in site selection and making the most of your site

Building orientation

Sustainability opportunities are optimised by well thought out positioning of the building to take account of the site's microclimate. This can maximise the benefit of fine weather and offer protection from adverse weather, which will reduce energy consumption and improve the durability of the building fabric. Overhead obstructions and shading by trees and adjacent buildings will limit the potential to use some renewable energy technologies (e.g. limit solar efficiency / prevent the installation of turbines).

Consider the following:

Passive solar gain
Good design of the orientation and glazed area of the building will make a significant contribution to space heating, allowing sunshine to heat up your rooms through the windows. This is referred to as "passive solar gain". It can be maximised through the design of appropriate roof and window proportions and through orienting glazed areas towards the south as much as possible. Aspect will also be important for the efficient siting of solar panels or photovoltaic units (solarPV) to maximise the supply of renewable energy. Shading of low-angled winter sun by coniferous trees or buildings should be avoided.

Shelter and prevailing winds
Siting a building in the shelter of a landscape feature (e.g. a hillside) can provide protection from prevailing winds and hence, some passive insulation. Existing trees or new planting can be used as windbreaks/shelterbelts. This has the added advantage of protecting the building exterior, to some extent, from weather deterioration. Avoid naturally cold sites – frost pockets and hill tops. The orientation of the building within the site is also a consideration for ventilation control.

Maximising daylight use
Use of natural daylight in the building is both good for the health of the occupants and cuts down on energy consumption for lighting. This can be achieved by good design – both orientation of the building and positioning of windows. Use of skylights and sun pipes can also enhance light penetration into other parts of the building. A sun pipe transmits daylight from roof level to the interior of a building via a tube that uses mirrors and other reflective devices.

Guide 4: Some construction approaches that you may come across

Construction Method	Application and Comments
Timber frame	A 'lightweight' construction approach using timber as the structural frame for walls, floors and roof. Specify timber from a sustainably-managed source. Sustainability can be increased by combining this construction method with timber cladding for the external walls, rather than conventional cement harling.
Steel frame	A similar 'lightweight' method – although high levels of "embodied energy" are used in the production of steel. Embodied energy is the energy used in extraction, processing and transportation of a building material or method. In steel frame construction, embodied energy is less if the frame is made from recycled steel. Can also be combined with timber cladding.
Cladding	Cladding usually refers to the outside envelope of a building whose structure consists of a timber, steel or concrete frame. It carries no load and is a protective and decorative envelope for the structural frame. Cladding materials include metal sheets, pre-cast concrete slabs, uPVC, tiles, masonry and timber.
Timber cladding	Timber cladding is not extensively used in Scotland but its use is increasing, driven by aesthetic and sustainability benefits. There is considerable potential to use homegrown timber as a renewable cladding material, adding value to Scotland's forest resource and sustaining local jobs. The sustainability, lifespan and maintenance costs of timber cladding will depend on how it is specified and constructed. For example, appropriate choice of timber species, durability and construction details can ensure that toxic timber preservative treatment is not necessary.
Raising the building above the ground	The whole structure of the building can be raised off the ground, effectively on 'stilts'. This ensures minimum disturbance to the ground and its waterways by avoiding extensive earthworks - useful on a sloping site where excavation would otherwise be required to provide a level base for construction. Boardwalks can be used for access, although this can be expensive and is likely to require maintenance.
Round Pole	This method uses a framework of whole stems (trunks) of conifer trees, which are sometimes bent into the shape of the frame. Suitable for small buildings e.g. chalets, sheds and small barns.
Greenwood	Construction with 'green' (undried) timber – usually to form a structural frame known as "post and beam". This dries out slowly in situ tightening the joints in the frame by natural shrinkage. 'Green' timber is also used for external cladding.
Straw bale construction	At present, the use of straw bale construction for major buildings is uncertain, as durability, structural safety and fire risk need further research. Nevertheless Scotland's first straw bale house was completed at The Findhorn Foundation, Morayshire, in 2002. Planners and building control officers are often wary, however, of large scale use of this method. Potential for small-scale use of these materials could be demonstrated in a bicycle shed, garden shed, garaging for vehicles etc.
"Earthship" design	This is the use of recycled car tyres, bottles and cans as main construction materials. Many of the issues that limit the use of straw bale construction (above) also apply to this method.

Guide 5: Some sustainability issues to consider when specifying your building materials

Materials	Application and Comments
Traditional "heavy weight" materials (concrete, cement, bricks, stone etc)	■ Concrete, cement and bricks demand high-energy input in manufacture and transportation, which is often far from the site. They also have low recycling potential at the end of the building's life. Minimising their use will improve the sustainability of a project. For example, avoid over-specification of concrete foundations etc, where these are necessary.· ■ The use of locally-sourced stone will minimise the environmental cost of transportation and bring benefit to the local economy. ■ Where possible re-use stone from other buildings- this has extra sustainability value and may enhance the visual and textural quality of your building. ■ Where possible, make use of local demolition materials for ballast, infill or hard-core.
Timber - for frame construction, cladding and internal finishes	■ Timber is a renewable construction material and providing it comes from a sustainably managed source, is one of the most sustainable building materials available in Scotland. Aim to source timber as locally as possible, to minimise transportation and support local businesses and employment. ■ Most homegrown timber is now independently certified as coming from a sustainably-managed source. The current exception is home grown hardwoods, although this absence of certification should not act as a deterrent. Forestry Commission Scotland uses strong regulatory frameworks to control timber harvesting and many sawmills can provide direct assurance that their logs come from a sustainably managed source. ■ Avoid the use of tropical hardwood. Where possible use a temperate hardwood or softwood substitute. Only use tropical hardwood that comes from an FSC certified source (Forest Stewardship Council). ■ Specify plywood or other building boards that **do not** contain tropical hardwood. ■ Where possible use reclaimed timbers - these have extra sustainability value and may add visual interest. ■ Specify naturally durable timber species for cladding such as larch, oak or sweet chestnut, or alternatively, take appropriate steps in the detailing, specification and construction of non-durable species (eg spruce).
Timber preservatives (commonly used to prevent/suppress fungal growth and insect attack during the life of the building)	■ Virtually all timber preservative treatments contain chemical formulations that are increasingly being classified as toxic waste. These chemicals pose a threat to workers during processing and to the environment on disposal (eg as construction / demolition waste). As far as possible the use of timber preservative treatment should be avoided. ■ Investigate alternatives to preservative use with your architect. ■ Minimise the need for timber preservatives by good detailing, including the use of natural ventilation to maintain adequately low moisture content in timber.

Guide 5: Some sustainability issues to consider when specifying your building materials

Materials	Application and Comments
CFC-based materials and systems	■ Chlorofluorocarbons (CFCs) are chemicals used in the manufacture of aerosol sprays, blowing agents for foams and packing materials, as solvents and refrigerants, and in some fire prevention systems. CFCs contain ozone-depleting chemicals that may contribute to global warming. Their use in buildings should be avoided.
PVC-u	■ PVC-u is commonly used in the UK for wire cabling, window and door frames, and drainage pipes. PVC-u products are believed to release toxic chemicals to the environment during both manufacture and disposal. There is significant debate about the safety of PVC-u in construction, both in terms of the health of building users and its eventual disposal through landfill or incineration. It has already been banned by several European countries. ■ Use alternative products to PVC-u, e.g. clay drainage pipes, Econet wood-based products for trunking and cabling.
Paints and glues	■ Many paints, varnishes and glues contain solvents that release volatile organic compounds (VOCs) to the atmosphere on evaporation. These can harm the health of both the worker applying them and the building user. ■ All timber panel products with a high glue content (eg chipboard, mdf, plywood) contain toxic chemicals. ■ Use paints, stains and washes that are solvent and lead-free. Water based alternatives and paint products with low environmental impact are available. ■ Wherever possible, substitute solid timber for timber panel products.
Insulation materials	■ When selecting your insulation material, remember that longevity and the ability to maintain a high performance throughout its lifetime is its most important characteristic. ■ Discuss options with your architect. A range of low impact, renewable insulation materials are available:- - Sheep's' wool has high ability to absorb and release moisture – it can absorb up to 30% of its dry weight with no noticeable reduction in performance. Its use could potentially provide an additional market for wool, thereby supporting the sheep farming industry. Sheep's' wool is currently more expensive, however, than most other insulation materials. - Recycled newspaper (e.g. Filicrete Warmcel 500) has a good degree of breathability, is readily available and generally affordable. - Other sustainable alternatives include flax slabs, boards and blankets or liquid made from recycled newspaper with jute, (for spraying into difficult areas).

Guide 6: Design checklist to minimise energy use and wastage

Design features to minimise heat loss

Control of airflow	■ Fit draught-proofing to doors. ■ Reduce the temperature gradient between inside and outside by use of buffer zones eg. porch or foyer ■ Consider using automatic door closure devices. ■ Try to minimise the number of doors in use. ■ Where frequent access is required through doorways, consider installing plastic strip curtains or fast opening/closing doors.
Insulation standards	■ Use high levels of continuous insulation to all external surfaces. Significant cost reductions in space heating can be achieved by insulating roof, floor and walls well beyond the levels set in the Building Regulations. Applying this "spend-to save" principle at the outset will have a substantial impact in minimising the running costs of the building, which is a key consideration for many communities. ■ Roof spaces should be insulated appropriately to a minimum depth of 150 mm/ 6 inches. Floor insulation should be installed during construction of all new buildings, including sealing of gaps between floorboards to prevent draughts. Wall insulation should be thickened at locations where radiators will be placed. ■ Select insulation products that are CFC-free with no effects of "off-gassing". (See guide 5).
Window design	■ Use glazing configurations with very low heat loss specification (ie. double and triple glazing), a large air gap and low emissivity (Low E) glass. Cavities can also be filled with gas. Although double glazing saves energy, installation costs are high in comparison with the annual cost savings realized. Savings are higher if windows are specified for very low heat loss. ■ Consider windows that can be opened in a number of directions, maximising flexibility to aid summer ventilation whilst protecting occupiers from drafts. ■ Window-to-wall ratios should not be excessive and thermal characteristics (known as U-values) should exceed levels set out in the Building Regulations. ■ Window design should give flexibility of building use and strike a balance between daylighting, ventilation, solar gain in summer, solar gain in winter, conduction loss in winter, noise control, general floor, wall and roof insulation levels, views out, privacy, appearance and security.
Energy control systems	■ Separate electricty meters could be installed for discrete facilities within the building that are to be hired out (e.g. meeting hall, computer suite) to ensure you can measure and charge for use appropriately. ■ Any requirement for close control of correct temperature and humidity for specific spaces within the building must be identified at the design stage eg. for IT rooms, museum spaces etc. Such areas should be separately controlled to achieve their specific performance requirements. ■ Specify appliances (fridge, cooker etc) that have maximum energy efficiency ratings under the EU Energy labeling system.

Guide 6: Design checklist to minimise energy use and wastage

Design features to minimise heat loss

Space heating	■ Underfloor heating (transmitted via a series of underfloor pipes) presents a significant advantage for meeting halls and auditoriums by freeing up wall space that might otherwise have been occupied by radiators. Used in conjunction with high levels of insulation, it is economic to run and can supply useful "round-the-clock" background heating, ensuring that the building is warm enough to use at all times. Underfloor pipes will not interfere with the installation of a sprung floor for dancing. ■ Where radiators are used, ensure that they are correctly sized and placed where heat is needed; increase wall insulation where radiators are located against external walls. ■ Fit an "intelligent" boiler management system to make efficient use of hot water and space heating.
Ventilation	■ Avoid mechanical ventilation and/or cooling systems (which require energy to power them) by designing for natural ventilation throughout, combined with passive control techniques (eg, opening windows, shading, orientation, thermal mass etc). ■ Manage ventilation carefully. Uncontrolled ventilation leads to high heat loss. For this reason, some sustainable buildings make use of air-tight construction combined with a mechanical heat recovery system (MHVR) that manages ventilation and recycles heat.
Water heating	■ Consider if a central boiler is needed; for instance, it is often more cost and energy efficient to deliver domestic water heating by point-of-use heaters.
Lighting	■ Specify energy efficient light bulbs and Compact Fluorescent Lamps throughout. These are 8-10 times as efficient as ordinary bulbs and last longer although initial cost is higher. e.g. a 100w bulb burning 5 hours per day is estimated to cost £12.50 pa compared to an energy efficient bulb at only £2.50 pa. ■ Specify lighting control systems that activate lighting when required, avoiding waste. Use a combination of local manual switching, timers, motion detectors and daylight sensitive photo-electic controls, to reduce energy use and costs. In addition, encourage a culture of people turning off lighting when not needed. ■ Use low pressure sodium lamps for external lighting for car parks and security, as these are the most efficient option available. The quality of the light colour provided is low, but adequate for these applications.

Guide 7: Renewable energy options appropriate for community buildings

Application and practical considerations	Local examples where the technology is in use
Solar Thermal system	
Gathers energy radiated by the sun through collectors mounted on the roof to directly heat fluids - primarily used for heating water. ■ An easy to install, relatively cheap option. A "must have" if this is the only renewables use you are able to incorporate in your design. ■ Low installation costs (@ £3-4k) with reasonable pay back period - small scale could potentially be fully funded via the SCHRI (see HIE Community Energy Unit in Where to go for Further Information). ■ The technology is well developed with a choice of equipment for many applications. ■ Generally comes with 10 year warranty and requires little maintenance. ■ Requires a conventional water heater to work in tandem. Could provide all hot water in summer and a contribution for the rest of the year. ■ Reduces CO_2 emissions by 0.25-0.5 tonne/yr depending on type of fuel replaced.	Mull & Iona Slaughterhouse. Ardross Millennium Village Hall
Photovoltaic Cells (PV)	
The cells convert light to Direct Current electricity, producing power during day light hours which can be stored in batteries for later use. ■ Can be used in very small scale applications through to integrated systems for offices/ public buildings. ■ Expensive to install for whole building system. Price depends on the size system and amount of electricity required. Grant funding is available from Energy Saving Trust, but not at 100%. ■ Long pay back period - up to 90 years. Therefore, highest cost-benefit is from small cell applications, which could receive assistance from SCHRI e.g. see examples:- street lighting, parking meters, power/heat a bio-digestor system for toilets without mains sewerage. ■ Valuable in remote locations with no mains electric, where a battery store is used. ■ Power use can be controlled by timer or movement sensor e.g. for security lights. ■ A high seasonal variation in power output means that back up power is ideally necessary e.g. with wind or conventional ■ Check planning requirements, especially for listed buildings and conservation areas. Usually installed on roof, although can be incorporated into wall design.	Bus shelter lighting in Shetland; combined with responsive sensor to activate lighting only when in use. Abriachan Forest Trust:- - to power playing of sound track recorded on small interpretive panels - to power the pump on the composting toilet Recent extension to Fortrose Academy, Fortrose Fishmarket, Wick

Guide 7: Renewable energy options appropriate for community buildings

Application and practical considerations	Local examples where the technology is in use
Single Wind Turbine	
A single turbine can be linked to a building to produce and store electricity - or to feed direct into storage heaters. ■ Knowledge of the local wind resource is critical to design, drawing on Meteorological Office Data etc; specialist input is usually required. ■ A suitable site for the turbine is required on or in close proximity to the building site. ■ Installation cost ranges from £5-25k depending on size and type. Easy to install. Low maintenance - turbine life up to 20 years. Potential to decrease electricity bill by 33%. ■ Particularly suited to off-mains-grid locations where a conventional supply is expensive to install. For off-grid systems, the size of the battery bank will determine how long applications can be run if there is no wind. Wind power is most commonly installed as part of a hybrid system, with a second tandem renewable source or mains/ fossil fuel supply. ■ Can be used in conjunction with storage heaters to provide a base level of heat to a community building. ■ CO_2 emission reduction is 5-6.6tonnes/yr for a 6kW system producing 12,000-15,000 units/yr. ■ Planning concerns include noise, safety and visual impact.	Two in Westray, Orkney (3KW and 6kW). One turbine supplies power to Scoraig school (Wester Ross) and a number of schools in Sheltland. One turbine provides intermittent power supply to households on the Isle of Muck
Small Scale Hydroelectric	
A mature and proven technology to produce and store electricity - 'micro' (under 100kW) hydro schemes suitable for local application. ■ Hydro costs are very site specific - and can be high. ■ Relies on the water source being close to site of power usage. Beware of droughts! ■ Useful in remote non-mains locations - where they generally produce a more reliable power supply than other renewable technologies. ■ Planning considerations: Abstraction License needed (SEPA) to set requirements to maintain river ecology; visual and noise impact from turbines (relatively easily overcome).	Isle of Eigg - Power supply to the Pier Centre, housing café, shop toilets and showers Community-owned hydro-schemes at Knoydart, Lochaber and Assynt, Sutherland
Biomass (also called bioenergy & biofuels)	
Energy from direct combustion of organic matter of recent origin to produce electricity and/or heat for space and water heating e.g. woody products, animal wastes or high energy crops burnt in boilers or stoves. ■ The capital cost of the boiler installation is significantly greater than conventional systems - however wood fuel prices offset this over time being very competitive compared to fossil fuels. ■ Wood pellets, chips or logs (of low moisture content) are usual fuel for small scale systems. Research the continuity of affordable/local biomass supply at the outset.	Bettyhill Swimming Pool, Sutherland Poolewe Swimming Pool, Wester Ross (at planning stage) Acharacle community office, Lochaber

Guide 7: Renewable energy options appropriate for community buildings

Application and practical considerations	Local examples where the technology is in use
■ Overall a biomass system is considered 'CO_2 netural' with net Zero Carbon emissions (carbon used in growing = carbon released in burning). However, this relies on the fuel supply being managed sustainably. ■ Use of the technology can support new jobs and enterprises in an area in forestry and chip processing or short rotation coppicing. ■ Planning issues include: storage space for fuel; fire safety regs; flue vent specifically designed for wood fuel appliance; smokeless zone.	Averon Leisure Centre, Invergordon, Easter Ross
Geothermal - using the temperature of the earth.	
Earth temperature a few metres below ground level stays constant at 11-12C throughout the year. This geothermal heat can be pumped into a building using a Ground Source Heat Pump (GSHP). ■ Can meet 100% of space heating requirements; usually only able to pre-heat domestic hot water - with a top- up heating source required. ■ Installation costs are cheaper if done during new build, as installation can be combined with other site earthworks. ■ GSHP can be cheaper to run space heating than oil, LPG and electric storage heaters, but is more expensive than mains gas. ■ Planning considerations: is under floor heating possible? (radiators can also be used); is there space and suitable ground material for the trench which will bury the ground loop?; what auxiliary heating will you use? ■ Environmental disadvantages are:- the use of mains electric is required to operate the pump (every unit used in pump produces 3-4 units ground heat) however this still produces less carbon emissions than a conventional boiler; also, refrigerants are used in the system.	Glenelg Community Hall, Skye & Lochalsh, has installed a GSHP in the new building to provide underfloor heating for all rooms in the hall New community centre at Glendale, Isle of Skye, Skye & Lochalsh
Green Electricity Tariffs	
Buying Green Tariff electricity from the mains means your electricity supplier is obliged to source an amount equal to the power you consume from existing renewable energy sources, through the mains grid. ■ Electricity is supplied to your building in exactly the same way - but is purchased by your supplier from a green electricity source such as hydro or wind farm. ■ You pay a premium for a Green Tariff, as generation from renewables is more costly, so your power is more expensive per unit to purchase (a few pounds per month - cost varies with supplier). ■ The benefit to the community is not highly visible, but this communicates to energy companies that there is a consumer preference for renewables. ■ When you buy 'regular' electricity, a small part will be from renewables, set by government targets and legislation which require energy suppliers to source a minimum percentage of the electricity they sell from defined renewables sources.	Glenelg Community Hall, Skye & Lochalsh, is purchasing Green tariff electricity to power the pump which drives the GSHP system

Guide 8: Sustainability pointers for water, sewage and waste management

Action	Savings and Constraints
Ensure installation of water meters.	Allows monitoring of water use and detection of leaks.
Specify toilets and urinals with low-volume flush (use lowest available); alternatively install smaller cisterns or water dams to reduce flush volumes.	Toilet flushing uses about one third of domestic water consumption.Low flush tends to be 2 litres per flush, as opposed to 4 litres, which is a considerable saving.
Use urinal equipment that does not require a constant flow of water: - install variable timing systems for automatic urinal flushing, or - install pressure-drop or occupancy detection sensors to link urinal flushing to use.	Rather than a continuous flush, urinals can be set to flush at 20/40 minute intervals (daytime) and twice per night/unoccupied time.
Specify taps that make efficient use of water; use spray heads or flow restrictors, or alternatively, percussion taps ("pressmiser"), which contain an adjustable flow restrictor. Fit showers with low flow heads.	Reduces water volume used per wash.
Fit plugs to sinks.	Reduces waste in running water.
Install a rainwater collection system to supply water for toilet flushing, washing machines and / or watering gardens.	Several proprietary systems are available to collect, treat and use rainwater. Water needs to be sterilised by a UV filter and topped up from mains during low rain fall. Pay-back period to recover costs can be prohibitive.
Waste "grey water" from sinks, showers and washing machines, with a relatively low level of contamination, can be recycled for purposes with a low quality requirement e.g. to flush toilets or for watering planted borders on site.	A number of systems are available that use grey water for toilet flushing. The cost of installing such a separate system needs to be offset against demand. Cost can be prohibitive. Water has to be filtered before re-use. More appropriate for larger buildings with greater volume and shorter throughput time than a small facilities with low volume and longer storage of grey water (with the knock-on hygiene considerations).
Careful consideration should be given to minimising the need to construct storm drains due to their high cost. Most relevant to new builds.	Minimising the amount of paved/tarmac paths/car parking areas allows rainwater to drain naturally into the ground. Car parking areas could be formed from deep graded aggregates allowing significant soakaway potential to be maintained whilst still giving a good surface.

Guide 8: Sustainability pointers for water, sewage and waste management

Action	Savings and Constraints
The use of constructed reed beds as an alternative to a soakaway to treat sewage on site may be an option if there is space for the reed bed. The system requires specialist installation, regular management and good explanation to nearby residents on their effective, smell-free and non-polluting nature.	Careful calculation needs to be made of the size of the reed bed and land area necessary, given the likely numbers of people using the building. Tricky in a refurbishment if no extra land. The rate of break down in the cool Scottish climate may make the system too slow to handle large volumes of waste created by a sizeable building.
Dry composting or long drop toilets can be considered in smaller buildings or as a stand-alone facility. Again, the system requires specialist installation and regular management.	Primarily suitable in rural locations, for low-volume use, where the required drop-height can be achieved. Provision of a safe on-site waste composting area requires more land. The compost produced could be a useful gardening resource on site. Local PR and information to residents and users required.
Include waste recycling facilities in the design.	Space should be allocated for storage facilities on-site to aid recycling measures; eg secure and hygienic containers for glass, metal, paper, organic materials. This could include a compost bin.

Guide 9: Access for all - design checklist

Physical considerations	■ Provision of entrance ramps, automatic doors, wide doors for wheel chair access. ■ Electronically pinned-back fire doors. ■ Low level public telephones for wheel chair users. ■ Easy access switches at low level for wheel chair users. ■ Disabled toilet facilities. ■ Lifts to upper floors to include braille inscription and voice messages.
Audio-visual considerations	■ Good levels of lighting for those with poor, deteriorating or partial sight. ■ Visual clues to floors; colour coding to enable people to know where they are. ■ Visual as well as audible fire alarm systems. ■ Braille maps of the building. ■ Installation of loop systems for those wearing hearing aids.
Transport mode	■ Provision of cycle parking (bike racks, covered bike sheds) to encourage bike use and enable children and non-car owners to access to building easily. ■ Some entrance pathways and car parking areas to be well surfaced to allow easy access by wheel chair users and those with mobility difficulties.

Guide 10: Sustainability tick list for community buildings

Summary

The **Sustainability Ticklist** is a series of tables that highlight key sustainability features of a building project under the nine aspects of sustainability listed below.

The Sustainability Ticklist is intended to help you:

- develop and maintain an overview of the key sustainability features of your project
- prioritise your sustainability goals and define the extent of your sustainability "mission"
- develop your project brief
- communicate with your design team
- communicate your sustainability aspirations to potential funding bodies.

The Sustainability Ticklist summarises a broad range of sustainability features, some of which may not be relevant to your project. It is recommended that you seek the assistance of your design team to complete the ticklist and to clarify any sustainability features listed that you are unsure about (particularly technical detail).

Sustainability Aspects	Tick below to confirm you have considered all relevant aspects in the attached lists
1 Site Selection and Use	☐
2 Building Surrounds and Grounds	☐
3 Construction Methods & Materials	☐
4 Energy Systems	☐
5 Lighting	☐
6 Access for All and Parking	☐
7 Water Management	☐
8 Waste Management	☐
9 Building Surrounds and Grounds	☐

* *Adapted from the SHN Green Scorecard - designed by the SNH Greening officer*

Guide 10: Sustainability tick list for community buildings

Tick list

1 Site Selection and Use

Indicator	Tick here
Re-use of existing building to good environmental standards	☐
Re-use of a site of low ecological value - eg brownfield site	☐
Site located close to Railway Station (within 15 mins walk)	☐
Good bus access - serving surrounding communities, partner bodies, customers (see tick list 6).	☐
Good cycle access via dedicated cycle routes (see tick list 6)	☐
Site not overshadowed or obstructed overhead (to accommodate renewable energy installation)	☐
Site can accommodate a sustainable waste-water treatment system	☐
Site chosen so that development will minimise negative impact on natural heritage	☐
Site chosen to avoid exposure to flooding, exessive frost and prevailing winds, and erosion	☐
Site chosen to take account of future climate change (warmer and wetter conditions)	☐

2 Project Brief and Design

Indicator	Tick here
Appoint architects with sustainability and environmental expertise	☐
High levels of insulation to roofs, walls, floors and windows, exceeding U-values (heatloss limits) set out in the Building Regulations	☐
Use of passive solar design	☐
Design to accommodate future climate change (warmer and wetter conditions)	☐
Design to minimise construction waste, eg using off-site pre-fabrication	☐
Design for ease of disassembly (and re-use of components)	☐
Extremely low electricity use (kWh/m^2/year within 'low consumption' bands).	☐
Extremely low water use (< 7.7 m^3/person/year)	☐
Natural ventilation for >80% of building	☐
Passive heating/cooling systems i.e. not driven by electricity	☐
Adequate natural working lighting for >80% of building	☐
Renewable energy system installed to provide electricity (Solar PV, Wind micro-turbine)	☐
Electricity submeters installed - eg for IT suite, day use for each part of building, night heating, night non-heating	☐
Rainwater collected and stored for "grey water" use	☐

Guide 10: Sustainability tick list for community buildings

Tick list

3 Construction Methods & Materials

Indicator	Tick here
Building materials have low "embodied energy" (energy used in extraction, processing and transportation)	☐
A significant proportion of building materials are from a renewable resource (eg timber that is sustainably managed)	☐
More than 10% of building materials are recycled (eg aggregate, stone, timber, blocks made from pulverised fuel ash (PFA))	☐
Building materials sourced locally to maximise benefit to local economy and minimise energy use in transport	☐
Insulation manufactured from renewable material that will perform well for the lifetime of the building	☐
Paints, varnishes, glues have low chemical content (eg absence of VOCs, heavy metal and other toxins)	☐
Window frames manufactured from sustainably sourced timber	☐
Timber and timber products carry FSC certification (or equivalent)	☐
All windows are double glazed using energy efficient glazing (low-E / low emissivity glass)	☐
All pipework is well insulated	☐
Natural floor coverings and fixings installed, eg solid wood, marmoleum, wool carpet (fixed with grippers, not glue)	☐

4 Heating and Cooling Systems

Indicator	Tick here
Heating system creates no CO_2 ("zero-carbon" system)	☐
Renewable energy heating system (eg woodfuel, ground source heat pump, electric from Green tariff)	☐
Condensing boiler used (if "wet" central heating system is installed)	☐
Electrical 'point of use' water heating installed, rather than boiler/immersion heater	☐
Timers to control all heating	☐
Thermostats to control all heating	☐
Any essential active cooling system does not use ozone-depleting substances	☐
Heat pumps & ducting used to recover and recirculate heat	☐
Solar Water Heating system installed	☐

Guide 10: Sustainability tick list for community buildings

Tick list

5 Lighting

Indicator	Tick here
Low energy light fittings installed throughout	☐
Motion and light level sensor switches installed in >60% of lighting	☐
Individual light switching installed	☐
Low energy sodium external lighting	☐
Motion and light level sensor switches for external lighting	☐
Fit skylights, sunpipes etc to reduce lighting demand	☐
Fit brise-soleil (canopies), tinted glazing, blinds etc to reduce glare	☐
Use task lighting (e.g.desk lamps) to reduce overall light demand	☐

6 Access for All & Transport

Indicator	Tick here
Covered and secure cycle parking	☐
Showers, clothing lockers & changing rooms installed for cyclists	☐
Collaboration with The Highland Council and cycling bodies to provide safe walking and cycle routes	☐
Collaboration with Highland Council and bus companies to alter bus routes and timetables as appropriate	☐
Clear visual/braille and audio interpretation of building layout, fire alarms etc.	☐
Permanent video conferencing suite/cam recorders installed	☐
Low level, easy access switches, handles (incl lever door handles), telephones etc. for wheel chair users	☐
Good level of lighting, avoiding glare, throughout building for those with deteriorating sight	☐
Step-free access around the entire site, with gentle gradients	☐
Slip-resistant floor finishes	☐

Guide 10: Sustainability tick list for community buildings

Tick list

7 Water Management *

Indicator	Tick here
Self-closing and spray taps (or equivalent) to minimise water consumption	☐
Low-flow urinal flush systems	☐
Equipment, eg dishwashers that are labelled water and energy-efficient	☐
Re-use grey water and/or rainwater	☐
Plumbed chilled drinking water (rather than bottled water delivered)	☐
Reedbed sewage treatment (or equivalent waste water management system)	☐
Water meters with submeters for large use areas of building	☐
Water butts to collect rainwater for grounds use	☐

* *Assumes that low volume cisterns will be installed, as per Building Regulations*

8 Waste Management

Indicator	Tick here
Provide adequate and accessible segration, storage and collection facilities for recyclates (paper, cardboard, cans, etc) both inside and outside the building	☐
Provide compost bins and manage composting operation	☐

9 Building Surrounds and Grounds

Indicator	Tick here
Survey undertaken to identify wildlife habitats and plant species on and near the site	☐
Design to minimise disturbance to wildlife habitats and plant species	☐
Wildflower meadow established	☐
Appropriate native trees, shrubs, hedging are planted	☐
Wildlife pond created	☐
Bird, bat, insect boxes introduced to the site	☐

Guide 11: Funding sources for specific sustainability costs

Funding available for:	Organisation	Type of Assistance
Renewable energy planning and installation	**HIE Community Energy Unit** (through the Scottish Community and Households Renewables Initiative) www.est.org.uk/schri See reference section 'Where To Go for Further Information' for full list of contacts	**Technical Assistance:** Funding is available for projects that are at a formative stage to investigate their potential to make use of renewable energy. These grants will: ■ Pay for the cost of a feasibility study ■ Provide support to develop a project proposal ■ Pay for community capacity building relating to renewable energy. The maximum grant is normally £10,000. Grants can be for up to 100% of eligible costs, although match funding is preferred. **Capital expenditure:** A capital grant is available to pay towards the cost of installing most renewable technologies. Funding is available for: ■ Capital costs for infrastructure ■ Project management costs associated with the development and installation of projects ■ The cost of establishing a partnership with a third party, such as a renewable energy company, where appropriate.
Solar Photovoltaic	**Energy Savings Trust (EST)** www.solarpvgrants.co.uk Tel: 0800 298 3978	Grants are available to install photovoltaic panels. If this is small scale with significant community benefit e.g. bus shelter/public toilet lighting, it can be funded through HIE's Community Energy Unit. For larger installations involving the supply of solar power to buildings, applications should be made direct to the EST - the Community Energy Unit can advise on making these applications.

network for the 21st century

Supporting Action for Sustainable Development

Sustainability Checklist

Sustainable Development is about improving our situation and getting the best out of the way we use things, while limiting any negative impact our actions have now or in the future.

The Sustainability Checklist provides a tool to help you identify the most sustainable way forward for your project. The purpose of your project may primarily be social, economic or environmental, but it might have impacts or benefits in other areas that you havenít yet considered. A small amount of thought at an early stage might make a big difference as the project develops.

The Checklist prompts you to consider any impacts your project might have under the headings below :

Community
Economy
Environment
The Future

There are a number of questions under each of these headings, designed to help you consider a range of sustainability issues. These are only a guide, and may not all apply to your project. Also, there might be other issues you think are important and want to include.

The checklist will help you to confirm your project's strengths and weaknesses and might also point to opportunities to improve the project's positive impact as well as threats that might reduce its effectiveness. As a general rule its always better to identify these at the outset, rather than wait for them to catch you out later on.

Whilst you are working through the checklist, you might find it helpful to note down strengths, weaknesses, opportunities and threats in the table provided at the end. This will allow you to get an overall picture of your projectís sustainability and what further action you might need to take to improve it.

COMMUNITY

1. Does the project have widespread Community Support?
- Has the whole community been able to comment on the project proposal?
- If there are concerns about the project from anyone in the community have they been addressed?
- How will you ensure the whole community is aware of how the project develops?

2. How will the project strengthen the local community?
- Does the project promote or increase access to culture (eg Gaelic), arts or crafts, music, sport, local history or archaeology?
- Does the project provide training or other resources to increase community confidence or allow the community to be more self-reliant?

3. How does the project help to ensure everyone has access to the same level of resources?
- Will the project help meet local needs for new services or to make better use of existing resources, including volunteers?
- Does the project improve access to infrastructure, services, information or support?
- Does the project make efforts to support the involvement of all members of the community, including those sometimes excluded such as older people, young people and people with disabilities?

4. Does the project have any impact on existing facilities or other organisations?
- Will the projectís activities compete with or have a negative impact on other organisations and services? (I.e. Hall tearoom competing with local businesses or noise from a youth club impacting on other hall users.)
- Does the project overlap with work of other organisations?
- Has consideration been given to impact on similar projects in the surrounding area?

ECONOMY

1. Does it help increase value of local products or make sustainable use of existing resources?
- Does the project create new income streams from renewable natural resources?
- Does it help to diversify the local or regional economy?
- Where appropriate, does the project encourage visitors to stay longer?
- Does it encourage inward investment?

2. Does it create jobs or retain existing jobs?

3. How does it help to develop skills of local people?
- Are efforts made to encourage uptake of such opportunities by long term unemployed or people with special needs?

4. Local Sourcing?
- Does the project purchase goods and services locally?

5. How does the project impact on existing businesses?
- Will there be benefits as a result of the project for local businesses?
- Will the project compete with existing local businesses?
- Will the project impact on businesses in surrounding areas?

ENVIRONMENT

1. How does the project help reduce waste and pollution?

- REDUCE – Does the project take steps to reduce what resources the project is using, ie. Consider buying in bulk to reduce packaging and transport costs.
- REUSE – Reuse existing resources such as glass jars, furniture or leftover paint. Are new premises or buildings being used rather than making use of existing buildings? Does the project use recycled materials and rechargeable equipment?
- RECYCLE – Ensure recycling opportunities are used or developed to minimise the amount of waste materials generated.

2. Does the project minimise energy use and/or support the development or use of renewable energy? If so, how will this be achieved?

- Has the project undertaken an energy efficiency assessment?
- Does the project, where appropriate, aim to reduce car use and promote public transport?
- Has the project considered development or use of renewable energy sources?

3. Does the project provide access to and awareness of wildlife and open spaces? If so, how will this be achieved?

- Does the project provide sustainable access to wildlife and open spaces?
- Does the project support access for all users? (People with disabilities, bike or equastrian access?)
- Does the project provide interpretation of the local area?

4. Does the project safeguard, protect and enhance the natural environment and support local biodiversity? If so, how will this be achieved?

- Has the project adopted good environmental management practices?
- Does the project protect fragile ecosystems?
- Does the project support the enhancement of native species and their habitat?

THE FUTURE

1. **What positive changes will the project bring?**

- What changes in service delivery or access to services do you anticipate?
- Will new resources, facilities or services be available as a result of the project?
- What change in community confidence and capabilities do you anticipate?
- How will the project impact on people's quality of life, such as health, safety or access to services or employment opportunities?

2. How does the project link with existing services or organisations?

- Does the project work with other organisations to fill a "gap"?
- How do you work with other services and organisations to co-ordinate and maximise resources?

3. How will running and development costs be met in the long term, particularly after the lifetime of any grant assistance?

- Has a long term exit strategy been developed or included in the project plan?
- How will you secure volunteer effort if this is necessary for the operation of the project?
- How will you resource any future costs? – repairs and renewals, insurance, salaries etc.

4. Does the project have any long-term impacts on the environment? If so, what are these?

- Is there a loss of habitat or erosion as a result of the project?
- Is there an increase in the use of resources or energy?
- Is there a loss of non-renewable local resources?

Strengths	Weaknesses

Opportunities	Threats

Network 21 is a Highland Well-being Alliance partnership established to support and build community based awareness and action for sustainable development. If you would like further assistance please contact Network 21's Co-ordinator for more information. Real examples of things other groups have done to overcome negative impacts and useful contacts can be found on the Network 21 website.

For more information regarding Network 21 please contact Helen Turnbull, Network 21 Co-ordinator, An Drochaid, Claggan Road, Fort William PH33 6PH Tel: 01397 706106
Email: hturnbull@network-21.info www.network-21.info

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