

Loch Lomond Shores Visitor Centres

Case Study produced by the A+DS
Sust. Programme.



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Two visitor centres created for the Loch Lomond and Trossachs National Park, developed following sustainable principles embedded in the Park's own plan.

<< Entrance to National Park Gateway Centre

BACKGROUND

The Loch Lomond and The Trossachs area was awarded National Park status in 2002 under the National Parks (Scotland) Act 2000. Legislation required that sustainability issues underpinned all four aims of the newly formed National Park:

- To conserve and enhance natural and cultural heritage
- To promote sustainable use of the natural resources of the area
- To promote the public's understanding and enjoyment of the unique qualities of the area (including recreation)
- To promote sustainable social and economic development of the surrounding communities

The aim of the National Park Authority is to deliver these stipulations in an integrated and sustainable way. Early steps taken by the Park Authority included the development of two sustainably designed visitor centres, plus specially commissioned outdoor furniture made using local and reclaimed materials. Community engagement was also an early feature of the implementation of the park's aims.

APPROACH

Sustainability principles are integrated within any policy, action and initiative implemented in the National Park Plan. This includes issues relating to transport, housing, employment, natural and cultural heritage, and recreation and visitor management. As part of the development of the National Park Plan, the quality of new-development design within the area was a major focus for the Park Authority, and the Plan set out various design principles and initiatives for raising the quality of design within the National Park. Some of the design issues the National Park Plan sought to address were:

- Developing policies, actions and initiatives for improving the quality of design of new development in the National Park
- Encouraging innovative design that was sympathetic to historical context and landscape setting
- Promoting sustainable development – encouraging building design that minimises energy use and low maintenance, that uses sustainable resources and materials, and that has a low environmental impact
- Developing partnerships with key players in the design process, including developers, private and public agencies, architects and landowners
- Involving communities in design issues.

The Loch Lomond and Trossachs National Park Authority (LLTNPA) was a new body and subject to public procurement procedures. Sustainability issues based on good business sense needed to be highlighted for every possible building considered within the National Park. The Park Authority agreed that the business case for sustainable development needed to be holistic, reaching beyond purely economic considerations, and addressing social and environmental issues.

At the earliest stage of the commissioning process, a detailed brief was

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prepared following consultation with the local community and staff. A similar process regarding alterations to the visitor centre at Balmaha resulted in a request for new furniture from staff, to service additional members. Community representatives, meanwhile, suggested a community-run café to serve visitors, while raising funds for local projects. The Park Authority recognised that briefing for innovation can be complex. For instance, the brief at Rowardennan included a request for composting toilets. The Park authority was then required to research issues such as toilet capacity, and conduct negotiations with Building Control.

When the LLTNPA commissions architects, it typically does so on a 70% quality/30% cost assessment basis, referring to SEDA (Scottish Ecological Design Association) for suggestions of possible architects to invite to tender. However, the architects' enthusiasm for a project and commitment to its design principles is also important, as is specific experience of sustainable design. Each factor is considered in the tender scoring system.

PROCESS

The main sustainability feature of the National Park Visitor Centre at the Loch Lomond Shores complex at Balloch is the considered use of materials with low embodied energy. To ensure this approach, staff from the Building Research Establishment (BRE) formed part of the design team at a very early stage, with the BRE ENVEST Programme team creating digital models of the building. The ENVEST tool analyses building design (height, number of storeys, window area, etc.) and element choice (external wall, roof covering, etc.)

The ENVEST measures identify the elements that will have a major influence on the building's environmental impact, as well as highlighting the effects of different materials. The environmental impact of heating, cooling and operating strategies is also revealed. The ENVEST results are then measured in Ecopoints, culminating in a single figure determining the environmental impact. This data allowed the design team to consider a number of design options. It became apparent that a lightweight building constructed with materials of low-embodied energy would be the most sustainable option for a building such as a visitor centre, which requires relatively low heating. The structure's lightweight aesthetic, meanwhile, was harmonious with the surrounding landscape.

In this building, building materials were selected for their low embodied energy. All materials were selected in response to the ENVEST programme, which considers source, transportation and production costs. Timber was sourced from storm-felled French Oaks. Local materials included Scottish steel frame (which, as with all steel, is 40% recycled) and Caithness slate floor.

In the Rowardennan building locally sourced materials included stone for walls and flooring which was sourced from a local quarry that closed in 1954 but was specifically re-opened for the project. The peg-jointed oak frame was constructed from trees felled within a few hundred yards from the site. Slates were recycled but originally quarried nearby in Aberfoyle. The building is a completely breathing structure, with no damp-proof membrane, the floor being lime concrete on a free-draining stone base.



Front elevation of Gateway Centre



Gateway Centre woodland walkway



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RESULT

Gateway Centre

The main exhibition gallery is of two-storey construction, allowing warm air to rise and then exit by manually operated vents. Rather than depend on automated building management controls, a conscious decision was made to train staff to operate the building to the required levels of comfort and efficiency. For instance on hot days vents are opened overnight to allow the building to cool. That the building could become too hot or too cold for two to three days every year during maximum or minimum weather temperatures was also carefully considered and approved within the plan.

The inclusion of large expanses of glass in the design, meanwhile, had the dual benefit of enabling impressive views of the landscape, while allowing for high levels of natural lighting. Indeed, ENVEST data revealed that with this type of building, lighting levels are as important for energy consumption as heating levels, and so low-ambient lighting was installed to supplement the natural light as well with the additional lighting around the individual exhibits.

The building use determined the use of low, ambient temperatures. Digital modelling analysis showed that heating produced less CO₂ than lighting, which in turn produced less CO₂ than construction materials. The client accepted a less sophisticated design specification, accepting that building temperatures could go above or below desired temperatures in exceptional weather conditions. Higher temperatures are provided at appropriate points: offices (which are also better insulated) and behind the reception desk (where there are higher levels of underfloor heating). Low, ambient lighting reduces energy use, with light levels boosted around individual exhibits. Natural ventilation is provided throughout the building. Manual building management provides specific temperature control for specific areas of the building.

Rowardennan Centre

The Rowardennan Centre comprised an interpretive display showcasing features of local interest, public conveniences, a warden's office and facilities for disabled patrons. The sensitive nature of the site determined a low-impact building, which was designed to incorporate natural and local materials such as timber and slate, specially gathered from former slate quarries. The use of local materials creates an environmentally sensitive building that connected immediately with its locality – stone used in walls and flooring corresponded to traditional, dry stone walls that feature throughout the area. Composting toilets were installed as there was no mains drainage in the vicinity, and a soakaway system was unsuitable because of the dangers of contaminating the nearby Loch Lomond. The high mass construction of the Rowardennan Centre constitutes a prime example of sustainable design appropriate for and sensitive to the surrounding landscape.

The walls are constructed using 'cob', an earth-based material fashioned from a mixture of clay, straw and sand that was once a traditional building fabric throughout Scotland. The walls consist of a lime-washed exterior built on lime mortared-stone walls. Internally, the finish is earth plaster with lime and earth renders. Natural oil-based paints are used on the joinery

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timbers. Pre-fabricated earth blocks bedded in earth mortar were used in the gables. Clay soil was sourced from around 50 miles away and was mixed with locally obtained aggregates and straw. The blocks were made off site and this proved to be a quick and efficient form of construction. The result was that concrete use was kept to a minimum.

The building works as an integral feature of the surrounding landscape, and also acts as a metaphor for a history of local-land uses. Making this kind of cultural connection with the landscape in vernacular buildings can also be a powerful tool within the educational process.

Bespoke furniture, including picnic tables, benches, interpretive panels and litterbins, was commissioned for use at a variety of sites in the Park. Picnic tables and benches were created using laminated green oak, while granite was recycled from an area at Glasgow Docks. Glue used to laminate the green oak, however, posed a significant problem in that it was unable to cope with the fact that the timber dried out over time. Litterbins were created using recycled plastic and were subsequently redesigned to accommodate recycling choices.



> View of Gateway Centre from woodland walkway

KEY LESSONS

Careful briefing at the outset is vital as it ensures that client aspirations are well voiced. This, in turn, significantly aids the architect in understanding exactly what the client wants.

Computer simulation, though expensive, can speed up the design process.

Materials use can be a more significant factor in reducing carbon emissions than the operational energy of heating and lighting.

It was important that the client accepted the fact that in order to save in construction costs, building temperatures might fall outside the desired range during extreme weather conditions. A subsequent need for training of operational staff to accommodate this decision was also accepted.

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The successful construction of the Rowardennan Centre using earth-based materials demonstrates that there is a sufficient base of professional design and construction skill to build with such materials in Scotland. Public interest and reaction to this unique construction also proved favourable.

The use of Scottish earth-based building traditions was recognised in the approval of the building warrant, which was granted on the basis of the use of Historic Scotland's Technical Advice Note 6 as a reference document.

Difficulties encountered included the fact that specialist contractors work to very tight job schedules; a delay with the main contractor led to hold-ups on site and the period allocated for earth-wall construction was postponed by several months to accommodate the specialist contractor's availability. This led to the project commissioner having to consider whether to accept such delays or change the design in the face of criticism for failure to maintain project deadlines and resultant postponement of the building opening. This illustrates the type of risk that project commissioners take when embarking on innovative building design. However, it is argued that the role of the public sector commissioner is to take risks usually avoided by the private sector in order to promote sustainable practice.

Specification can be overly complex – inclusion of composting toilets, for instance, required analysis of likely levels of use, due to the fact that waste cannot simply be flushed down the drain.

Choosing contractors can also prove difficult where an adventurous purchasing body recognises risks and so must find ways of dealing with them. To ensure 'Best Value' criteria are met, contractors are selected by tender. A degree of innovation, however, can dissuade local firms from applying. Contractors who are unfamiliar with the specified construction techniques may have difficulty pricing the job. This can sometimes result in drastic under-pricing (in which case the purchaser has to prove by careful tender-analysis that such a price is unrealistic). Equally, a high tender may have been costed over-cautiously in favour of the contractor. In this case negotiation is required. However, it can be hard to determine whether a high-priced tender is a contractor's way of implying that they will only accept a high rate for such a job or, indeed, that they don't want the job at all. Some construction elements are better priced by a specialist contractor (timber-frame construction, for instance).

Another costing difficulty arose from the opening of a snatch quarry as a means of providing local stone – a rare request that was not easily costed and that required negotiation with landowners. Planning implications also needed to be considered.

Project management on such initiatives is more time consuming. Architects may need to cost for extra staffing to source materials, or to develop cutting schedules for timber.

Also, the client needs to consider and respond to public perception of directional initiatives, such as attitudes to composting toilets, high-cost issues or views surrounding project delays.

Project Information

Client: Loch Lomond and Trossachs National Park Authority (and its predecessor the Loch Lomond & Trossachs Interim Committee)

National Park Gateway Centre

Location: Loch Lomond Shores, Balloch, G83 8QL
Date completed: 2001
Project Value: £1.5m
Gross Internal floor area: 857 sq. m.
Architect: Bennetts Associates
Structural Engineer: Buro Happold
Services Engineer: Hulley & Kirkwood
Quantity Surveyor: Banks Wood and Partners
Consulting Engineers: British Research Establishment
Main contractor: Barry D Trentham

Rowardennan Centre

Location: Rowardennan, G63 0AL
Date completed: 2001
Project Value: £190,000
Gross Internal floor area: 102 sq. m.
Architect: Richard Shorter Architects with Simpson & Brown Architects
Structural Engineer: Wren & Bell
Quantity Surveyor: Brian Byrne
Specialist Contractor: Becky Little (Traditional Builder in Lime)
Main contractor: Cumming & Co. Ltd

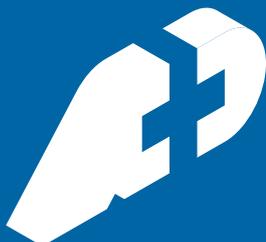
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