

Sustainable and affordable building

= is it really costing too much?

Chris Morgan (architect), Bernard Planterose (designer/builder), Mark Jones and Mary Fielding (builders) have pooled their knowledge and experience to come up with ways in which you can keep the costs of your new eco-house down...

From the Thames Gateway to the Scottish Highlands, the call for 'affordable' housing grows louder by the day. At the same time, the construction industry is being rightly targeted to deliver a far more environmentally sound product. The big question for governments and environmentally conscious builders alike is, "Is it possible to build at low monetary and environmental cost simultaneously?"

Different answers to that 'big question' will be found depending on which costs you are including or excluding. Clearly there are purely monetary costs to the builder/buyer, there are also monetary costs to the community inherent in construction and there are environmental and social costs (collectively evaluated in whole life costing). In this article we assume that (a) you have a relatively low budget, (b) you have already made a commitment to build 'fairly to very' green and (c) you are building a one-off design and making design decisions in collaboration with an architect or other design professional. Starting with first (or capital) costs to you, the self-builder, here are our top ten action areas.

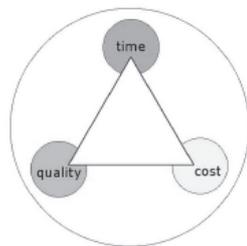
1. Choose your site carefully

You will have already fixed your budget before you even go looking for a site, of course many

come at an exorbitant price. Every pound you spend on the site will therefore be one less for your building and it cannot be over-emphasised that the wrong site can present you with practical, and thus financial, difficulties from the start. Too many people spend too much on the 'perfect' site and then struggle to achieve the 'dream' home. Set aside an agreed budget for the house and for those aspects which will mean most to you, such as finishes, and do not let the money be used up elsewhere. In general, avoid ground which could increase foundation costs, such as excessive slopes: Brinkley's Slope Law suggests an additional £5,000 for every five degrees from the horizontal. Realistically assess the likely costs of access and services, which can cost several thousands in remote rural locations (see also 'Groundworks' later.)

2. Give yourself time

The diagram illustrates an age-old axiom that when building a house you can have any two of the three, but only two.



You have already chosen to minimise cost but you want 'green and good' - so you must concede 'Time'. This is fine, provided you have it! It is crucial to afford yourself time enough to take care at every stage, but bear in mind that time spent planning is cheaper and easier than the equivalent time on site. If you get this right, you will find the whole process less stressful and more likely to be successful in achieving your aspirations. If you have a whole load of time, see below for building it yourself.

One of the most common ways in which buildings go over time and over budget is that

clients (and designers) continue to make changes once the building is on site. Clients, who are not usually trained in visualising three-dimensional forms and spaces based on two-dimensional drawings, often don't fully appreciate the true nature of their new home until it is well underway. Furthermore, they do not appreciate the hassle factor for those doing the work when they change their minds. They are genuinely affronted by the costs of these changes and this can lead to all sorts of problems! The lesson is simple - take the time to get it right on paper first and try to minimise disruption thereafter.

If you are attempting to manage some of the design or site processes yourself, you will require meticulous organisation. It is not easy to visualise all of the trades and sequences, the materials and ordering time-scales, the delivery schedules and site storage arrangements, without some practice. And there is nothing more irritating - or costly - than double handling, wheel-barrowing the pile of sand the day after the digger left and so on.

3. Build small and smart

Question your spatial requirements. The amount of space we appear to 'need', compared with our ancestors and compared to most of the other people on this planet, is vast. Space is what costs - not just to build, but to keep warm, clean and maintain over time. The cost of houses varies hugely, but for a one-off house, with reasonable 'green' credentials, a realistic 'low' construction budget is £750 per square metre (many high specification/green houses are currently costing over £1,000 per square metre). This gives you an idea of what you pay for that extra bedroom.



Locate's Offices which double as a guest room through the use of a simple sofa-bed

Consider doubling up on spaces. Could the study also be used as the guest bedroom? Do you really need a separate dining room, which is empty for 95 per cent of the time? Consider too the notion of 'lifetime homes', where houses are designed to anticipate and accommodate changing needs. This reduces the cost of change and keeps communities more stable, as people can alter buildings rather than move on. Techniques include lofts with trusses, which allow for conversion and bathrooms on the ground floor. Seek out the burgeoning literature on mini and micro houses. Small used to be beautiful - now it's the new cool. Be proud to build the smallest house on the block (or crofting township). You could always extend (or build a teenager/guest annexe) later.

4. Do it yourself

Everyone values their time differently and if you earn more than the average builder does, then the economics of self-build will not stack up. But there are many other reasons for wanting to be involved in building your own home and these may make the choice a reasonable one. For instance, wishing to build something truly hand-crafted will almost inevitably lead you down this route. Or, if you are in a more remote situation, you may simply not be able to find anyone to build your green dreams. For many on a low budget, doing some of the labouring will be a useful way of reducing the hired labour costs and provide opportunities to add personal touches. Building the whole thing - well that's an article in itself. Don't try this without speaking to folk who have done this themselves!

5. Use natural materials

Very generally speaking, the cost of houses is half materials, half labour. Choosing more unusual natural materials, like straw bale, earth and straw-clay, offer some attractive cost-saving possibilities and are amenable to self-build. The methods are reasonably simple, requiring relatively few special skills or tools and the materials are non-toxic and enjoyable to handle. However, advice should be sought

from someone with experience in these materials, as the most environmentally benign methods are often subtle and not widely known in Scotland. It should also be appreciated that these options tend to be more labour intensive and, if contractors are brought in to do this work, it will probably cost more than conventional solutions.

RS readers will be happy to hear that it isn't an exaggeration to say that the use of timber represents the most practical, short-term and cost effective way of building to 'save the planet' - and probably your pocket simultaneously. But some qualification is necessary. If you use timber which has been shipped half way around the world or been taken from old growth forest then you've lost most, if not all, of that environmental advantage. So use home-grown wherever possible. This takes a little extra time and care in the sourcing and should only add a small



Small units of terraced housing at Findhorn built by Build One. The compact dwellings are cheaper to build and to keep warm, and the

amount to your capital costs while dramatically reducing costs to the planet.

Timber-framed houses are now the norm in Scottish new-build and the substitution of home-grown softwood into these (mostly 'kit') frames offers one theoretically simple and inexpensive route for the eco-builder. This may be out of the question with many suppliers but it is worth asking. If you are 'stick building' (i.e. building piece by piece as opposed to buying a kit) then using home-grown or FSC-certified timber should be a major goal for the committed eco-builder.

6. Use local materials

The pollution associated with the transport of building materials can be the biggest chunk of environmental damage caused by your new house. In addition, genuinely locally sourced and vernacular materials begin to lend a sense of place to new buildings, helping them to fit in far beyond the rather banal requirements of planners. Costs can be higher, but some creativity in sourcing can work wonders.

7. Use local skills

It is now widely understood that using local or small-scale tradespeople plays a crucial role in supporting local and rural communities and raising the value of the money you do spend. Do it if you possibly can. Buying a Canadian kit-frame house is just not the same, even if you do put it up yourself.

8. Share the load

It does not suit everyone, and there may be planning restrictions, but teaming up with others, even in a limited way, can help offset many costs as long as there is clarity and good organisation throughout the process. Even two houses can begin to take advantage of economies of scale, as builders are often more enthusiastic about larger jobs and renewable energy technologies become more cost effective at larger scales.

9. Groundworks

The trouble with groundworks is that very few people are interested and so they don't examine what is being spent with quite the enthusiasm reserved for kitchen cabinet doors. Furthermore, groundworks come early in the process of building when there's still plenty of money! Yet many thousands of pounds are spent unnecessarily shifting earth around, dumping tons of gravel, sand and hardcore, building retaining walls, tanking with bitumen, driveways, trenches, drainage routes, soakaways, engineered slopes and so on. All of which can often be avoided, or at least reduced, with a little care at the design stage. Try to think of each lorry-load of gravel as a pair of patio doors you can't have or a complete coat of paint

you'll have to finish yourself and the incentive should increase to look at these aspects with more care.

10. Design simple forms

The form your house takes will most likely end up as a compromise between your dreams, your architect's imagination and what the planners will allow (which may explain why so little of artistic integrity gets built). Whatever your favoured 'typology', keep it simple. This means avoiding too many



A simple, symmetrical, steel-profiled roof with no dormers or rooflights on a North Woods house under construction this year in the Highlands - installed in two days.

corners and curves, dormers and bays, chimneys and porches and so on. Complex forms tend to really hit home when you get to the roof, where different pitches, valleys, ridges, flashings and so on can really slow down the build and increase the cost dramatically. A simple roof, of all the simple things to have, is the best. Remember though, in the wrong hands, simple can turn into banal all too easily. Conversely, just one or two strong devices or exquisitely designed and executed details can lift an artless box to artistic accomplishment.

Just as important as the initial costs are the environmental and monetary costs of your new house once its in use:

Running costs

Monetary running costs should be considered from the very first design stage and, in many cases, reducing these will mean reducing environmental impact simultaneously. However, this frequently involves increasing first costs – the case of insulation provides an obvious example. But many and more complex cases occur in any building, such as the use of an expensive material to give longer life or to provide protection to a vulnerable material.



High levels of insulation and careful attention to airtightness on a building designed and partly built by Chris Morgan for his mother whilst working at Gaia Architects. All the materials used are natural and non-toxic; the floor and roof insulation are of sheepswool, and the timber framed walls are infilled with woodchips and straw mixed with clay. The walls are rendered with clay inside and out. Design: Gaia Architects

Low energy

In a new build project there are four main routes to achieving low energy demand:

- Minimise the volume to be heated in the first place, i.e. build small and avoid wasted space
- Insulate heavily
- Build airtight
- Install energy efficient plant/services

It cannot be overstated how important a high level of insulation is to both your running costs and the amount of CO₂ your house will release into the environment over time. If you have lived in an uninsulated stone house or poorly insulated block house you will be amazed what 200mm (or more) of insulation will achieve. If there is one aspect not to skimp on as an environmentalist builder this has to be the one. And, yes, the more natural environmentally sound insulants, such as wool, do cost more but the savings in heating can be impressive, if sometimes hard to believe for some!

Once you have insulated your building well, the main energy losses are associated with infiltration (draughts) and then with water heating, lighting and so on. Attention to all of these will be more cost effective than any

attention to renewable supply technologies. Like pudding, you can have them, but not until you've properly finished reducing the first course/demand side! If you don't reduce demand first, you will never make the savings claimed for these technologies and the money will be largely wasted.

Renewable energy

Everyone has their own enthusiasms and different technologies will clearly suit different sites. But if we are talking about low-cost renewables, those really worth the effort have to be wood fuel in place of fossil fuel and direct

solar water heating, especially in combination with wood fuel. Of course, having a photovoltaic panel or a windmill is better than not having one, but if you are concerned about cost, then you will spend much less money to better effect by simply insulating the house better. And you will have saved yourself a maintenance burden to boot. This, of course, may not be the case if you are going the whole hog, building deliberately off mains and/or installing a 12V system.

Maintenance

'Maintenance-free' is another holy grail in construction, yet things which get rained on, trodden on, rubbed up against, knocked, opened and closed a lot will necessarily wear, weather and decay. 'Cheating' with plastic look-alikes and other engineered alternatives does not forestall the inevitable for long and frequently introduces whole new layers of toxicity and embodied pollution. It is far better, in general, to accept an element of maintenance and learn to spend a little time with, and on, your home and investment.

Design for deconstruction

Design for deconstruction looks at ways in which buildings can be designed so that costs of and wastes from refurbishment, alteration and maintenance are reduced. This is done by ensuring that easily worn surfaces are detachable without removing the permanent framework behind, that services are easily accessed for upgrading, that cladding can be repaired or replaced without disruption to the insulated wall behind and so on. For more information on this, visit the Scottish Ecological Design Association's website at www.seda2.org.

Healthy specification

'Sick building syndrome' has become a familiar term and, while specific causes and effects

are often hard to isolate, it is agreed that a cocktail of gases given off by a wide variety of synthetic materials and finishes in buildings is a major factor. It has been reported that 1 in 7 children in Scotland suffers from asthma – the highest incidence in the world – and some of the causes of asthma are known to be 'environmental'. The costs of ill health to the individual may be inestimable but are then often visited upon our beleaguered health service at yet more cost to us as taxpayers. Unhealthy buildings are not affordable at any level. For those who are concerned, there are many architects, designers and builders now familiar with these sorts of issues who can advise on the alternatives. Replacing volatile organic compounds (VOCs) with natural oil based paints and wood finishes is a very straightforward option and one which will add little to the cost for a major improvement in internal air quality, as well as minimising wider environmental damage.

Lasting value

It can be depressing to hear that while such-and-such an idea would be wonderful, it might make the house more difficult to market. For most people, their home is by far their biggest investment. It is our belief that a house built with real care and attention will have something which most modern houses lack completely – originality, lasting quality, a personal touch – and these things will always make it marketable and certainly more fulfilling to inhabit in the meantime.

Chris Morgan worked for several years with Gaia Architects and started his own practice, Locate Architects in January 2004. He is accredited to a B level in Sustainable Design by the RIAS and has developed particular experience in timber and other natural materials, energy efficiency and healthy specification on largely low cost and community based projects. For more information, please refer to www.locatearchitects.co.uk (see advert on page 55)*

Bernard Planterose owns North Woods Construction Ltd which offers a complete design and build service in timber buildings. Although currently involved with three high specification eco-houses (two of which are co-designed with Chris Morgan), it also specialises in micro buildings such as studios, home offices, observation hides and so on. (See advert on back page).

Mark Jones and Mary Fielding manage Build One Ltd, an ecological house-building contractor based in Findhorn on the Moray Firth. They have constructed over 20 homes of varying size and specification as part of the eco-village development at Findhorn. They can be contacted by email at: buildone@ukonline.co.uk