The biggest wins in terms of making houses more energy efficient over the past decade or so have obviously come from smarter design. Energy ratings have made a big difference, and people generally better understand the value in building a house that requires less energy to heat and cool these days – especially as energy prices become more frightening, and as awareness about the state of the planet slowly sinks in.

The equation’s changing a little though, and according to environmental consultancy Edge Environment in a recent report entitled ‘Energy-efficient dwellings – Can embodied energy spoil the story?’ (by Jonas Bengtsson, Clint Craggs and Josh Dowse), builders and designers will need to start looking more closely at the specific materials they’re using to build more sustainable, energy efficient homes.

To understand why, you first need to get your head around how all of the emissions that are associated with the entire life of a house tally up. The basic equation looks a bit like this:

Building carbon = materials + construction + operations + decommissioning

‘Building carbon’ refers the total carbon emissions produced throughout the entire life of a house – obviously, the lower this is, the more efficient the house is considered to be.

The ‘operations’ bit of this equation refers to the energy used by the occupants as they live in the home – heaters, air conditioners, hot water systems, iPads, electric toothbrushes and so on. ‘Operational energy’ has traditionally (in recent history, anyway) accounted for the lion’s share of the total emissions across the lifespan of a house.

As people are becoming more energy-conscious though, and as star ratings and other regulated energy efficiency measures begin to take big bites out of the emissions related to heating, cooling and appliance use, the volume of carbon emissions associated with the ‘operations’ component is shrinking at a rapid rate of knots.

As Edge Environment’s report explains, what this means is that the emissions related to the materials used now account – relatively speaking – for a much more significant slice of the whole ‘building carbon’ pie. In fact, emissions related to the production of materials already account for up to half of lifetime emissions, in some cases. This means that using building materials with a smaller carbon
footprint is fast becoming a far more effective opportunity for people to reduce lifecycle emissions and improve a home’s overall energy efficiency.

For clients who are serious about building an energy efficient home and shrinking their carbon footprints, the choice of materials will be a big deal – and this presents some valuable opportunities for savvy builders who understand this need.

CHOOSING MATERIALS WITH A LOW EMBODIED ENERGY

A proper assessment of a given building material’s environmental impact is known as a lifecycle assessment (or LCA). A lifecycle assessment is a cradle-to-grave account of how much energy is required throughout the life of a particular product – part of which involves its embodied energy. The embodied energy of a given product accounts for all of the energy associated with the extraction of the raw materials used in the product, and the energy used to manufacture and transport the product.

Some materials, by virtue of the fact that they’re considerably less energy-intensive to produce, compare far more favourably in terms of their embodied energy – but obviously it’s a matter of looking at the whole package. There’s no point building a home from materials with a super-low embodied energy if it’s not possible to create a design that minimises things like heating and cooling loads.

The best choices to reduce embodied energy in materials will depend largely on how the house is designed, and what sort of climate you’re building in – there’s no single material (or set of materials) that’s always going to be the ideal choice.

“It’s about optimised design and fit for purpose material selection rather than selecting silver bullet low impact materials,” explains Edge Environment.

“Generally, the best option is to reuse materials from other buildings, for example reused bricks and timber. Other guidelines include to minimise the amount of material and resources used – this could be, for example, to reduce the amount of concrete and cement used for the slab by using pods to create voids in the slab or using concrete which is mixed using flyash instead of ordinary Portland cement.

“Sometimes, the climate warrants using more materials, such as double or triple glazed windows or increased wall and roof insulation in harsh climates”, Edge Environment explains. “In Australia, the focus is still very much on driving down operational energy for a better overall outcome, so materials that help reduce operational energy are by association typically good.”

IT’S ABOUT OPTIMISED DESIGN AND FIT FOR PURPOSE MATERIAL SELECTION RATHER THAN SELECTING SILVER BULLET LOW IMPACT MATERIALS.

WHAT ‘STYLE’ OF BUILDING OFFERS THE BEST ENVIRONMENTAL BENEFITS?

There’s a lot of discussion going on in the industry at the moment involving sometimes conflicting messages, and it’s not always clear what sorts of (commercially viable and available) building materials and configurations are likely to offer the best tradeoffs between operational energy and embodied energy savings.

New lightweight materials can help to reduce embodied energy in the right configurations, but in the balance, the overall ‘savings’ will depend very much on how well the building performs, from a thermal perspective. Depending on the design and location, the best option might even involve a mix between traditional materials like brick and newer lightweight cladding systems.

Edge Environment explains that “In general, in benign climates such as much of Australia’s most populous areas, there certainly are benefits from appropriately insulated lightweight buildings in terms getting the balance right between embodied and operational impacts. In other climates with significant diurnal temperature changes, heavyweight construction can provide benefits.”

HOW TO FIND MORE INFORMATION - AND WHAT TO LOOK FOR

If you’re after more info on how to reduce the embodied energy in the buildings you’re constructing, Green Tag and Good Environmental Choice Australia are a great starting place – as is the Green Building Council of Australia (although GBCA certification, for the moment, has some limitations when it comes to rating Class 1 buildings).

As for specific labels and certifications for products, Edge Environment recommends taking the bigger picture into account. “Look for life cycle based information, not just [labels] focusing on single issues [e.g. carbon, recyclable, low-VOC].

“The best sources are from third party ISO compliant eco-labels and environmental product declarations. For example Green Tag, GECA, Cradle to Cradle, Environmental Product Declarations (EPDs). There are also product category specific certifications such as FSC certification of timber, aiming to assure sustainably managed timber production.”

To read Edge Environment’s report, visit www.edgeenvironment.com.au/energy-efficient-dwellings-can-embodied-energy-spoil-the-story