Shades of GREEN

Create a home that’s kind to the earth – and your hip pocket.

Building and renovating is no longer just about creating your dream home. Clever design and planning can make a difference to the environment – and your home’s running costs – but it’s hard to know where to start. So we surveyed architects, builders, designers, environmental experts and government authorities to produce a practical guide to what you can do now to make a real difference in the years ahead.

SUN & SHADE

Unprotected glass is the greatest source of heat gain in a well insulated home. In summer, it can be 100 times greater than through the same area of insulated wall, and in winter, heat loss can be 10 times greater.

Exposures to hot/cool rooms and extremes can be mitigated by shading. Windows in summer and heat loss in winter.

Louvre windows are also becoming popular and can be set to angles to increase solar gain in winter and reduce it in summer. They can also improve cross-ventilation.

Double glazing, used overseas for decades, is now gaining popularity here to reduce winter heat loss (surprisingly, more of a problem in Perth than summer heat gain). It doesn’t prevent radiant heat from occurring, but slows down conduction and convection heat losses.

With the big bang of products, it offers a way of incorporating large windows without sacrificing thermal efficiency.

Planning tools

One way of quantifying the sustainability of a home is to get a carbon assessment. Local product a Tool has been identified as one of the world’s leading tools for this by the Curtin University Sustainability. Policy Institute. A Tool can compare the environmental impacts of materials and house design. In Life Cycle Assessment (LCA) includes analyzing the embodied energy (the energy and carbon that go into the materials, their transportation to site, assembly and maintenance) and the operational energy (energy used to run the building past the building’s design life). It also includes a cost analysis to find out which design will give the best value for the investment and your hip pocket. Figures are now showing that with intelligent design principles, including an on Tool LCA, designers can produce a home that costs less to build and run and has a lower carbon footprint, less waste and has greater value. The web-based software is free for anyone to use, or a Tool team can conduct the assessment for you.

RAINWATER TANKS

Although WA is behind other states in making rainwater tanks mandatory in new homes, rainwater harvesting is becoming more common. It is hoped this will continue, despite the fact there’s no state government rebates in the city and federal rebates are no longer available.

An average roof in Perth can collect about 30,000 litres of water a year and, when plumbed, can supply up to 20 per cent of a household’s water needs (depending on tank size). Tanks range in size from a few thousand litres to 30,000 litres and styles range from domestic tanks to fabricated steel tanks installed under the house.

The cost to buy, install and connect one varies greatly but is about $5000 to 7000 for a 4kl tank and $5000 to $7000 for a 3kl tank.

Most urban homes are limited to tanks of around 3kl unless they can be integrated underground or under verandahs or deck edges.

If tanks were mandatory for new homes, and continued to be installed in existing homes at the current rate, the annual demand on Perth’s scheme water supplies could be cut by 2.9 gigaliters (3.9 billion litres) by 2035 – enough to supply more than 10,000 homes with water for a year and 50,000 homes by 2060.

“No average roof in Perth can collect about 50kl of rainwater a year, enough when plumbed, to supply up to 20 per cent of a household’s water needs.”

“An average roof in Perth can collect about 50kl of rainwater a year, enough when plumbed, to supply up to 20 per cent of a household’s water needs”
FINISHES

The internal finish of the stage that initially introduces elements that aren’t very ‘green’, particularly finishing products and adhesives. Choose those with minimal embodied energy (without destruction to natural fibres, etc) which also have a long life and low VOC (volatile organic compounds) levels. For example, low VOC paints, which are becoming readily available, will mean fewer chemicals are vented into the house.

It comes down to doing some research, although contacting every supplier to find out about the green credentials of their products and materials can be very time-consuming.

An excellent resource is www.ambientarchitecture.com.au, an online knowledge base of more than 6000 products, services, technologies and materials that meet certain eco-credentials. Linking independent information with a powerful search interface, recognising and defining innovative sustainable product solutions as well as time and cost reduction.

A tool (see page 103) is another online option for comparing the environmental impacts of products and materials.

SWIMMING POOLS

Unfortunately, one low affair with pools is not very sustainable. They rely on chemicals and can lose up to three times their volume per year through evaporation, splashing and backwashing. Pool maintenance, a requirement for new pools, can reduce evaporation by up to 75 per cent, reduce the amount of chemicals needed and keep the pool so clean it can be used for most of the year. A biannual pool service costs about $1000, a good investment even if your pool isn’t used. Variable speed pumps are also now available, reducing energy use by half the bill for about $3500 (per year).

Alternatives to the traditional chlorine and salt systems include Magnatool, which is low in chlorine and rich in magnesium and potassium. The water is well for wellbeing and can be used on the garden once drained. Designed for energy efficiency, it costs $5000 as a self-installation or $1000 (for a retailer). It saves about $500 a year in running costs compared with a salt system. There’s also the Delhi V system, which uses ultraviolet light to sanitise the water. It costs less than $5000 and is easily installed to be turned on and off with the pool pump.

Then there’s the green option—natural swimming pools. They’re built to operate on the way Mother Nature does, to clarify and clarify natural ponds. Through biological regeneration in a planted area, natural pools clean and maintain themselves as a living organism. Without the use of chemicals or backwashing.

They use about 80 per cent less energy than a standard conventional pool and the only water loss is through evaporation. The system is living, but that doesn’t mean some with bugs. Bioremediation’s two bases means the pool can be restored to the regeneration area and look like a conventional pool. Or it can be an organic look to blend with the biological regeneration area. They can be built from about $50,000.

RENOVATE

Reno, or remodel rather than demolish and rebuild. The amount of energy required to demolish, remove the waste from site and build a new house, combined with all the embodied energy associated with the construction and material workforce, far outweighs the energy consumed in a renovation.

Architects agree renovating will generally give you ‘more bang for your buck’. But it’s the final design is completely different to the original, you could be better off starting again—making sure you recycle as many materials as possible.

BUILDING MATERIALS

In NSW and WA we’re finally moving away from the traditional double-brick method. Alternatives, environmentally friendly construction methods are being adopted, often with pre-fabricated materials. Highly thermal-efficient Insulated Concrete Formwork systems and Structural Insulated Panels (SIPs) are just two examples of materials being used instead of double-brick. They have a thermal performance three times greater and are also more cost-effective because construction doesn’t take as long using these newer materials.

“A gas-boosted solar water heater can pay for itself within five years compared with electric or bottled LPG-boosted ones, and eight compared with gas”

Solar water heating

Water heating is the largest single energy user in WA households, gushing up about 25 per cent. The integrated tank/solar water heater was developed in the 1960s in Australia and is now. Today almost every building in local law one, yet only 12 per cent of Australian houses do.

Systems are available from state and federal governments. For new and replacement gas hot-water systems, the state issue is $550 for a natural gas boosted systems (in gas-registered areas) and $510 for bottled LPG boosted systems (in non-registered areas). The federal issue is $150 to replace electric hot-water systems.

Costs for hot-water usage vary greatly as it’s hard to calculate typical costs and peaky times. But it’s suggested that a gas boosted solar system can pay for itself within five years compared to an electric or bottled LPG system. Coster and eight years compared to a natural gas hot-water state. Larger household are likely to recover their costs sooner
**STANDBY POWER**

10 per cent of electricity consumed in Australian homes is attributed to appliances in standby mode. You can turn them off by you. However, there’s a more sophisticated way. Standby power reduction systems allow a motor to turn off all non-essential loads when you leave the house for a short time or an extended period, turning the house to “holiday mode”. In new houses it’s a minimum cost to install these, but for existing homes, standby power reduction systems can be extremely inexpensive and difficult to retrofit. So if you’re building, give it some serious thought.

**HEAT PUMP WATER HEATING**

No space for a solar hot water system? A heat pump may be the answer. It uses energy from the surrounding ambient air and doesn’t need direct sunlight. It transfers heat from the air to water inside a heat pump heat exchanger, saving about 50 per cent on your hot water bill. An average of 3.4 tonnes of greenhouse gas emissions a year. Heat pumps cost about $3000 before rebates. A federal government rebate of $600 applies (with some restriction).

**GREYWATER**

Greywater recycling is on the increase. But there are no clear government rebates, and federal government rebates have been discontinued. The average household produces about 960L per year of greywater (from sinks and showers), which can be reused in the garden and/or toilet flushing via one of two types of systems. The greywater immersion heater is a kit that stores or treatment, using a “heated” switch or tap to divert it to the garden for sub-surface irrigation. The greywater treatment system collects and treats it to a higher quality to reuse via sub-surface irrigation (when not discharged), surface irrigation and possibly toilet flushing, and cold-water laundry washing, machine use (when discharged).

Simple domestic systems can be purchased for less than $2.50, while treatment systems start at about $3000, plus installation costs.

**Solar heating**

Thermal mass is a very simple way of using heat from the sun to warm the house without motors, but can only be achieved through clever solar angles. One of the most popular ways to achieve this is using concrete or stone floors or walls that capture the heat from the sun and maintain through night by using small windows. The house is slowly heated during the day and night. An innovative take on this is the use of thermal mass can be done using an internal wall of radiant systems. In winter, the sun falls on the wall and the wall absorbs the heat, which is transferred to the house. In summer, the wall is on the warm side and the sun is reflected by the wall.

Four recovery ventilation systems are another low-cost energy innovation, heating the house using the sun’s energy. They work on the principle of directing solar-generated warm air into the house via fans and draught doors. There are different ways this can be done, for example, using the ceiling cavity to trap heat. For the roof space of a house can reach high temperatures, and this heat can be directed into the house via fans, which can be released to soak warm air out of the house during winter. The roof space air temperature can be further increased by replacing a section of roof sheathing with clear polycarbonate sheathing. This can increase a higher level of ceiling insulation to ensure the efficient heat does not enter the house during summer.

Solar heating is an effective way to reduce solar energy, but it is not just a matter of grabbing a bunch of natural plants and sprinkling them in the garden. It’s important to buy them from local sources so they have not reached carbon miles and choose plants suitable for your type of soil.

**SUSTAINABLE GARDEN**

While native gardens are all the go because of their low water use, it’s not just a matter of grabbing a bunch of native plants and sprinkling them in the ground. It’s important to buy them from local sources so they have not reached carbon miles and choose plants suitable for your type of soil.

But native gardens aren’t the only sustainable option and in some cases, edible plants can be a better use of garden space. Introduce some chickens — they’re the cornerstone of recycling.

**The right angle**

Contact orientation for passive solar design helps keep the temperature comfortable with minimal heating and cooling. This means lower energy bills. Ideally, the house should face north, with most windows positioned to catch the low angled winter sun and keep out the high angled summer sun. In particular, living areas should be facing north, resulting in solar gain in winter.

Doors and windows should be placed to capture cooling breezes in summer. Contact orientation is most easily achieved when the block faces north-south, but with some design work, it can be achieved on any block.

“Native gardens aren’t the only sustainable option and in some cases, edible plants can be a better use of garden space. Introduce some chickens — they’re the cornerstone of recycling.”

measures for plants. Soil improvers, soil warming agents and nutrients can be added to increase water and moisture-holding capabilities. When choosing materials for your outdoor space, look for local or recycled products. Locally sourced materials not only have low carbon miles, they also look authentic in our environment. For example, limestone looks and feels right in Freemans, while lavender looks and feels right in the Pink Hills.”
## Photovoltaic systems

Harness the sun's rays to generate clean electricity with a photovoltaic (PV) system. This reduces the amount of electricity you draw from the grid and if you make more than you need, the excess is fed back and you're credited (feed-in tariff). Another benefit is the Renewable Energy Bonus Schemes, a principled by the electricity company for excess generated energy. In fact, in some local government schemes, renewables can sell energy to the grid.

### Clever air-con

A new climate-controlled system of split systems can actually generate some of the electricity needed to run it, reducing bills. Waste energy is recovered from the superheated refrigerant through a turbine and harmonic expansion chamber. The waste energy plus energy provided by solar warm water is captured, and the surplus is fed back into the grid. It’s also used in conjunction with a PV system.

## How much can you save?

Compare these household water and energy-saving features.

<table>
<thead>
<tr>
<th>System Type</th>
<th>% of Annual Use in a Typical Household</th>
<th>Annual Savings to Typical Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHOTO-VOLTAIC SYSTEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3kW</td>
<td>Up to 73%</td>
<td>Up to $1050</td>
</tr>
<tr>
<td>1.5kW</td>
<td>Up to 37%</td>
<td>Up to $525</td>
</tr>
<tr>
<td>SOLAR HOT WATER SYSTEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Figure Not Available</td>
<td>$500</td>
</tr>
<tr>
<td>GREYWATER HARVESTING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TREATMENT METHODS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5kL</td>
<td>Up to 33%</td>
<td>Up to $111</td>
</tr>
<tr>
<td>2kL</td>
<td>Up to 28%</td>
<td>Up to $94</td>
</tr>
<tr>
<td>RAINWATER TANKS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Up to 22%</td>
<td>Up to $73</td>
</tr>
</tbody>
</table>