Shire of MUNDARING

shire of kalamunda

Sustainable Living Guide

Sustainability is based on the principle that every aspect of our survival and wellbeing depends, either directly or indirectly, on our natural environment.

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Further copies can be obtained from the Shire of Kalamunda.

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At the time of printing in November 2013 all information and website details were correct.

Shire of MUNDARING

The Hills Sustainability Group

shire of kalamunda

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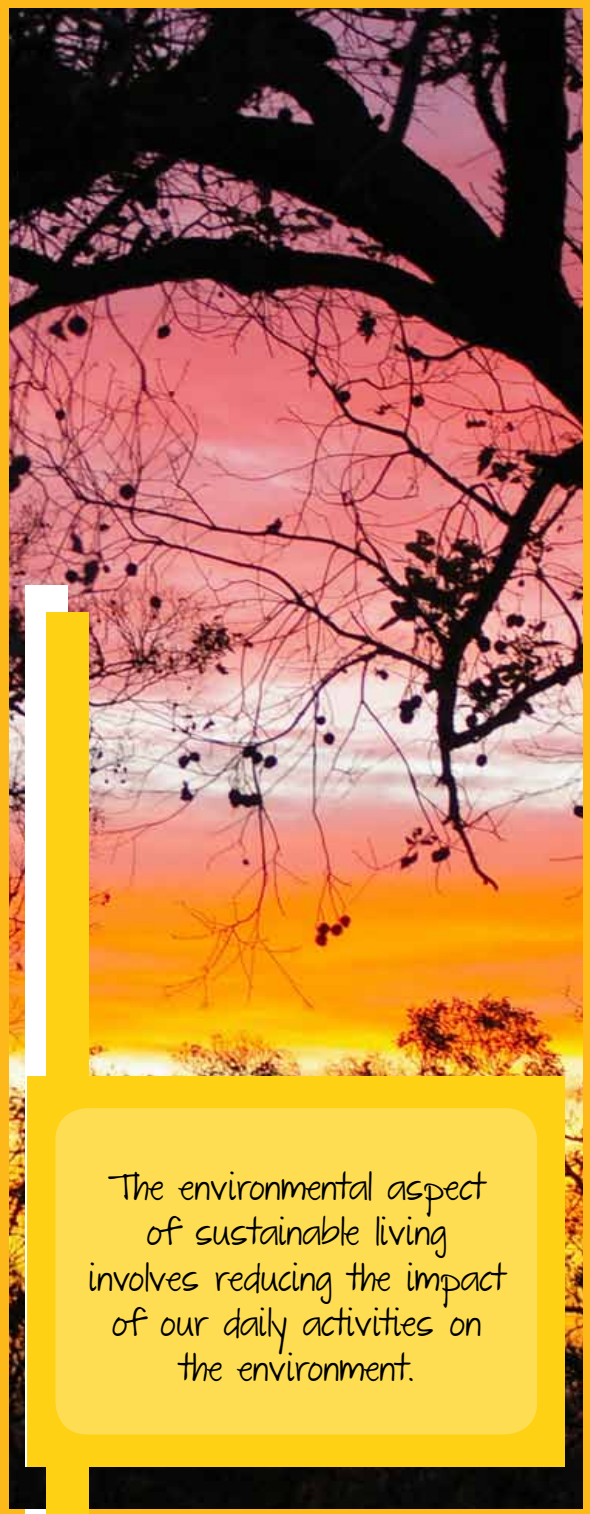


The environmental aspect of sustainable living involves reducing the impact of our daily activities on the environment.

Photo courtesy of Lesley Thomas

1. INTRODUCTION

Welcome to the first edition of the *Sustainable Living Guide!* The Guide provides a sourcebook of ideas for sustainable ways of living and describes reasons for making lifestyle changes, to help you understand why making these changes is worthwhile.

Information in this Guide will help you to:

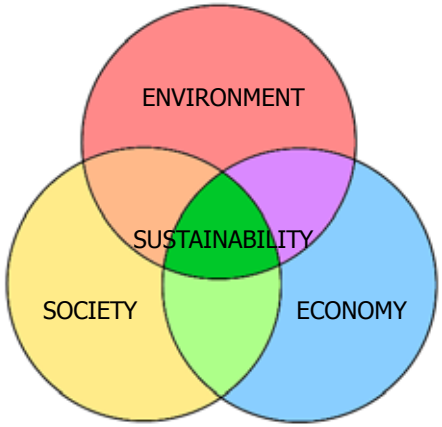
- reduce your energy and water use
- reduce the amount of waste your household produces
- get involved in your community
- think about ways to spend your money to support our local economy.

You don't have to start all the actions in this Guide at once. You can take ideas from these pages and commence the actions you feel ready to undertake, and then build on achieving further actions in the future. Sustainable living is not all about sacrifice; it can also be very satisfying. Doing your bit can save you money as well as help the environment, and can also help to inspire others.

1.1 Sustainability

Sustainability is based on the principle that every aspect of our survival and wellbeing depends, either directly or indirectly, on our natural environment. Sustainability may be described as our responsibility to live in a way that fosters cultural, economic and environmental health and vitality for present and future generations.

Sustainability means finding a balance between environment, economy and society, and looking for ways of living which benefit all of these areas.



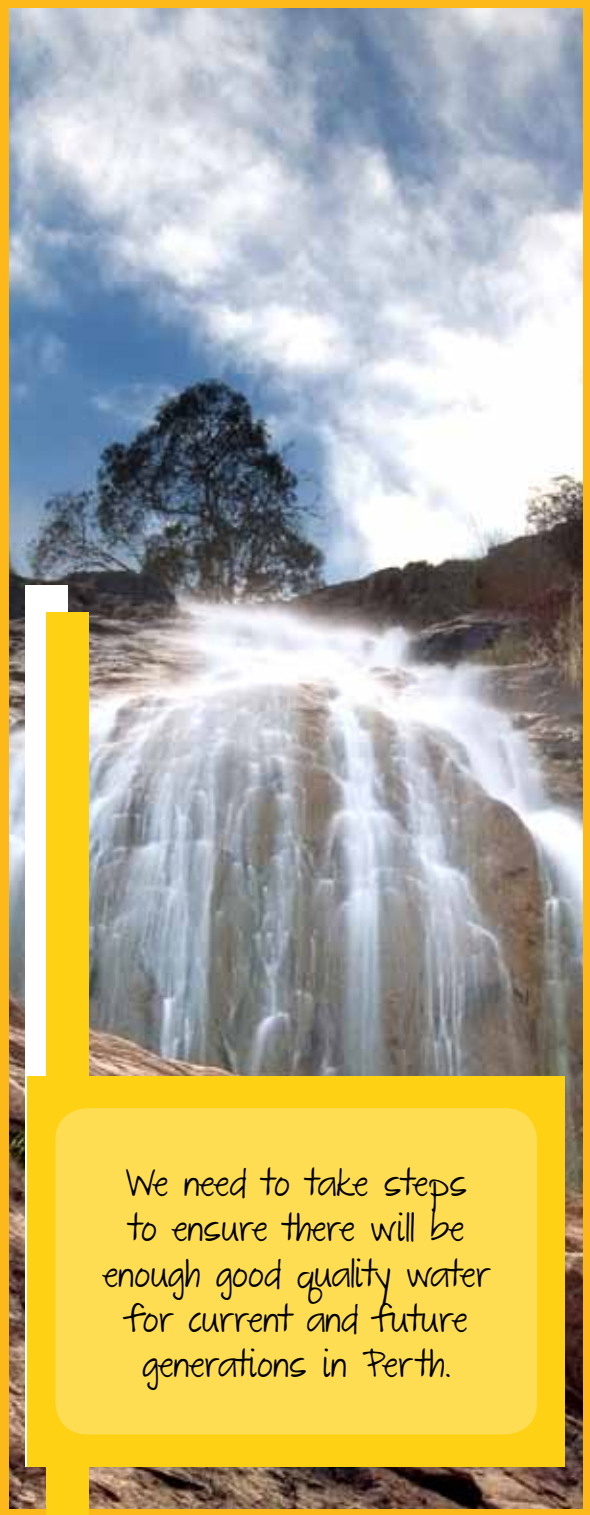
Sustainability means different things to different people. But the key point is to integrate sustainable living into our lives. This Guide contains actions and advice to help you do this.

1.2 The Guide

This Guide aims to provide enough information to get you started and does not claim to be comprehensive. Updated versions will be available in the future to include additions and/or new information based on feedback from people such as yourself using it.

If you would like to provide feedback for future editions please contact the Shire of Kalamunda Environmental Team on 9257 9999 or email kala.shire@kalamunda.wa.gov.au.

Enjoy sustainable living!



We need to take steps to ensure there will be enough good quality water for current and future generations in Perth.

2 ENVIRONMENTAL

The environmental aspect of sustainable living involves reducing the impact of our daily activities on the environment. This involves changing our practices so we use resources in a wise, efficient and less wasteful way. This will ensure present and future generations have access to a similar quality and quantity of resources as those that we presently enjoy.

2.1 Being Waterwise

2.1.1 What's the Problem?

Perth's climate is becoming dryer and our natural water supplies are less assured. As well as trends of reduced late autumn and winter rainfall[1] there is an increasing pressure on groundwater supplies, which make up approximately 35–50% of the water supplied to Perth.[2] The underground aquifers where this groundwater is stored are steadily declining by unsustainable levels of extraction to feed Perth's water hungry households and gardens.

West Australians are now realising water is a scarce and valuable resource, and we need to take steps to ensure there will be enough good quality water for current and future generations in Perth. Every household can contribute to this by reducing its demand on our limited scheme water supply, and there are ways to do this where we can still enjoy healthy gardens, and the benefit of water on tap. Being waterwise can be achieved by capturing rainwater, reusing greywater, and waterwise efficiency.

2.1.2 Caring for Waterways

As well as reducing the amount of water you use, you can take action to maintain or improve local water quality. Water that drains from your house into stormwater drains or into the garden and soil on or near your property ends up in local waterways and groundwater aquifers. The Shires of Mundaring and Kalamunda are situated at the 'top of the catchment' of waterways that eventually drain into the Swan and Canning Rivers. It makes good sense to take responsibility for the quality of water we are sending to our neighbours and ecological systems downstream.

Fertilisers are high in nutrients, such as phosphorus and nitrogen. These can wash down stormwater drains and enter our waterways, ending up in the Swan-Canning River system and the ocean. Phosphorus and nitrogen can be responsible for toxic algal blooms in our waterways, resulting in fish deaths. Phosphorus can also seep into our groundwater systems which forms much of Perth's drinking water supplies, which is a problem.

Ways to reduce your household's fertilisers entering our waterways include:

- Minimise lawn areas around your house
- Grow local native plants instead of exotics as natives require less fertiliser and water
- Apply fertiliser sparingly in Spring or early Autumn, as these are the optimum times for absorption of the fertiliser by plants
- Use natural alternatives instead of chemical fertilisers such as compost, soil improvers and worm castings.

For information on how to get involved in a community group caring for a local bushland area see section on 4.1.3 Get Involved With Community Activities. Several of the areas cared for by these groups are along waterways and their work helps improve local environmental water quality.

2.1.3 Capturing Rainwater

Rainwater that would normally run off your household roof and go into a soakwell can be captured from gutter downpipes and reused for household needs.

A tank installed in a home in Gooseberry Hill

One millimetre of rain on one square metre of roof equals one litre. You can calculate the amount of rainwater you could save from the roof of your home using the following formula:

Roof area (m^2) x average annual rainfall (millimetres)
x 80% (0.8) = water volume (litres) collected per year

The Department of Health recommends using collected rainwater for non-drinking uses such as flushing toilets, in washing machines and for washing your car.

- To estimate of the size of your roof you can use aerial photography, such as Google Earth, nearmap, or your Shire's website mapping interface.
- The Bureau of Meteorology website has data for each of its weather stations to help you find out the average annual rainfall in millimetres for your area, or you can use your own rain gauge measurements if you have them.
- The figure of 80% accounts for 20% losses due to first flush diversion (more on this below), evaporation, and showers that are too small or light to produce enough run-off to collect.

Example: The average house in Australia has a floor area of 215m^2 (Australian houses are now the largest in the world on average).[3] Assuming a roof area of the same size, and using the annual average rainfall at the Perth Airport Weather Station of 721.7mm[4],we can calculate as follows:

roof area (m^2) x average annual rainfall (millimetres) x 80%
215 x 721.7 x 0.8 = 124,132.4L per year (= 124.1kL)

It rains more on average in the hills than on the Swan Coastal Plain, so a house of the same size, with the Bickley Weather Station average rainfall of 1082.3mm, would be able to collect 186,155.6L per year (= 186.2kL).

Be aware that not all of your roof area may easily connect to a rainwater tank, as this depends on the setup of your gutters and downpipes and where you have room to place a tank(s). Also, more than 80% of the rainfall in Perth occurs during the months of May to October, so the longevity of your supply after October will depend on the size of your tank.

The Department of Health (DOH) recommends using collected rainwater for non-drinking uses such as flushing toilets, in washing machines and for washing your car.[5] Rainwater may be legally used for drinking purposes in a private household (there are different requirements for food premises and accommodation premises where water is supplied to the community), however the DOH recommends disinfection first, by boiling or chlorination.[6] Other common methods of water disinfection include

Car washing in a waterwise way using only a micro-fibre washing glove, a micro-fibre outdoor drying cloth and a single bucket of water Photo courtesy of Pat Crichton

reverse osmosis and ozone—which can be setup as part of the system by a qualified plumber who connects the rainwater to your household water supply. *Check the DOH website for necessary approvals.*

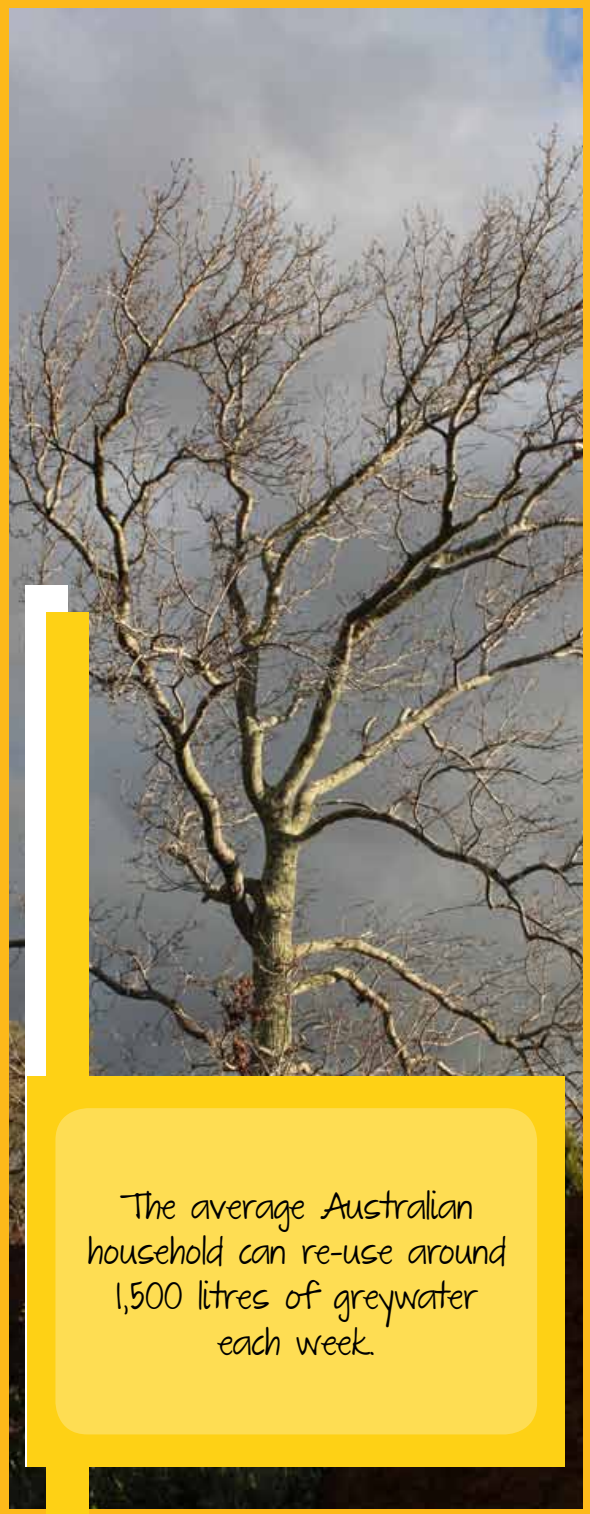
There are various types of rainwater storage systems commercially available:

- **Above Ground Tanks:** are common, and slimline style tanks will take up less room next to your house.
- **Bladder Tanks:** have soft sides, and can be installed under the house floor or under a deck, and save space.
- **Underground Systems:** include heavy duty tanks built to withstand the pressure of the surrounding soil in which they are buried. It is generally more costly to install underground systems in the hills due to rocky soils; the sandy soils of foothills in the Swan Coastal Plain are easier to excavate.

Rainwater harvesting may not be suitable if you have an older style house with an asbestos roof or roof with lead flashings as this can pollute the water you are collecting.[7]

A rainwater system should have a mesh filter where the drainpipe enters the tank, to prevent leaves entering and to provide a 'first flush' mechanism. This diverts the first few minutes' rainfall to an overflow pipe instead of the collection tank and means the first flow of water, which washes dust and debris off the roof, will not be collected.

A leaf catcher and first flush mechanism with a ball-shaped float (inside the plumbing) to divert water away from the tank. Photo courtesy of Steve Gates



The average Australian household can re-use around 1,500 litres of greywater each week.

Also, consider what you want to reuse the water for as the polypropylene plastic used to contain water in some types of tanks could make the water unsuitable for drinking. Using rainwater to water the garden is the simplest and cheapest use as it doesn't require any special treatment.

Particularly in Winter, when most of Perth's rainfall occurs and your garden is watered naturally, a rainwater tank can provide extra benefit when it is plumbed into your house. Rainwater harvesting systems need an appropriate pumping system and need to be connected to the house correctly so the water may be used and rainwater cannot flow back into the scheme water system; here a licensed plumber is required to advise on the best way to set up and install your system.

Collecting rainwater can increase the water security of your household, and can offset rising household water costs if the price of water increases in relation to its scarcity.

2.1.4 Reusing Greywater

The Australian Government Living Greener website states "the average Australian household can re-use around 1,500 litres of greywater each week". [8] This water that would be discarded into the sewer system is a great resource for non-drinking uses such as watering the garden, toilet flushing and use in the washing machine, depending on the level of treatment.

What is Greywater?

Greywater is wastewater from the shower, bath, spa bath, wash basin or washing machine. Water from the kitchen sink has higher levels of greases, oils and detergents than wastewater from other sources. Kitchen sink water cannot be used in many types of greywater system, and is not included in the definition of greywater.

Electric pump on a water tank, capable of opening and closing the valve
Photo courtesy of Steve Gates

Greywater is not wastewater from a toilet, urinal or bidet—this wastewater is referred to as blackwater. *For more information on rules and guidelines for disposal, reuse of blackwater such as septic systems, and aerobic treatment units (ATUs) contact your Shire's Environmental Health services team.*

Greywater Reuse Options

Greywater needs to be treated according to the level of quality required for your desired use. The Department of Health advises avoiding human contact with the greywater, due to the potential contact of pathogens.

A good place to start is a Waterwise Specialist irrigation shop or supplier. The Water Corporation lists these on its website.[9] Each specialist has undergone approved training in water use efficiency and health standards and can offer up-to-date advice and information. The DOH's *Code of Practice for the Reuse of Greywater in Western Australia 2010* [10] gives the following options for greywater reuse:

A tub catching shower water for re-use
Photo courtesy of Steve Gates

- Bucketing
- Greywater Diversion Devices
- Greywater Treatment Systems

- **BUCKETING:** is where water is captured from the shower or laundry tub (eg. when the washing machine does a rinse cycle) and is manually carried to be reused in the toilet cistern (for flushing), on the garden, pot plants or in your washing machine.
- **GREYWATER DIVERSION DEVICES (GDDS):** divert greywater to the garden without storage or treatment. The water is filtered to remove larger particles that would otherwise block your irrigation system.

The greywater may only be reused legally in gardens via sub-surface irrigation. This is a special purple pipe (to indicate its greywater) and must be buried at least 10cm below the soil surface or under mulch. The GDD will have a manual switch or tap so greywater can be sent into the sewer rather than the irrigation when desired; for instance, in winter when the garden is naturally watered by rainfall.

There are further guidelines for the use of GDDs in the Code of Practice. Importantly they can only be used in single residential domestic dwellings and not in commercial premises or groups of villas. Greywater must also be kept within the confines of the property.

There are two types of Greywater Diversion Devices:

1) Gravity Diversion Systems: work well when your block is on a slope and the garden is lower than the house. The pressure of gravity moves the water from the house to the garden irrigation system.

Reusing household greywater highlights what your household puts down the drain.

2) Pump Diversion Devices: may be used when a suitable slope is not available or when the garden is uphill from the water collection point. In these systems a pump supplies water to the irrigation system.

Maintenance of the system is the responsibility of the homeowner, and may be done by the homeowner. This includes frequent tasks of cleaning and replacing the filters, and an annual flush of the irrigation system with scheme water.

- **GREYWATER TREATMENT SYSTEMS (GTS):** collect greywater and treat it to a higher level of quality than GDDs. If a GTS does not disinfect the greywater it may only be legally used for subsurface irrigation (as for GDDs). However, if a GTS disinfects the greywater to a suitable standard the water may be used for surface irrigation (sprinklers), toilet flushing and for cold water washing machine use.

Regular maintenance of the system is required and is the responsibility of the homeowner. An authorised service person rather than the homeowner must conduct a minimum annual inspection of GTSs as part of the maintenance requirements. *See the Code of Practice for further details.*

A greywater diversion device for irrigation
Photo courtesy of Steve Gates

Both GDDs and GTSs have specific requirements for the minimum amount of irrigated land based on your calculated volume of greywater.

Key Differences between GDDs and GTSs

Greywater Diversion Device (GDD)	Greywater Treatment System (GTS)
Diverts greywater without storage or treatment.	Collects and treats greywater to a higher quality.
Water may be used for subsurface irrigation only (minimum 10cm under mulch).	Water may be used for: 1) Subsurface irrigation 2) Surface irrigation—if the system has disinfection to 20/30/10 standard 3) Toilet flushing and Washing machine—if the system has advanced secondary treatment and disinfection to 10/10/1 standard, water may also be used for.
Can be maintained by the householder.	Must be maintained by an authorised service person in accordance with the manufacturer's specifications.

Approval

The DOH's website provides the following approval process:[11]

1. Read the *Code of Practice for the Reuse of Greywater in Western Australia 2010* to ensure your greywater reuse systems will meet these legislative requirements.

2. Choose a GDD or GTS system that is approved for use in Western Australia by reviewing the DOH's list of approved systems. [12]

3. Lodge an application to your local Shire (though the title says 'Sewage' this application form is also used for greywater systems). All successful applications will be provided with an approval and 'Permit to Use' for you to go ahead and install the system. *Contact your Shire's Environmental Health Services Team for more information on this process or see your Shire's website.*

What Goes Down the Drain?

Reusing household greywater highlights what your household puts down the drain. It brings the focus of water and the impact on the health of our environment now literally into 'our own backyard'.

Each household's greywater will have a different mix of nutrients (phosphorus and nitrogen) and salts (sodium, calcium, magnesium, potassium and other salt compounds). Comparative information on the nutrient and sodium content of various washing powders and detergents is available at the Lanfax Laboratories website.[13]

A combination of both financial investment (within your means) and challenging yourself to change your behaviour can make a big difference to how waterwise your household becomes.

- **Nutrients in Greywater:** are sourced from washing detergents and powder, soaps, shampoos and other cleaning agents. Greywater containing nutrients used in irrigation can be beneficial to your garden, as nutrients are required for healthy plant growth. This is a good example of 'closing the loop' in a system, where the waste from one activity is a beneficial input to another.

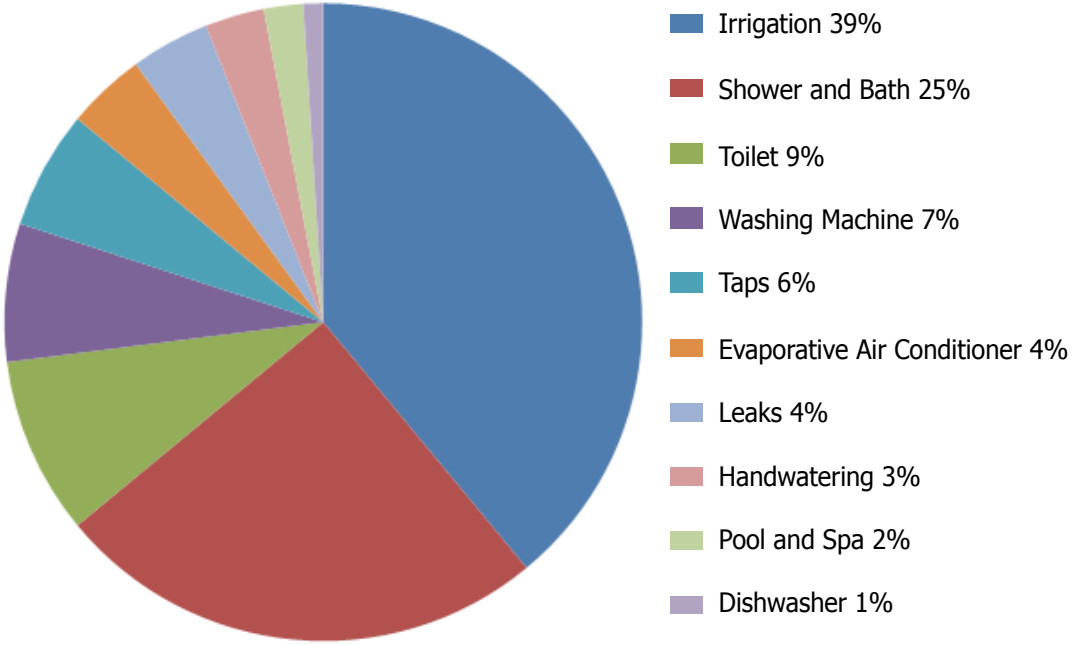
- **Salts in Greywater:** come from washing detergents and are commonly compounds of sodium, magnesium and calcium. Salt is more of an issue than nutrients in greywater, as excess application of salt to your soil can reduce its ability to hold water (soil permeability). Salt is included in washing powders as a filler. Generally there is less salt in concentrated powders, and even less in liquids.

Amending your soil by adding organic matter, such as manure around plants, and a layer of mulch on the soil surface will help with regard to both nutrients and salt in greywater. Organic matter helps the soil maintain its structure and ability to absorb water and nutrients, and reduces the risk of soil salinity.

2.1.5 Waterwise Efficiency around the home

There are many ways to be waterwise and save water around the home which vary due to financial input and behaviour changing. For example, installing a water-efficient toilet will have an upfront cost but won't require you to change your behaviour; your new toilet operates in the same way as your old inefficient one. Another idea is to bucket greywater from your shower or laundry tub and put it into your toilet cistern for flushing. This behaviour change will save water without any cost, as will taking shorter showers. A combination of both financial investment (within your means) and challenging yourself to change your behaviour can make a big difference to how waterwise your household becomes.

Average Perth Residential Water Use By Area



Based on the Water Corporation graph on the left[14] this section addresses waterwise efficiency measures you can put into place in your home and garden in order of greatest to least area of water use in the average Perth residence.

Irrigation

This graph shows that on average 39% of Perth households' water use goes to irrigation. Some key tips for reducing water used in your garden include:

- **Reduce the amount of lawn area in your garden.** Lawn requires a lot of water compared to other types of low water using plants. Replacing your lawn with waterwise plants will save you time watering, maintaining irrigation, fertilising and mowing. Lawn may be replaced with waterwise plants, groundcovers or mulch. The Water Corporation website has information about creating a water-efficient verge.[15] *Be mindful that verge landscaping requires approval from your local Shire.*

Soil improvement makes a big difference, as adding clay and organic matter to your soil will improve its structure to help it retain water and nutrients.

- **Plant waterwise plants:** Local native species are a great option as West Australian plants are adapted to survive the dry conditions of our long summers, and the bountiful biodiversity of our region provides a variety of species to suit the needs of any garden. Be wary of native plants from the Eastern states. Although they require little water they often have potential to escape from gardens and become bushland weeds. *Contact your Shire's Environmental Services Team for a list of species local to your area and information on local weeds and garden escapees.*

- **Use hydrozoning in your garden layout:** Group plants together in your garden by their water needs. Plants that need very little water can be grouped together and higher water using plants can be placed in a separate area. This makes for much more efficient watering and reduces water use.

- **Protect your soil by adding a layer of mulch:** A 5–10cm layer of mulch over the soil will allow water to drain into the soil and prevent evaporation. Waterwise mulch should be of a chunky consistency rather than fine so it will soak up the water, compact and prevent water filtering through to the plant's roots.

  Mulch also helps suppress weeds, which reduces maintenance. Top up mulch each year to maintain the appropriate level but do not place mulch so that it contacts the stems of the plant as this can cause the plant to rot. Mulch should be well composted to prevent the spread of disease and weeds.

  Be aware that adding mulch can cause nitrogen drawdown. This is when micro-organisms such as fungi and bacteria start to compost the woody materials on the soil surface. To do this they need to draw nutrients out of the soil. Nitrogen drawdown results in the competition for nutrients between the plant roots and the mulch on the surface being broken down. To combat this first place a 1–2cm layer of well-rotted cow manure or compost on the soil around your plant, then the woody mulch layer on top of this. The manure will directly provide nutrients for the plants and creates a 'buffer' so the mulch sitting on top won't compete and draw nutrients out of the soil away from the roots.[16]

- **Improve your soil:** Soil improvement makes a big difference, as adding clay and organic matter to your soil will improve its structure to help it retain water and nutrients. When planting new plants, add organic matter into the planting hole, mixing it in with soil from the hole and water in well. The organic matter feeds the plant and promotes healthy soil life (microbes and worms) that support the plant's health. It also helps improve soil structure so it will better distribute and hold water. The rule of thumb is to add an amount of organic matter to the planting hole equivalent to the amount of potting mix in the plant pot. Addition of commercial soil wetting agents can also help soils absorb water and get to the plant roots. Both sandy and clay soils will benefit from the addition of organic matter. *The Water Corporation website has further resources about soil amendment for saving water.* [17]

- **Install an efficient irrigation system:** Irrigation is most efficient when water is applied to the root area of the plants rather than spraying the leaves. For this reason drip irrigation systems are highly efficient, and are a cheap option for your garden. A drip irrigation system prevents loss of water through surface evaporation, especially if it is installed under a good layer of mulch. Watering early in the morning before 9:00am or in the evening after 6:00pm will help to avoid evaporative loss. A waterwise irrigation design shop can provide you with the most expert up-to-date advice on waterwise irrigation systems. *See the Water Corporation's website for the current list of Waterwise Specialists.*[18] *The website also has lots of useful information on improving your soil, creating waterwise gardens and choosing waterwise plants.*

- **Use greywater for irrigation in your garden:** Reusing household waste water sourced from the shower, laundry tub and wash basins allow you to use this undervalued resource to keep your garden lush and healthy. The nutrients in the greywater from the laundry wash cycle can reduce the amount of fertiliser you need to add to your garden. *See Section 2.1.4 on Reusing Greywater for further information.*

- **Use water collected from a rainwater tank:** Collected rainwater may also be used to irrigate your garden; however, as garden irrigation requires much more water usage than is required in the house, you may prefer to save your store of rainwater for inside rather than outside use. A good rainwater tank vendor will work with you to match your tank size to your household needs.

Installing a water-efficient toilet to replace a single flush toilet could save your household around 30,000L of water per year.

Shower and Bath

Shower and bath use account for 25%, or one quarter of household water use in the graph. Here are some options to help you be more waterwise in this area:

- **Install a low-flow showerhead:** The Water Efficiency Labelling and Standards (WELS) Scheme[19] rates products and appliances by their water efficiency, with up to six stars for the most efficient products. Old fashioned showerheads can use up to 12L of water per minute. A 3-star rated showerhead only uses 9 litres per minute, which can save 20 to 30L of water per person per day.[20] To measure the amount of water your showerhead uses, turn it on and direct water into a bucket for one minute, and note the amount of litres of water in the bucket. This is your showerhead's water usage in litres per minute.

  The Water Corporation offers a free Showerhead Swap program for customers in the Perth area where you can exchange one or more showerheads for low-flow equivalents. Please note if you have a gravity-fed hot water system, a low flow showerhead may not be suitable as your system is already low flow. Some old instantaneous hot water systems may also be incompatible as these systems already restrict water flow, so check this before exchanging any showerheads. *See the Water Corporation's website for further information on this scheme.* [22]

- **Reduce your shower time to 4 minutes:** Taking an 8-minute shower every day with a conventional showerhead (12 L per minute) uses approximately 35,000 L of water per year. Taking a 4-minute shower every day under a 3-star rated showerhead (9L per minute) uses less than 15,000L per year, saving over 20,000L of water per year. A shower timer can get you in the habit of taking 4-minute showers. These are inexpensive and readily available to buy online at hardware stores, ecoshops and Waterwise Specialist shops.

- **Take a 'navy shower':** In warmer weather you could take a 'navy shower', which involves running the water for a little while initially to get wet, turning it off to wash yourself with soap or shampoo your hair, and then turning the water on again to rinse off. Anecdotally, this form of shower was popularised in the navy in order to save fresh water stored on seafaring ships.

- **Reuse your greywater:** One easy option for this is bucketing by collecting water in a bucket while you are waiting for the shower water to warm up and/or during your shower, and then pouring the water on the garden when you are finished. Make sure to use a bucket which is of a manageable size. *See Section 2.1.4 Reusing Greywater for further information.*

- **Other waterwise appliances:** Other waterwise appliances, such as flow regulators or aerators on your taps and single lever mixer taps, are also available to help save water. *See the Water Corporation website for more information.*

Waterwise Efficiency for Toilets

Toilets attribute 9% of household water use. The Water Efficiency Labelling and Standards (WELS) Scheme website notes that "an old-style single flush toilet can use up to 12 litres of water in one flush, whereas more water efficient dual flush toilets average less than four litres".[22]

Ways to reduce the amount of water used include the following:

- **Install a more water efficient toilet:** The WELS Scheme requires new toilets be registered and labelled with an efficiency rating score out of six, with six being the most efficient. The Water Corporation runs a Toilets To Go program, where a discount is offered to householders on a selection of 4-star rated dual flush toilets, which use 4.5L of water for a full flush and 3L for a half flush. [23] Installing a water-efficient toilet to replace a single flush toilet could save your household around 30,000L of water per year.[24]

- **Put a bottle of water in your cistern:** If you are unable to install a new toilet, you can place a one- or two-litre bottle of water in your toilet's cistern (ie. a bottle full of water with the lid on). It will reduce the amount of water needed to fill the cistern, and therefore the amount of water used per flush. Given that people use a toilet an average of seven times per day, this is a cheap option that can save a considerable amount of water.

- **Fix leaks:** A leaking toilet can waste up to 25L of water a day.[25] You can test for leaks by adding a dash of food colouring to your toilet cistern, leaving it for an hour or two without flushing, and then inspecting the toilet bowl. If the water shows any sign of the colour you added, you have a leak. There are several possible reasons for this and there are a number of useful troubleshooting guides to solve this problem on the internet. However, most causes can be fixed yourself through checking, cleaning, adjusting and replacing dysfunctional parts in the cistern (hardware stores carry replacement parts for toilets) or engaging a plumber. After replacing dysfunctional parts, repeat the food colouring test to make sure you have fixed the leak.

- **Install an Aerobic Treatment Unit (ATU) and reuse your blackwater:** In areas of your Shire where connection to the sewer system is not available ATUs are an alternative to septic tanks. These systems treat water to a higher level than septic systems, and the water may then be reused on your garden which saves scheme water use on irrigation. Investigate if an ATU is right for you as there are ongoing costs. A qualified contractor must undertake maintenance inspections on a regular basis. *For more information please contact your Shire's Environmental Health Services Team.*

Installing a pool blanket (pool cover) to prevent evaporation can save a staggering 50,000L of water a year, amounting to thirteen buckets a day.

A composting toilet system can significantly help to reduce water usage in your household

- **Install a composting toilet:** Composting toilets are another option for reducing water use if your property is not connected to the sewer system. These toilets break down human waste using natural decomposition processes and usually operate without a water flush system. Some types of composting toilets have heating and drying units powered by electricity or wind power to assist the decomposition process. If your composting toilet is well maintained it will not smell.

  The DOH website provides information on these systems[26] and your Shire's Environmental Health team can also assist. Each Shire requires an 'Application to Construct or Install an Apparatus for the Treatment of Sewage' form to be completed and lodgement with the Shire prior to installation.

Evaporative Air Conditioner

If using evaporative air conditioning one way to save water is to collect water bled from the air conditioner by putting a container under the dump pipe and emptying it onto your pot plants. Note that this water is higher in total dissolved salts than tap water due to the evaporative process of the air conditioner. Reusing this water also requires some vigilance so that water is not left standing as this could allow mosquitos to breed.

Fix Leaks

4% of water consumed in the average Perth residence is the result of leaks. This is a significant figure given that this water is not being used for any useful purpose. An easy way to check for leaks is to read your water meter before going to bed, avoid using taps or the toilet overnight and read the meter again in the morning. If there is a change in the reading you may have one or more leaks. Small leaks take longer to show so it is good to wait this length of time in order to pick them up. If you suspect a large leak you need only wait a couple of hours before checking the meter again. If a leak is detected first check all taps and fittings, and try the toilet food colouring leak test described above. Change all washers and seals you can manage yourself and if you are still experiencing a leak contact a plumber. *The Water Corporation website also has good tips on looking for leaks.*[27]

Hand Watering

Hand watering makes up only 3% of household water use and is a very small figure compared to the amount of water used on irrigation. However, water use in this area can be reduced by switching to drip irrigation where possible, as this is the most efficient form of irrigation. Reducing the number of pot plants you have is another option as pot plants use more water than plants in the ground.

Pool and Spa

Though pool and spa water use seems small at only 2% of household water use, installing a pool blanket (pool cover) to prevent evaporation can save a staggering 50,000L of water a year, amounting to thirteen buckets a day.[28] The pool blanket should cover the pool whenever it is not in use. As well as conserving water a pool cover can help reduce your pool's chemical consumption (as this evaporates along with the water), reduce cleaning time by keeping dirt and falling leaves out of the pool and can also make your pool warmer to swim in.

Dishwasher

Dishwasher use makes up 1% of the average household use, and the WELS rating system mentioned also applies to dishwashers. If you are buying a new dishwasher, choose a highly rated model. Also save water by waiting until your dishwasher is full before turning it on to maximise the benefit from the water used. To save a significant amount of energy, turn off the drying cycle and open the door to let your dishes air dry naturally.

Reducing the number of pot plants you have is another option as pot plants use more water than plants in the ground.

2.1.6 Useful Resources and Programs – Being Waterwise

Resource	Description	**Website** (then search for Resource)
Water Corporation website	Waterwise in the home, waterwise irrigation, and choosing waterwise plants. Water saving programs are also offered eg. showerhead swap.	www.watercorporation.com.au
Target 60 Campaign	Water Corporation campaign, encouraging Perth residents to reduce their water use.	www.target60.com.au
Water Usage Calculator	Hunter Water's online calculator responds to a series of questions about water use in each area of your house and garden. This calculates your household water usage, and provides water saving tips based on your responses.	www.hunterwater.com.au/Save-Water
Living Greener website	Australian Government website with information, 'how-to's' and rebates for sustainable living.	www.livinggreener.gov.au/water
Living Smart brochures	Department of Transport resources for households. Contains brochures for making your household more sustainable, including ways to save water.	www.transport.wa.gov.au/activetransport
Tree Canopy and Understorey Program	Shire of Mundaring program; free native seedlings are provided to local residents, ratepayers and community groups each year for planting within the Shire. These are generally waterwise plants.	www.mundaring.wa.gov.au

Resource	**Description**	**Website** (then search for Resource)
Plants For Residents Program	Shire of Kalamunda program; free local native seedlings are provided to Shire residents each year.	www.kalamunda.wa.gov.au
Community Group Revegetation Program	Shire of Kalamunda program providing free local native plants each year to Friends Groups working on Shire reserves.	Call Shire of Kalamunda Environmental Services Team on 9257 9999 for further information.
ICLEI Water Campaign™	The Water Campaign™ is an international freshwater management program developed by the International Council for Local Environmental Initiatives (ICLEI). The program aims to reduce water consumption and improve water quality, both in Shire operations and the community.	Shire of Mundaring's sustainability projects, including the Water Campaign™: www.mundaring.wa.gov.au Shire of Kalamunda: www.kalamunda.wa.gov.au
Waterwise Councils	The Shires of Kalamunda and Mundaring are both endorsed as Waterwise Councils. This program is a partnership between the Water Corporation and Dept of Water and helps participating councils adhere to State Government water efficiency measures and encourages improved water use management in the Shire and the community. Waterwise brochures are available to help residents become more waterwise.	Shire of Kalamunda webpage with brochures to download: www.kalamunda.wa.gov.au
Living Smart courses	Living Smart courses are offered to the community by each Shire occasionally. They cover 10 sustainable living topics such as water smart, waste smart, healthy home and gardening food. The course is broad in subject matter, but it is tailored to the needs and interests of the group involved each time.	www.livingsmart.org.au

Every household, school and business can do something to reduce their carbon emissions, and reduce the impact of climate change.

2.2 Saving Energy and Using Renewable Energy in the Home

2.2.1 What's the Problem?

Saving energy in your home reduces the amount of carbon emissions and other pollution your household produces, and allows you to directly help reduce the impacts of climate change. It can also help make your home more pleasant and comfortable to live in. Installing a renewable energy source in your home, such as a solar photovoltaic (PV) system, can allow you to offset your household's carbon pollution. Using renewables and reducing your household energy can also help you save money.

Installing solar panels can help to offset carbon pollution

Climate Change and Its Impacts

Climate change is a high priority issue with the potential to affect every aspect of our day-to-day lives, and presents major impacts on all generations. The good news is that every household, school and business can do something to reduce their carbon emissions, and reduce the impact of climate change. A lot of the actions you can undertake are fun, satisfying, can save you money and can improve your health and wellbeing.

Climate change is caused by greenhouse gases—primarily carbon dioxide (CO_2)—accumulating in our atmosphere and trapping heat from the sun. Greenhouse gases normally keep the Earth's temperature habitable; however the build-up of these gases in the atmosphere since the start of the industrial revolution has increased levels above anything in the last 800,000 years. The majority of the world's scientists agree this is causing the Earth's climate to change.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Australian Government Bureau of Meteorology (BOM) report *State of the Climate—2012* summarises their observations of Australia's climate and analysing factors influencing it.[29] Some of the trends observed in data collected from the last five decades and predicted to continue are:

- a projection that average temperatures in Australia are to rise by 0.6 to 1.5 ºC by 2030; [30] and
- rainfall is decreasing with an effect on the survival of some plant species, while other more resilient species including weeds become more dominant. Decreasing rainfall also puts pressure on agricultural systems, affecting the security of our food supply.

The combination of increased temperatures and decreased rainfall also increases the likelihood of bushfires.

2.2.2 What can I do?

The term 'carbon' in this Guide refers to all greenhouse gases collectively as there are several such gases, with carbon the most prevalent. These carbon emissions may be measured in units of carbon dioxide equivalent or CO_2-e. You can do your bit to reduce emissions by reducing your household energy use, which can both reduce your carbon emissions and save you money.

Much of household energy comes in the form of electricity and natural gas. When fossil fuels are burnt to produce this energy carbon is emitted into the atmosphere. Reducing the amount of energy used reduces your household carbon emissions. Some ways to reduce energy use in your home follows.

2.2.3 Assessing Your Energy Use

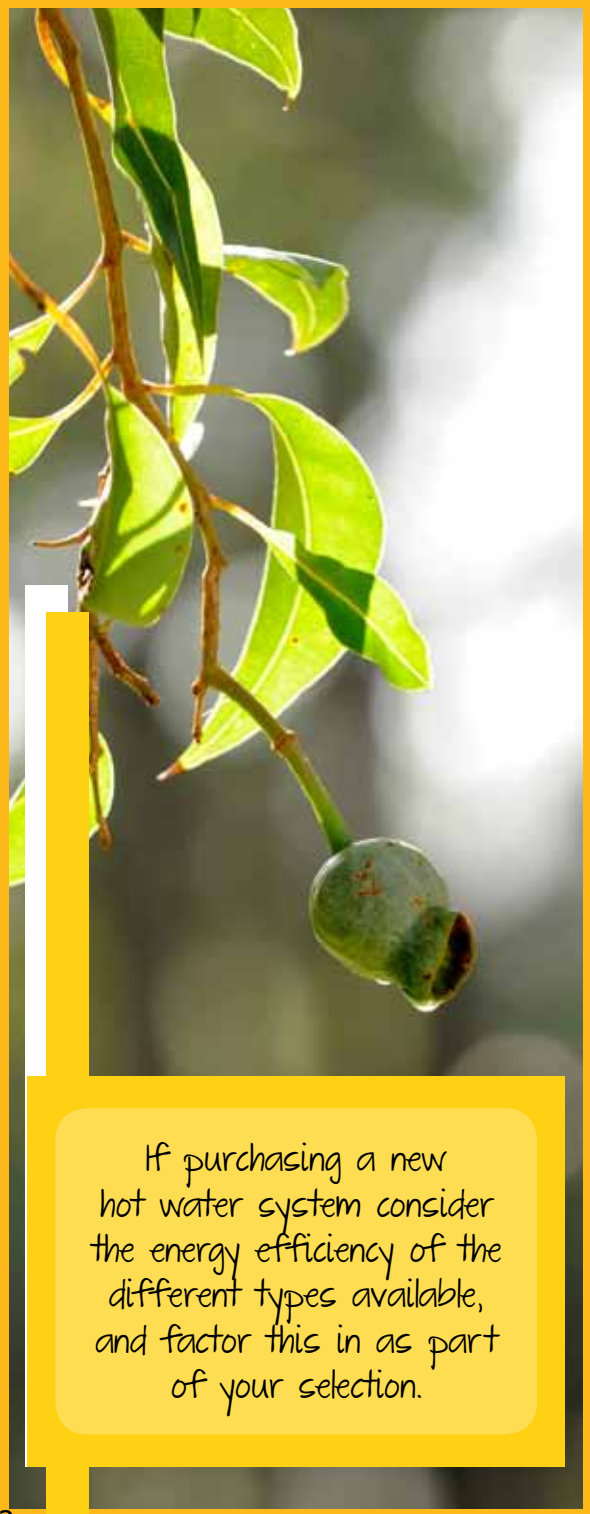
A good way to start saving energy is to find out how much you are currently using.

Reading and Tracking Energy Bills

Firstly, examine one of your recent electricity bills and find the section that gives your average daily consumption in 'units' of energy (1 unit = 1 kilowatt hour of energy). While the typical household uses 15 units of electricity per day an energy smart household may use as few as 4 per day.[31] Then examine your gas bill to find out your average daily consumption in units (kilowatt hours). As they are given in the same unit of measurement, you can add your gas and electricity use and compare them to the following table[32] to see how your household compares.

Household Size	Electricity & Gas Use Combined - Energy		
	High Usage (per day)	Medium Usage (per day)	Energy Smart Usage (per day)
1-2 Persons	30 kWh	20 kWh	10 kWh
3-4 Persons	45 kWh	30 kWh	15 kWh
5 + Persons	60 kWh	40 kWh	20 kWh

If you track your energy use over time you will notice patterns in how much energy you use at different times of the year. This will also help you compare your usage over time and to see how much energy you have saved through energy-saving actions.



If purchasing a new hot water system consider the energy efficiency of the different types available, and factor this in as part of your selection.

Power-Mates and Other Power Meters

Power-Mates are energy meters, which are available for loan through both the Library services in the Shire of Kalamunda and Shire of Mundaring. Power-Mates can help you find out how much power your appliances use when in operation or just on standby. They can also extrapolate the usage to report on the amount of energy your appliance uses over a longer time period such as a year, and how much this will cost you in bills. Other power meters of various types are available to purchase from electronics and hardware stores, and work in a similar way.

Knowing how much electricity your household appliances use makes you aware of energy use in your home. As energy use is unseen this helps you to 'see' where it's going. Then you can decide which appliances need to be running all the time, and which would save you a lot of energy if switched off at the wall.

One of the Power-Mates available for borrowing from your local library

2.2.4 Ways to Save Energy

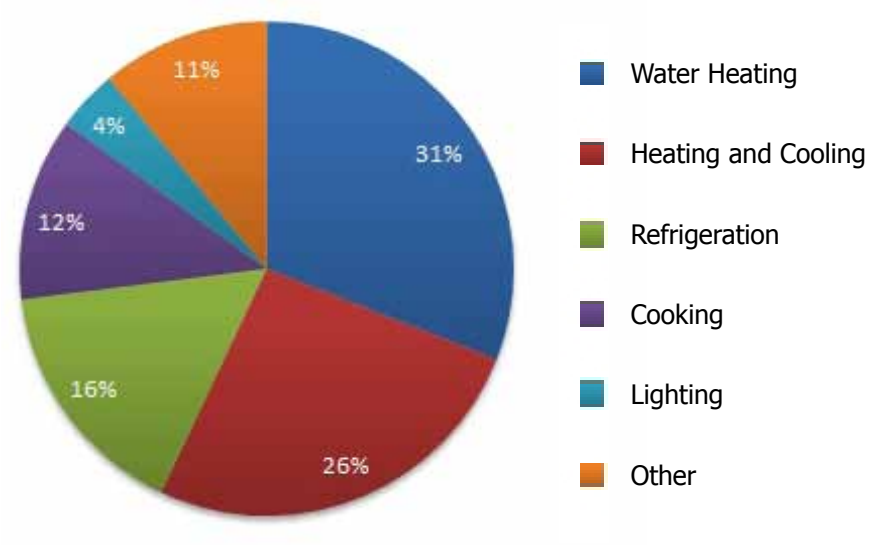
Green Energy Billing Options

Western Australia energy supplier Synergy provides their customers several green energy options: NaturalPower, EasyGreen and EarthFriendly. For a small additional cost on top of your regular bill, you can have a portion of your electricity offset by greenhouse gas reduction programs. This is an opportunity for people who do not have the means to generate their own renewable energy to reduce their carbon emissions from electricity, such as people renting or those who own their home but do not have solar panels. *See Synergy's website[33] for further details of these options.*

Saving Energy throughout your Household

The chart below from the Sustainable Energy Development Office[34] shows in which areas energy is used in a typical household in WA. This section addresses ways to save energy in your home in order of greatest to least area of energy use.

Typical Energy Use in a WA Household



Water Heating

Water heating is the number one area of household energy use in the chart. This is an area where significant savings can be made and may be achieved by the following:

- **Lower the thermostat setting on your hot water system:** The recommended setting is 60°C for storage hot water systems and 50°C for instantaneous systems.[35] A reduction of your system's thermostat of 20°C is estimated to save 147kg of CO_2-e per year.[36] Your water heater need not be as hot during the Summer months when a cooler shower is preferable, so adjust the setting to help reduce the use of energy.[37]
- **Take shorter showers:** Four minutes is the recommended length of time for showering, and reducing your average shower time will save many litres of precious water.
- **Fix leaky hot water taps as soon as possible:** A dripping hot water tap wastes energy as well as water. Changing the washer in a leaking tap is a low cost action that can save around 4,500L of water a year wasted if the tap is left to drip![38]
- **Replace your electric or gas hot water system with a solar alternative:** This action has a higher upfront cost than the previous actions. However, this investment can save 4,153 kg of CO_2-e per year if you replace an electric system, and 834 kg per year if replacing a gas system.[39] Your emissions reduction will be even better if your solar hot water system is electrically boosted and you buy or generate renewable energy with a solar photovoltaic system.
- **Choose an energy efficient hot water system:** If purchasing a new hot water system consider the energy efficiency of the different types available, and factor this in as part of your selection. *The Living Greener website has a useful section on hot water systems to get you started:* www.livinggreener.gov.au/energy/hot-water-systems

Window glass conducts heat very well and a lot of heat can transfer through your windows during Summer and be lost in Winter.

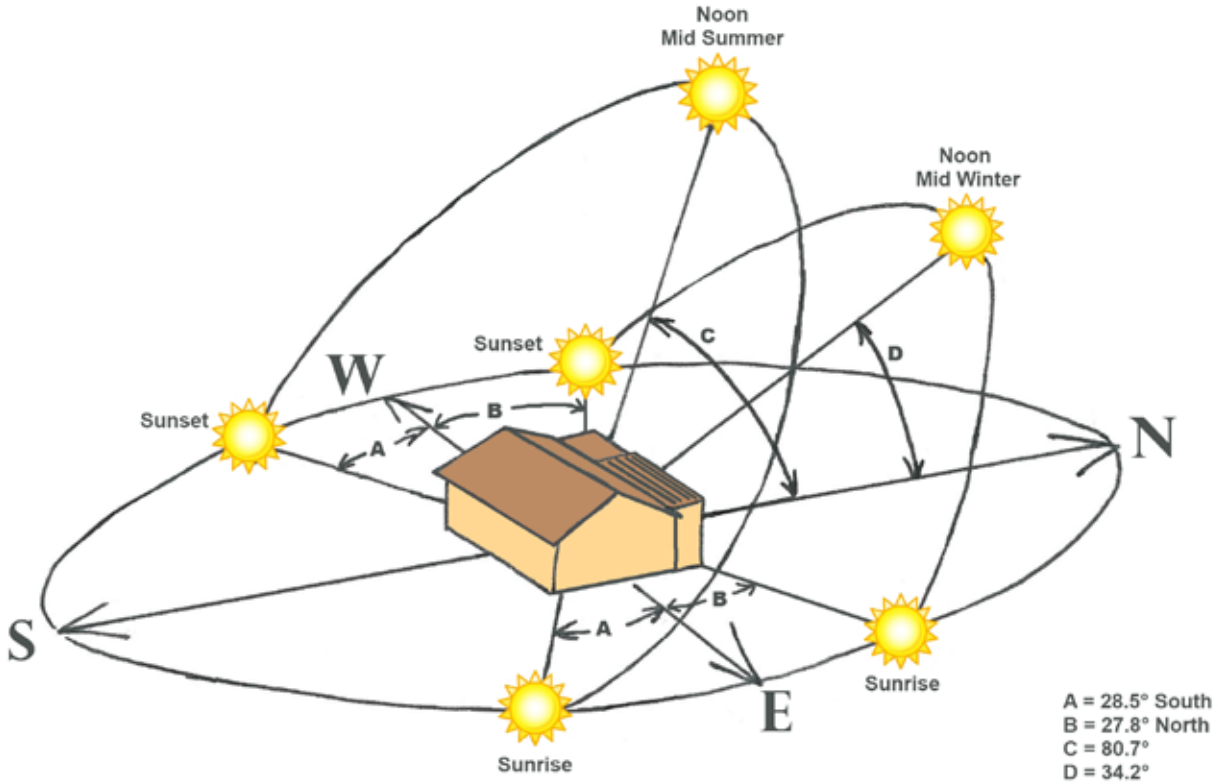
Heating and Cooling

Heating and cooling is the next biggest area of power use in WA households, accounting for 26% of use. Some ideas for saving energy on cooling and heating are provided below.

House Orientation to the Sun

It is useful to examine the orientation of your house in relation to the sun and prevailing winds which can help you adjust window treatments to make your house more 'climate sensible'.

Seasonal (Apparent) Movement of the Sun in Perth



Due to the tilt of the Earth's axis movement, the sun's position in the sky varies throughout the seasons:

- In Summer the sun rises earlier in the day. At the Summer solstice (21 December) it rises south of due east and sets south of due west, and at noon it rises to the highest northern angle in the sky it will reach all year.

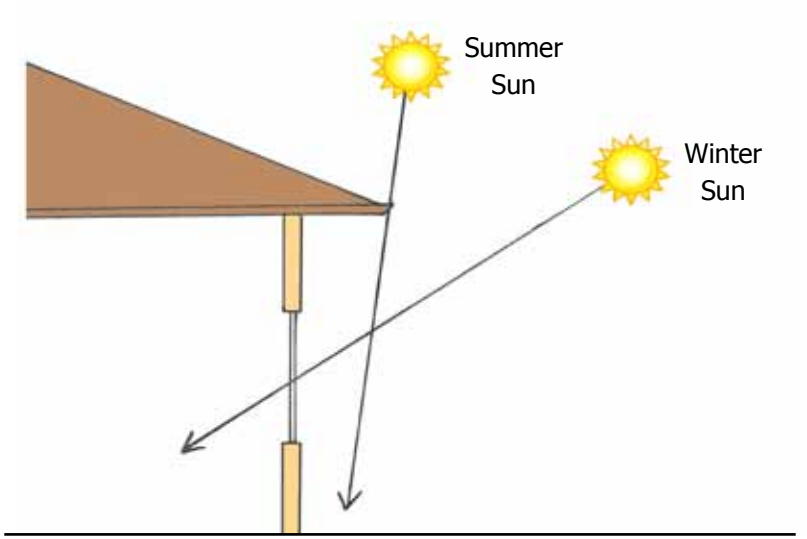
- Approaching Winter, the sun starts to rise later in the day and set earlier until it reaches the shortest day of the year, the Winter solstice (21 June). On this day the sun rises north of due east and sets south of due west [40], and at noon the sun reaches the lowest angle it will be seen at all year. The days then slowly become longer and the sun gets higher, moving back towards the peak at the next summer solstice.

If you are building a new house, it is sensible to consider orienting your house to work with the sun and prevailing winds to maximise passive design benefits and reduce the need for mechanical cooling.[41] This will save you a lot of unnecessary energy use.

Shading Windows

Due to the earth's movement, more sunlight is provided in summer on your east- and west-facing windows. Window glass conducts heat very well and a lot of heat can transfer through your windows during Summer and be lost in Winter.[42] This sunlight has the potential to heat up your house. To insulate this area, shade the east- and west-facing windows with external awnings or roller shutters. As the sun sits in at a low angle in the morning and afternoon, shading needs to be low over the window, and shades should be removable to let the sun in during winter.

Eaves Design for North-Facing Windows



You can also block out sunlight internally with curtains or blinds. For maximum insulation put in double-lined curtains with solid-topped pelmets (where practical), and make sure they touch the walls at either side of the window and also the floor or window frame.[43] This creates an insulated 'air gap' around the window to prevent unwanted heat loss or gain through the glass.

Capturing Seasonal Cross Breezes

To cool your house naturally, capture cool seasonal cross breezes. Ideally your doors and windows will be positioned to achieve cross ventilation in Summer, with inlets smaller and lower than the outlets which should be higher and larger, and at opposite sides of the house. As hot air rises, the cool air will push the hot air out.

Another alternative for living shade is growing deciduous creepers or vines over an open pergola on the north side of your home.

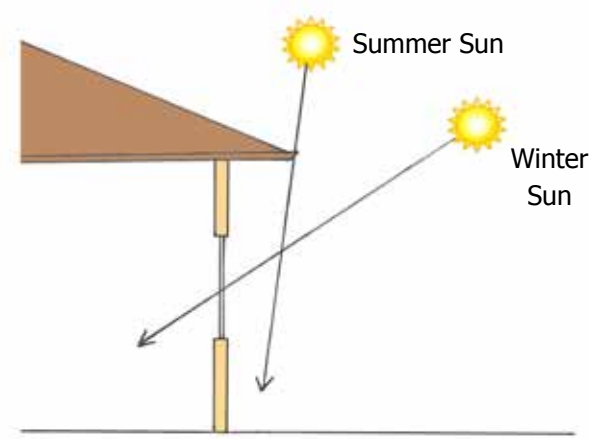
In Perth, cool breezes in summer come from the southwest, so ventilation inlets and outlets would ideally be at the south-west and north-east sides of your house respectively. If you are living in an existing house, you will have to do the best you can with the existing layout, however knowing about your local prevailing breezes will help you identify some options for natural cooling.

Eaves and Louvres

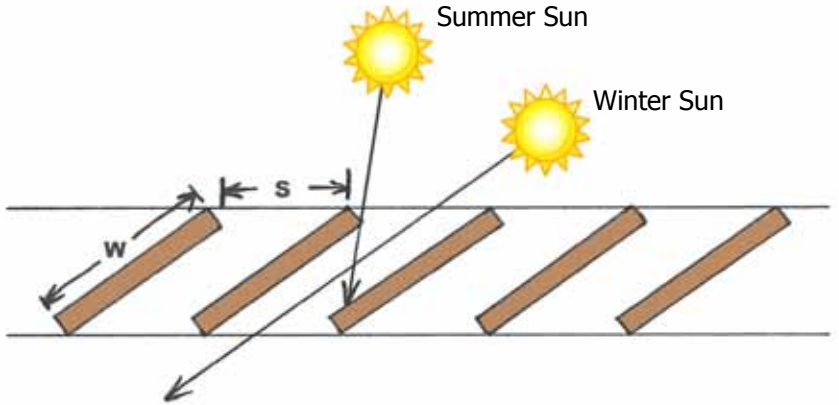
The sun is positioned higher in Summer when you don't want it entering and heating up your house. It is positioned at a lower angle in Winter, when you do want it to warm your house. Having eaves on your north-facing windows will allow you to block out the Summer sun yet allow the Winter sun into your house. Unlike the east- and west-side eaves, the north-side eaves can be closer to horizontal as the sun comes in at a higher angle on the north side. *See the diagram above right for the ideal design.*

Another way to block out Summer sun on the northern aspect of your house is to install a pergola with angled louvres. This design allows the low-angled Winter sun through, while blocking out the high-angled Summer sun.[44]

Eaves Design for North-Facing Windows



Pergola with Angled Louvres



As a 'rule of thumb' spacing of louvres (S) should be 75% of their width (W). Louvres should be angled at the noon mid Winter sun angle (34° in Perth)

Wisteria grown over a pergola for aesthetics and to enhance the shade. Photo courtesy of Maureen Robinson

Nature's Insulation

For natural insulation you can also plant deciduous shrubs and trees to shade your house. These will provide shade in summer, and when they drop their leaves in winter it will allow the sun through. Street or verge trees can lower the temperature of a neighbourhood a lot and reduce air-conditioning loads by as much as half.

Another alternative for living shade is growing deciduous creepers or vines over an open pergola on the north side of your home. Suitable examples s include grapevines and Virginia Creeper (Parthenocissus quinquefolia) or Wisteria (Wisteria spp.). Take care if using these vines as they can become weeds of bushland areas, and be mindful of building protection zones and bushfire mitigation where vegetation overhanging rooftops can be an issue. *Refer to your local Shire for further information on protecting your house from bushfires.*

Some other heating and cooling options that will save you energy include:

- **On hot days use fans instead of air conditioners:** Fans use a lot less energy than air conditioners and are a good alternative on hot days. If you do put the air conditioner on check the temperature outside occasionally. When it starts to cool down outside open your windows and let the cool air in and switch the air conditioner off.

- **Set your air conditioner to 24°– 27° in summer or 18°–20°C in winter:** [45] Try not to overcool or overheat for comfort more than necessary. For every adjustment of 1°C on your system's thermostat you save 56kg per year of CO_2-e.[46]

- **When using your air conditioner close off areas:** To isolate the rooms you are using keep doors closed to the rooms you are not using. This will minimise the area to be cooled and prevent cool air escaping, so your system will work more efficiently.

- **Choose energy efficient air conditioning and heating units:** When buying a new air conditioner examine the energy rating label and choose a unit with a high star rating. [47] Also consider whether you need an evaporative or refrigerated system, and ask which systems are more energy efficient and produce less greenhouse gases. *Links are provided under 'Useful Resources and Programs', and the Living Greener website has information about heating and cooling options and their efficiency:* www.livinggreener.gov.au/energy/heating-cooling

Consider trying a solar cooker which cooks using the heat of the sun so uses no electricity or gas at all.

- **Install roof insulation:** If you do not already have it, roof insulation is a great addition to regulate the temperature of your house. Hot air rises, so in Winter heat is lost through the ceiling. Conversely, in Summer a lot of unwanted heat is transferred through the roof. However, insulation will resist heat flow, and can reduce your unwanted heat loss or gain in the house by up to 30%.[48]

- **Replace paved areas with plants:** Paved areas next to the house that are exposed to direct sunlight will accumulate heat. If they are under windows this heat will transfer inside your house. However, if replaced with plants the vegetation will absorb the heat instead. [49]

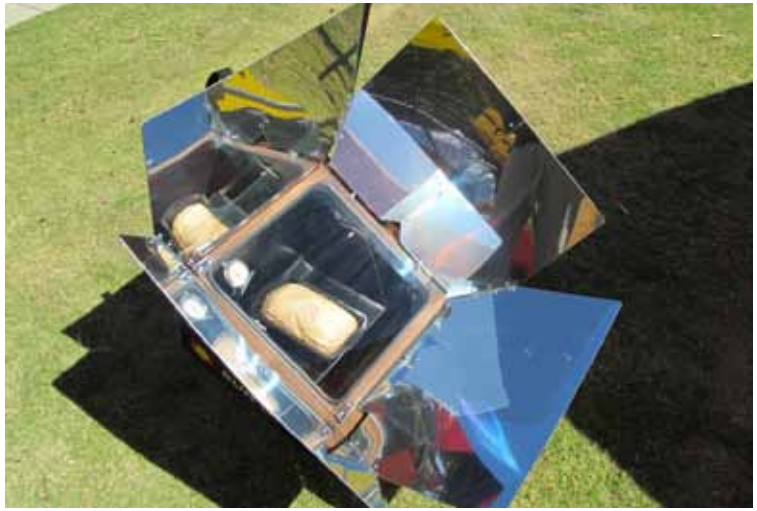
- **Seal gaps around windows and doors:** Gaps and cracks can account for up to 10% of your home's heat gain, therefore seal gaps to keep the Summer heat and Winter draughts out.[50] Use draught stoppers under doors ('door snakes') if you have gaps to help prevent cold air getting in.

- **Dress for the weather:** Before you go to put on the heater in winter or the air conditioner in summer, consider putting on a jumper in winter or switching to cooler, lighter clothes in summer.

Cooking

Cooking uses 12% of household energy use. Unfortunately, electric stoves and cooktops are not currently regulated for energy efficiency, however Minimum Energy Performance Standards (MEPS) and Energy Rating Labels (ERL) apply to domestic gas cooking appliances and domestic outdoor gas barbecues, so these can be compared for their energy efficiency when purchasing.[51]

Here are a few other ways to reduce this energy use:



A solar cooker in action, baking bread

- **Cook outside on the BBQ or solar oven on hot days:** In a small house in winter cooking inside can heat up the whole house, so when you cook inside in Summer the same thing happens, where you may need to use extra energy to cool it down. On pleasant Summer days cook outside to avoid heating up the house. To improve the efficiency, use the barbeque hood to maintain the heat.

- **Use energy efficient cooking practices:** Match your burner to the pot size, as smaller burners use more energy than larger ones. Only heat the amount of water you need. Simmer instead of boiling where possible, such as using only a small amount of water to steam veggies instead of immersing them fully in boiling water (which also retains more nutrients in the vegetables). Keep the oven door shut as much as possible when cooking as heat is lost each time it is opened. Keep lids on your saucepans when boiling water as this will help them to heat up quicker. Use small appliances where possible, such as the toaster instead of the grill on your stove. Let frozen foods thaw before cooking them.

- **Switch off electric devices at the wall to save on standby power:** Devices such as your toaster and microwave may draw power even when on standby. The section on Power-mates and Other Power Meters explains how to find out how much power your appliances are using.

- **Use a solar cooker:** Consider trying a solar cooker which cooks using the heat of the sun so uses no electricity or gas at all. Two common types are box cookers (pictured) and parabolic cookers. Box cookers cook at moderate to high temperatures and work by reflecting sunlight into an insulated box with a glass or plastic window. This forms a heat-trap, and works much like the way a car sitting in the sun heats up inside. The box is usually black on the inside to absorb heat effectively. In contrast, curved concentrator 'parabolic' cookers cook fast at high temperatures, so can reach heats suitable for boiling water. The reflector is shaped so light coming in is directed to a focus point within the 'bowl' shape of the cooker. This spot gets very hot and is where you place your pot or kettle.

Refrigeration

Fridges, freezers and bar fridges use a lot of energy in the household as they are on 24 hours per day. Here are some ways to reduce the energy you use on refrigeration:

- **Switch off your second fridge:** If you have a second fridge just for drinks leave it off until you need it. This action alone can save 842kg of CO_2-e per year. [52]

- **Choose energy efficient appliances:** Air conditioners, fridges and freezers are required to carry Energy Rating Labels, so you can choose an appliance based on its energy efficiency.

- **Locate your fridge away from hot areas:** Avoid positioning your fridge next to a wall of your house that heats up during the day, and make sure there is good airflow around it to allow movement of the hot air.

- **Keep the fridge door shut as much as possible:** This is the cheapest and easiest way to keep your fridge cool and save energy.

One of the big users of household energy which can easily go unnoticed is standby power.

- **Keep your fridge between 3° and 5°C, and the freezer between -15° and -18°C:** [53] Invest in a fridge/freezer thermometer to check your fridge and freezer temperatures. Leave the thermometer inside the unit for an hour without opening the door to avoid the 'spike' caused when the door is opened, and adjust your thermostat to get the temperature within the range given above for maximum efficiency.

- **Replace fridge seals:** Check your fridge seals by putting a business card between the seal and the closed door. If it doesn't stay in place your seals need attention. Seals can be fitted by a fridge maintenance professional and will stop the cool leaking out of your fridge.

Lighting

Lighting accounts for only 4% of household energy use. However, changing to energy efficient light bulbs is a relatively easy action that saves you maintenance time and money, as they last longer than old fashioned (incandescent) light bulbs.

- **Compact Fluorescent Lamps (CFLs)** use a quarter of the electricity required by regular incandescent light bulbs and have a longer lifespan, lasting around 8,000 hours. Unfortunately, they contain a small amount of mercury, making them household hazardous waste (HHW) so they need to be disposed of correctly. *Collection points are located at your Shire's administration office and at local shopping centres.* [54]

- **Light Emitting Diode (LED) Lamps** are arguably the next up-and-coming lighting technology. Good quality LED light bulbs may last up to 50,000 hours, and they also use far less power than incandescent ones. Currently they have a high initial purchase cost, but this is likely to reduce over time as their uptake increases. [55]

- **Light Tubes** can be used to bring daylight from outside your house into the interior. They are great for retro-fitting old houses with dark rooms, and can completely transform a space by bringing in more natural light. Superior to old style skylights, they capture low-angle light effectively for more morning and afternoon daylight inside the house and bring very little heat into the house. Light tubes can save you energy by reducing your need to use electric lighting in the daytime.

Switching off Standby Power

Finally, we come to the section of the chart called 'Other' totalling 11% of household use. One of the big users of household energy which can easily go unnoticed is standby power. This is the power your appliances draw when plugged in but are not in operation, and can count for about 10% of your household energy use[56], a big figure for power that is not even being productively used!

Devices on standby mode can simply be turned off by flicking off the switch at the wall (they don't need to be unplugged). To make this simpler, you can organise your devices so that those that could be switched off (such as computer, printer, and stereo) are on a separate power board than those you want left on. There are also various types of clever power boards available at local hardware stores, such as 'master-slave' ones, which switch everything off when one device is switched off and some with a remote control switch to help turn power off in cases where the power point on the wall is hard to reach.

To get in the habit, try putting a note to yourself on the front door to remind you on your way out to turn off lights and appliances, or on the back of your bedroom door to switch things off before you go to bed.

2.2.5 Renewable Energy – Solar Power

Solar Panels

Installing a solar photovoltaic (PV) system (solar panels) on your roof benefits both the environment and you as the homeowner. As solar energy is generated from the sun, which is a renewable resource,

Solar panels and a solar hot water system help to reduce power costs

creating your own solar energy reduces your household's carbon emissions and power bills. Solar panels increase the value of your home, and provide you with a level of energy security.

Solar panels work by converting light energy from the sun into Direct Current (DC) electricity, which then needs to be converted into the type of electricity used in the home, Alternating Current (AC) electricity. So your PV system will include a device called an inverter, to convert the DC power to AC.

Solar panels are best installed on the north-facing side of your house roof to obtain maximum sunlight.

To find out what size of system you require, examine your energy bills (*see Section 2.2.3 Assessing Your Energy Use*) to find out both your daily average consumption in units, and your total annual use (1 unit = 1 Kilowatt hour (kWh) of electricity). Your solar panel supplier should tell you how much electricity the system can be expected to generate.

State and Federal governments have offered rebates in the past, but at the time of publishing this Guide none are available. It is important to size the system to meet the energy requirements of the household, however there are also Small Scale Technology Certificates available.

Small Scale Technology Certificates (STCs)

These are created when you install a solar PV system and also apply to solar water heaters and heat pumps. Their value is calculated to represent the amount of renewable energy your system will generate during its lifetime of up to 15 years. This is the limit of the calculation; however, your system may continue to operate for longer.

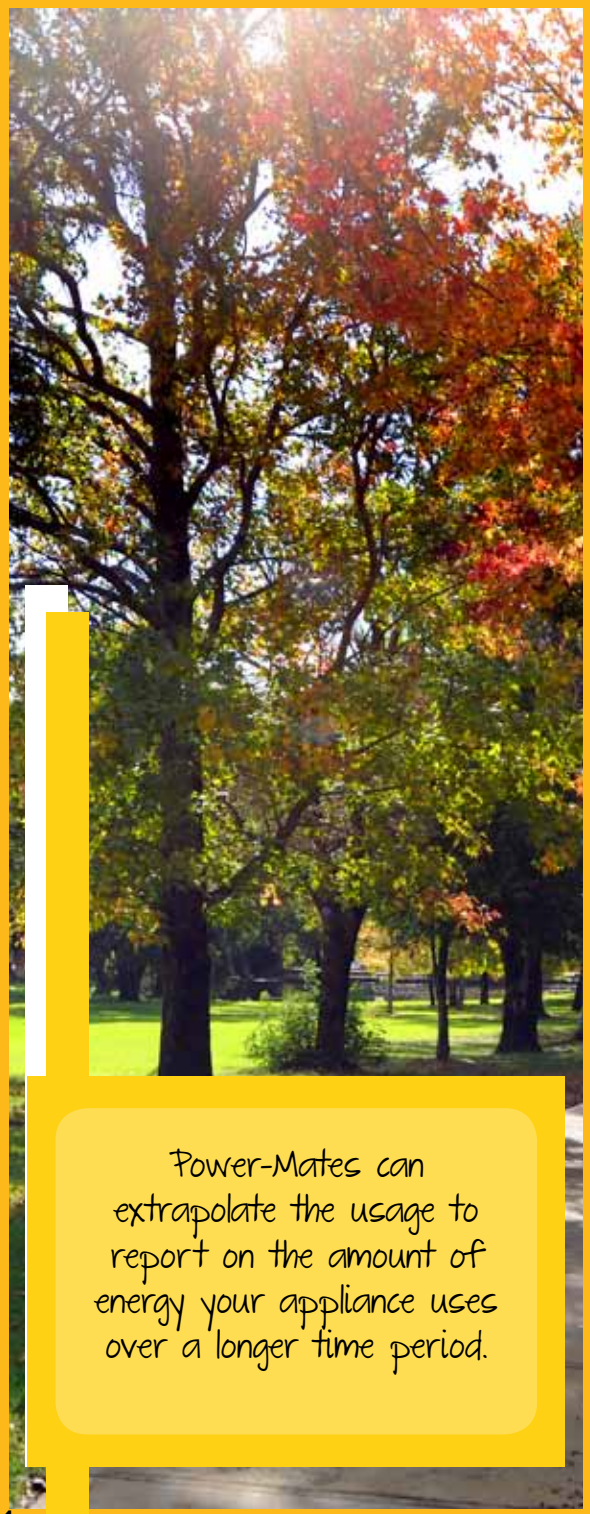
Your PV supplier will likely offer you a discount on the purchase price of your system in return for you assigning your STCs to them. They can then register and sell these on the market. You also have the option of selling them yourself. *See the Clean Energy Regulator's website for further information: http://ret.cleanenergyregulator.gov.au/Certificates/stcs*

Another option is not to sell your STCs at all. If you keep them you are offsetting a portion of your households own carbon footprint through producing renewable energy. If you sell them you will be offsetting someone else's emissions, as people purchasing STCs do this to reduce their own carbon footprint.

Solar panels are best installed on the north-facing side of your house roof to obtain maximum sunlight, though east and west facing sides of the roof are also possible as they will capture morning and afternoon sun respectively. Make sure to ask your supplier lots of questions, both about the experience of their company and the resilience and quality of their product.

2.2.6 Useful Resources and Programs – Energy Efficiency and Renewable Energy

Resource	Description	**Website** (then search for Resource)
Carbon Footprint Calculator	Step-by-step calculator that lets you calculate your household carbon footprint and compares it to your country's average footprint and the world target.	www.carbonfootprint.com
Green Vehicle Guide	Allows you to look up the fuel efficiency of your car, and compare to that of other cars. (Use this information when calculating your carbon footprint.)	www.greenvehicleguide.gov.au
Older Models Fuel Efficiency Search	Search for fuel efficiency information for older model cars from 1986–2003.	www.environment.gov.au
Living Greener website	Australian Government website with information, 'how-to's' and rebates for sustainable living. Includes information on energy efficient appliances, heating and cooling, lighting, hot water systems and more.	http://livinggreener.gov.au/energy
Living Smart brochures	Department of Transport resources for households contains many useful brochures, for making your household more sustainable, including ways to reduce energy use.	www.transport.wa.gov.au
Your Home Technical Manual	Produced as a collaborative project managed by the Department of Climate Change and Energy Efficiency, Comprehensive, detailed resource for people aiming to build, buy or renovate a sustainable home.	www.yourhome.gov.au
Your Home Renovators Guide	As above, but targeting people who are renovating an existing home.	www.yourhome.gov.au
Energy Efficient Home Renovator Tool	Energy retailer Synergy's interactive animated webpage shows how simple changes such as using vegetation to absorb heat, shading windows, and maximising the efficiency of air-conditioners can save energy in the house.	www.synergy.net.au



Power-Mates can extrapolate the usage to report on the amount of energy your appliance uses over a longer time period.

2.2.6 Useful Resources and Programs (cont.)

Resource	**Description**	**Website** (then search for Resource)
New Home Designer Tool	Synergy's webpage shows how home orientation, location of windows etc. can improve the energy efficiency of a new home.	www.synergy.net.au/at_home
City of Cockburn Sustainable Living Home	Online guide to building a sustainable home. Information is provided on topics such as site planning, passive cooling and solar heating, landscaping and more, and a virtual tour is available.	www.ecockburn.com.au
Renters Guide to Sustainability	Produced by the Alternative Technology Association, this Guide may be downloaded as a PDF document. It contains many useful tips for saving energy and water, and reducing waste.	www.ata.org.au/sustainability
Sustainable Energy Now Inc. (SEN)	SEN is a not-for-profit WA volunteer association, "with the aim of promoting practical, affordable strategies for the adoption of renewable energy toward a sustainable global future."	www.sen.asn.au
Achieving Carbon Emissions reduction (ACEr)	Shire of Mundaring and Kalamunda participate in the ACEr program which supports member Councils to monitor, report on and reduce their corporate carbon emissions. The program also provides education to the community and local businesses to help them reduce their energy consumption in order to mitigate climate change.	Shire of Mundaring's Sustainability page contains further information: www.mundaring.wa.gov.au

Resource	**Description**	**Website** (then search for Resource)
Perth Solar City	The Australian Government's Solar Cities Program is trialling practical and creative ways to be smarter about our energy use. Perth Solar City is driving the uptake of solar energy through the installation of smart meters, solar hot water heating, photovoltaic electricity generation, and behavioural change through energy assessments and education. Both Shires have installed demonstration projects in their facilities to raise awareness of renewable energy options available for households and businesses.	Shire of Mundaring: www.mundaring.wa.gov.au Shire of Kalamunda: www.kalamunda.wa.gov.au
Living Smart (LS) Courses	Living Smart courses are offered to the community by each Shire occasionally. They cover 10 sustainable living topics including Energy Smart, which includes renewable energy. This helps participants to set and achieve goals to increase the efficiency of their household energy use. [*The LS program was developed by the City of Fremantle, Murdoch University and Southern Metropolitan Regional Council and is now coordinated by Be Living Smart Inc.]*	www.livingsmart.org.au
Living Greener website	Australian Government Living Greener website with useful tips on things such as: selecting appropriate heating and cooling devices; renewable energy – including installing a solar photovoltaic system; and various types of hot water systems.	www.livinggreener.gov.au/energy
Consumer Guide to Solar PV	Comprehensive document by the Clean Energy Council on installing a solar photovoltaic (PV) system.	www.cleanenergycouncil.org.au
Air-conditioning FAQs	Australian Refrigeration Council ARCtick website with answers to Frequently Asked Questions on how to select an energy efficient air-conditioner.	www.lookforthetick.com.au/air-conditioning-faq
Product Energy Efficiency Comparator Tool	Equipment Energy Efficiency Program (E3) website (a joint initiative of Australian, State and Territory and NZ Governments), with a comparator tool for comparing the energy efficiency and running cost of products such as air-conditioners, refrigerators, hot water heaters and more.	www.energyrating.gov.au

In 2009 the transport sector contributed 83.6 megatonnes CO_2-e, or 15.3% of Australia's national greenhouse gas emissions.

2.3 Move Smart

2.3.1 What's the Problem

How we travel has a great impact on the amount of carbon our daily activities emit into the environment. Personal car use, particularly when only one person is in the car is a high contributor to Australia's greenhouse gas emissions. The Department of Climate Change and Energy Efficiency reported that in 2009 the transport sector contributed 83.6 megatonnes CO_2-e, or 15.3% of Australia's national greenhouse gas emissions. Of this, passenger cars were the largest transport source, contributing 41.5 megatonnes.[57] In summary, the carbon emission from burning fuel for passenger car travel contributed 7.6% of Australia's greenhouse gas emissions in 2009.

The Australian Government Living Greener website notes: "The average passenger car travels 13,200 kilometres per year and emits 2.7 tonnes of Carbon Dioxide", and "For every litre of petrol used in a motor vehicle, 2.3 kilograms of carbon dioxide (CO_2) are emitted from the exhaust".[58] So avoiding car use is one of the best ways to reduce your carbon emissions, plus alternatives to car travel can also increase your level of exercise and improve your health.

2.3.2 What Can I Do?

Keeping a travel journal for a week can help identify opportunities to use your car less (see sample next page). For example, shopping on the way home from work can save an additional car trip. Carpooling, using public transport, cycling, walking, working from home or holding work meetings via Skype or telephone rather than in person are also options, depending on your situation. Cycling and walking have the additional benefits of exercise.

Hills Sustainability Group's Travel into the Future event September 2012 where electric vehicles were on display. Photo courtesy of Pat Crichton

About 80% of trips by people in Perth are made using a car. About half of these trips are 5km or less and 10% are 1km or less. Most people can cycle 5km in 20 minutes and can walk 1km in 12 minutes, so consider making some of your small trips to the shops or post box more sustainably, and get some fresh air at the same time! [59]

Public Transport

This is a great option for reducing the carbon emissions of your day to day travel. As a bus full of people takes up considerably less space on the road and produces far less emissions than the equivalent amount of driver-only cars, using the bus helps ease traffic congestion as well as reduce carbon emissions. Trains are another good option. Though public transport services are somewhat limited in the hills, you as a community member can advocate to our State planners and politicians for improvements.

Travel Journal

Day and time	Start of trip location	End of trip location	Mode of transport	Time (mins)	Distance (km)	Could I use alternative transport? (Y/N)

Example of a Travel Journal which can help you identify opportunites to use your car less

Avoid buying products that come with a lot of associated waste and you immediately reduce the amount of waste you are responsible for sending to landfill.

2.3.3 Useful Resources and Programs – Moving Smart

Resource	**Description**	**Website** (then search for Resource)
Active Transport website	The Department of Transport website has a lot of great resources, including walking and cycling information, school and workplace TravelSmart programs and more. Various maps and brochures are available to download.	www.transport.wa.gov.au/activetransport
Transperth Journey Planner	An online tool that assists you to plan a journey in the Perth metro area via public transport. The website also has bus and train timetables and other information.	www.transperth.wa.gov.au
Green Vehicle Guide	Allows you to look up the fuel efficiency of your car and compare to that of other cars. (Use this information when calculating your carbon footprint.)	www.greenvehicleguide.gov.au
Fuel Consumption Guide Database	Search for fuel efficiency information for older models of cars from 1986–2003.	www.environment.gov.au
Sustainable Transport Coalition of WA	A community-based coalition advocating sustainable transport in Western Australia.	www.stcwa.org.au
Australian Electric Vehicle Association (AEVA)	The Perth AEVA is an active group of over 20 members who meet monthly. They promote the use and adoption of electric propulsion for transport, and represent all EV enthusiasts.	www.aeva.asn.au

2.4 Waste Reduction – Rethinking Waste

Reducing the amount of waste your household produces helps reduce carbon emissions by diverting waste from landfill particularly green waste, which as it breaks down produces the greenhouse gas methane. As our landfills fill rapidly and we see the harmful effects of leachate (toxic liquid that leaches from landfill and risks groundwater supplies) and legacy emissions from landfill (methane gas that continues to rise up through the soil and escape into the atmosphere for years after a landfill is decommissioned) waste management has moved towards the practice of Reduce, Reuse, Recycle, Recover.

2.4.1 Reduce

Reducing waste works on the principle that putting less in your bin is better. Avoid buying products that come with a lot of associated waste and you immediately reduce the amount of waste you are responsible for sending to landfill. Some ways you can do this are to:

- Start by thinking "Do I really need it?" (this has also been called 'precycling')
- Buy in bulk, such as choose a large bottle of juice rather than individually packaged single serve juices
- Buy products with little or no packaging, or that come in recycled or recyclable packaging
- Mend things instead of buying new ones
- Place a 'No Junk Mail' sticker on your letterbox, to avoid junk paper being delivered to you
- Use your own reusable bags and refillable containers when shopping
- Make your own bread (such as in a breadmaker), and with flour bought in bulk to save on plastic bread bags

- Use a reusable coffee cup at work for take-away coffees and bring your own hand towel instead of using paper towels
- Use your own water bottle, or jug and glass, rather than buying bottled water.

Plastic Bags

Plastic bags are a big problem in the waste stream as they are:

- used prolifically and mostly not recycled. In 2007 Australians used a staggering 3.9 billion single-use high density polyethylene (HDPE) bags. Of these 2.96 billion were from supermarkets, and the rest were from other types of shops. Only 14% of HDPE plastic carry bags are returned to major supermarkets to be recycled;[60]
- long-lasting, taking 20–1,000 years to break down. It is estimated around 50 million bags enter the Australian litter stream every year, with many remaining in the environment and accumulating at an astonishing rate;[61]

Home composting and worm farming are excellent ways to reuse household kitchen waste and reduce the amount of organic matter going to landfill.

- made from fossil fuels, which are non-renewable resources that should be used wisely instead of wastefully;
- able to escape and float easily in air and water so can travel long distances; and
- are responsible for the deaths of many thousands of marine mammals and seabirds every year around the world. Worse still, once the animal dies and decomposes the plastic is released into the environment again to cause further harm.

To reduce your plastic bag use, bring your own reusable bags to the shops. Once you get in a good habit, such as leaving them in the boot of your car or taking pannier bags if you go shopping on your bicycle, you will find this just as convenient. There is also the added advantage that reusable bags are more robust and less likely to split than their unsustainable cousins.

Please note that plastic bags cannot be recycled in your yellow top rubbish bin. Plastic bags tend to blow around at the material recovery facility (MRF) where your recycling is hand sorted, and then become entangled in the conveyor belt machinery. Also, if your recycling is neatly tied up in a plastic bag, the whole bag will be sent to landfill, as the MRF sorters do not have time to open the bag, and doing so may be an safety and health hazard. Leave your recyclables loose in your yellow top bin.

The Difference between Degradable and Biodegradable Plastics

Degradable plastics contain an additive which, over time, will break the product up into smaller pieces; however, despite being small, these pieces may still take decades to completely decompose. Biodegradable plastics are also designed to break up into tiny pieces; however, they are polyethylene free (that is made from plant products) and leave no toxic residue.

2.4.2 Reuse

Reusing is often associated with the ways of older generations, who often live in a more thrifty way that avoid waste. Look for ways to 'close the loop', where waste from one activity becomes an input to another. Rather than your waste going on a one-way trip to landfill you can reuse it and get other benefits from it. An example is to put your kitchen veggie scraps into your compost or worm farm, and then reuse your compost or worm castings as soil improver in your garden.

Try these ideas:

- Buy reusable items such as cloth napkins, rechargeable batteries, and cloth hankies, instead of disposable alternatives
- Buy from and donate items to your local Opportunity Shop
- Buy from local garage sales, and hold your own

- Share infrequently used items with neighbours such as electric saw, wheel barrow, large tools
- Save your egg cartons for friends who have chickens and your empty washed jam jars for friends who make jams and preserves
- Visit salvage yards or tip shops for old sleepers, wire etc. when installing gardens.

Home Composting and Worm Farming

Home composting and worm farming are excellent ways to reuse household kitchen waste and reduce the amount of organic matter going to landfill. Organic matter rotting in landfill is a key source of methane gas, and also creates a risk of groundwater impact from landfill leachate.

Composting is a great way to resuse food waste and help fertise your soil

Composting

This is the process of turning food scraps and organic garden waste into a soil-like product which may be used as a fertiliser and soil amendment.

The simplest form of composting involves making a wetted pile consisting of layers of organic matter, allowing micro-organisms to naturally break it down into humus.

Though recycling is important it requires energy to recycle the products and transport them to their next destination, so it is not as preferable as reducing or reusing.

To help your compost heap break down it will periodically require turning and re-wetting to keep up the oxygen and moisture to encourage the micro-organisms to flourish and do their job. There are also several types of commercially compost bins and tumblers available.

Successful composting requires the right balance of ingredients:

- carbon – 'brown' things such as straw, dry leaves and sawdust
- nitrogen – 'green' things such as lawn clippings, veggie scraps, and leafy tree pruning
- oxygen
- moisture.

Worm Farming

Worm farming involves keeping worms in a container and feeding them organic materials such as your kitchen veggie scraps. The worms turn this into worm castings and 'worm wee' which are rich sources of nutrients and can be used to feed your garden.

Specific breeds of worms (such as Tiger and Red Wriggler) are used in worm farms, as these breeds are very efficient at eating their way through scraps.

Worm farms built from old (de-gassed) refrigerators – Forrestfield Primary School Community Garden.

Worm farms are available for purchase at places such as hardware stores and are also easily assembled from reused materials, such as the polystyrene boxes that vegetables are delivered in which can be picked up from your local greengrocer.

Worm farms and compost tumblers are also easy to come across second hand, on road verge pick ups or you can make them yourself. *See links in the 'Useful Resources and Programs' section for further information on composting and worm farming.*

2.4.3 Recycle

Recycling is a process where waste materials are broken down into their raw state and then reconstituted into new reusable products. Suitable materials include glass, paper, metal, plastic, textiles, and electronics. Though recycling is important it requires energy to recycle the products and transport them to their next destination, so it is not as preferable as reducing or reusing.

Recycling is quite straightforward in the Shire of Kalamunda and the Shire of Mundaring as a separate yellow-top recycling bin is provided to each household. But remember to not contaminate your recycling bin with non-recyclable items (such as garden waste, plastic bags and ceramics) as this is hard to extract at the recycling facility. *Refer to the Waste and Recycling Guide provided with your rates notice for more information on what can and cannot be recycled.*

To make reusing and recycling easier set up a convenient sorting system within your home, as it is a lot easier to sort things out as you go rather than doing this when you take things out to the bin.

For example, have a cardboard box in a cupboard under the sink or a separate kitchen bin for recyclable items, and a small container with a lid on the counter for vegie scraps to go to the worm farm or compost.

Keep recycling bins free of non-recyclable items such as garden waste, plastic bags and ceramics

E-waste

E-waste is waste from equipment that is dependent on electricity in order to function. It includes all components, sub-assemblies and consumables which are part of the original equipment at the time of discarding. Examples include:

- Consumer/entertainment electronics such as TVs, DVD players and stereo equipment
- Office equipment such as cabling, computers, printers, telephones and mobile phones
- Household appliances such as fridges, freezers, washing machines and microwaves
- Lighting devices such as desk lamps
- Power tools such as power drills and sanders
- Devices for sport and leisure including toys.

E-waste is growing three times faster than any other type of waste yet it is estimated that in 2010 only 17% of television and computer waste was recycled.

E-waste is growing three times faster than any other type of waste. The Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) reports that in "2007–2008, an estimated 106,000 tonnes of televisions and computers (16.8 million units) reached their end of life. It is estimated that in 2010 only 17% of television and computer waste was recycled."[62]

Another issue is that e-waste can also contain heavy metals including lead, cadmium, mercury and arsenic, which are hazardous to human health and can leach into the water table when put into landfill. These need to be disposed of correctly and not put in the bin or on the verge except during an e-waste collection. *See your Shire's local Waste and Recycling Guide for further information.*

The National Television and Computer Product Stewardship Scheme was initiated by the Australian Government to boost the recycling rate of certain e-waste products. The Scheme will expand its recycling services across Australia by the end of 2013. It requires importers and manufacturers of TVs and computers to join arrangements that will collect and recycle televisions, computers and computer products. This means that the industry providing these products to consumers will now be responsible for funding and running a scheme to boost their recycling rate.

Under the Scheme householders and small businesses will not be charged to drop off eligible items for recycling at a designated recycling service. Such services may include a permanent drop-off point,

a take-back event or a mail-back option. The Scheme aims to boost the recycling rate for these items by 2022 to 80%. Red Hill is now a permanent free drop-off site for computers and televisions.

Other e-waste items such as mobile phones, batteries and printer cartridges already have specific recycling programs. *See the 'Useful Resources and Programs' section for further details.*

Opportunity Shops

A great way to pass on goods for which you no longer have a use is to recycle them by donating them to an Op Shop (Opportunity Shop). Op shops are generally run by charitable organisations, so donating items and spending money in their shops can help them to run community service projects. Wearing recycled clothes rather than buying new clothes also reduces the amount of energy and resources you consume.

Some Op Shops will also arrange collection of furniture you would like to donate. Be sure to only offer good quality items as they will inspect your items and will not collect damaged furniture, such as with stains or rips, as they may not be able to sell it. The same goes for items placed into Op Shop bins; if the Op Shop cannot sell it they will have to dispose of it, which may cost them money.

2.4.4 Recover

Resource recovery is when valuable resources are recovered from the waste stream. This usually happens at the waste management facility level.

The Eastern Metropolitan Regional Council (EMRC) is a regional local government working on behalf of six member councils, including the Shires of Mundaring and Kalamunda. EMRC provides waste management (among other services) to its member Councils. It is currently working to create a resource recovery facility where alternative waste technology will be applied to waste, to convert it into marketable resources such as compost and/or energy. EMRC's objective is to have a fully operational resource recovery solution in place by 2015/2016. This may involve a resource recovery facility and/or resource recovery park, where recovery activities divert significant waste from landfill and process it into reusable products.

See the following section for further information.

2.4.5 Useful Resources and Programs – Waste Reduction

Resource	**Description**	**Website** (then search for Resource)
R-Gang website	Provides local Council information on resources, education programs and practical hints on how to manage your waste more effectively. Facilitated by EMRC and its six member Councils, the Shires of Kalamunda and Mundaring each have a customised section giving details of the waste and recycling services in each Shire.	www.rgang.org.au *EMRC run free tours for school and community groups at the Red Hill Waste Management Facility and Education Centre*
Waste and Recycling Guide	A handy guide delivered annually to each household and can be downloaded online. It provides information on waste collection services, recycling options and the safe disposal of household hazardous waste.	www.rgang.org.au
Recycling Near You	This website from Planet Ark allows you to search for recycling services in your area by location or product.	http://recyclingnearyou.com.au
Waste Wise Schools	Department of Environment and Conservation (DEC) program	http://education.dec.wa.gov.au
EMRC Resource Recovery Project	Information on the Project to set up a resource recovery facility and/or resource recovery park. Project background, details and current status are provided.	www.emrc.org.au

Resource	Description	**Website** (then search for Resource)
REmida	Creative reuse centre for schools looking to reuse art items	www.remidawa.com
Waste Authority of WA	This website has useful information including ways for community members to reduce waste and increase recycling.	www.wasteauthority.wa.gov.au
Clean Up Australia	Clean Up Australia runs a number of waste reduction and environmental programs including Clean Up Australia Day, Say NO to Plastic Bags and Clean Up Our Climate.	www.cleanup.org.au
Keep Australia Beautiful Western Australia	KAB WA runs a variety of activities and targeted campaigns with the objective of educating different sectors of the community in litter prevention and environmental sustainability.	www.kabc.wa.gov.au/
Great Gardens workshops	These free workshops by the Great Gardens team cover topics including soil improvement, effective planting and watering techniques, best practice fertiliser use, composting, worm farming, being waterwise and riverwise.	http://greatgardens.info
Home Composting and Worm Farming	Information on the R-gang website on home composting and worm farming, including brochures to download.	www.rgang.org.au
International Composting Awareness Week	A week of activities and events that aims to improve awareness about the importance of compost as a valuable organic resource and to promote compost use, knowledge and products.	www.compostweek.com.au
Beyond gardens	Beyond Gardens aims to inspire, inform and empower people to live sustainably. Beyond Gardens is committed to helping Metro and Regional communities alike through an extensive range of informative, fun and generally FREE seminars and special events.	www.beyondgardens.com.au

Every object and service we purchase has environmental and social connections, and each item we buy should deliver more benefits than costs.

3 ECONOMIC

Sustainability interfaces with economics through the social and ecological consequences of economic activity. Every object and service we purchase has environmental and social connections, and each item we buy should deliver more benefits than costs, including environmental and social benefits. It is good to contribute to our local economy as this supports local employment in our community, and also reduces the 'embodied energy' of items you buy as they do not have to travel so far to get to us (delivery uses fossil fuels such as truck fuel, and creates pollution). And before going to throw something away it is good to consider whether we can sell, share or give it to someone else in the community to reduce waste.

The monthly Rotary Kalamunda Village Market

3.1 Money Smart

Every product that ends up for sale on a shelf has a story. Its raw materials are sourced somewhere; it is assembled by someone and then packaged; it may be freighted over some distance; it is stored, possibly in refrigeration; and is ultimately either bought by someone or disposed of. So where you spend your money and what you choose to buy have environmental, social and economic impacts.

This section focuses on finding smart ways to spend your money which reduce your environmental impact, have social benefits and support the local economy. Also mentioned are ways to acquire goods without spending money. *For ways to save money on bills see Section 2.1 Being Waterwise and Section 2.2 Saving Energy in the Home.*

Good reasons for more sustainable spending may include:

- **Supporting Your Local Economy:** This enables local businesses and producers to continue to thrive.
- **Reducing Food Miles:** 'Food miles' refers to the distance food travels between production and consumption, and can include its packaging. The theory is a product that has come from far away, such as milk brought from the Eastern states, has a greater carbon footprint than something produced locally. Buying milk produced in WA supports local dairy farmers, keeping that industry alive.
- **Greater Freshness and Associated Health Benefits:** Food produced locally should be fresher. Do be aware of what is actually in season, as some fruit and vegetables can be kept for long periods in cold storage before being sold.

To help you be Money Smart try the following:

3.1.1 Support Local Businesses Including Farmers Markets and Other Local Markets

The core importance of the Money Smart concept is to consider where your money is going. Does it support businesses owned and/or operated by members of our local community? How many of the products/services sold by the business are produced and sourced locally? Ask these questions when you shop.

Local businesses are owned and operated by local people and supporting them means that people can continue to live and work in our community and not need to relocate or commute to work elsewhere. Where local needs are provided for people don't need to travel as far to shop, and this helps to reduce emissions generated by transport.

Local producers and the markets at which they sell their wares are also an important part of the local character of the area and its history.

Eggs on sale at a Farmers Market Photo courtesy of Lesley Thomas

Freecycling is the 'gifting' of unwanted items to somebody who wants them, aimed at diverting reusable goods from landfills.

Markets in Kalamunda and Mundaring

- **Kalamunda Farmers' Market:** is held every Sunday morning from 8am to 12 noon in Kalamunda Central Mall, hosted by the Kalamunda Chamber of Commerce. Stallholders sell produce they have grown, caught, pickled, preserved, or baked.
- **Kalamunda Village Markets:** is held on the first Saturday of each month from 8:30am to 3:30pm in Kalamunda Central Mall, hosted by Rotary. A large range of crafts, provisions and produce are sold.
- **Mundaring Sunday Markets:** are held on the second Sunday of each month in Nichol Street, Mundaring, hosted by Rotary. The markets take place in indoor and outdoor venues, and stalls include art, craft, fresh produce, plants, homemade products and more.

Bickley Harvest Festival

Annual Events Showcasing Local Produce

- **Bickley Harvest Festival**: A 2-day weekend event held throughout the Bickley and Carmel Valleys each May, hosted by the Kalamunda Chamber of Commerce.

3.1.2 Swan Hills LETS

LETS is a Local Exchange Trading System or community currency system. LETS allows members to exchange goods and services by recording transactions in their accounts using credits. There is a well-established Swan Hills LETS group, which calls their currency 'Gumnuts'.

3.1.3 Freecycling

Freecycling is the 'gifting' of unwanted items to somebody who wants them, aimed at diverting reusable goods from landfills. Ways to do this include placing an advertisement for your give-away items in the 'Free' section of a newspaper, such as the *Quokka*, or on online network such as Gumtree. There is also a Perth Freecycle group set up as a Yahoo! Group where members can advertise their unwanted items.

3.1.4 Recycling Through Opportunity Shops

This is described under Waste Reduction in the Section 2.4.3 Recycle.

3.1.5 Food and Bulk Buying Coops

These are described in section 4.1.2 Meet Your Neighbours. Bulk buying can help reduce packaging, as well as allow people to save money.

3.1.6 Useful Resources and Programs – Money Smart

Resource	**Description**	**Website** (then search for Resource)
Shire of Mundaring Business Directory	Contact details for businesses within Shire of Mundaring.	www.mundaring.wa.gov.au
Swan Hills LETS	A well-established Local Exchange Trading System in the Swan Hills area.	http://swanhillslets.org
Markets in Kalamunda	Shire of Kalamunda webpage with details of the Kalamunda Farmers Market and Rotary Kalamunda Village Markets.	www.kalamunda.wa.gov.au
Food Miles - Why Eat Local?	*Choice Magazine* article examining how "well-travelled" our food is.	www.choice.com.au
The Story of Stuff	A short animated film which is "a 20-minute, fast-paced, fact-filled look at the underside of our production and consumption patterns". There are also other interesting videos at this site.	www.storyofstuff.org

Community resilience is based upon building a network of people who know and trust each other, allowing people to share, and support each other in good and bad times.

4. SOCIAL

Essential ingredients for success ... tools, coffee, shelter and good company – Glen Forrest Community Garden 2012. Photo courtesy of Selena Moonbeam

Implementing change for sustainability has a crucial social dimension, which at the householder level involves things such as individual lifestyles, ethical consumerism, and finding ways to increase community cohesion and self-reliance. Individuals and groups can also influence government and corporations through providing feedback to these organisations and suggesting ways to improve the sustainability of their activities.

4.1 Your Community

There are a variety of community levels of involvement available for you to choose from according to your interests and what you feel comfortable with.

Community resilience is based upon building a network of people who know and trust each other, allowing people to share, and support each other in good and bad times. Even in good times a sound community network can be a great asset, as people can share skills, knowledge, and resources, and celebrate each other's successes.

Various ways to get involved with your local community are described below.

4.1.1 Meet Your Neighbours

Though many people live in suburban areas, with neighbours in close proximity, it is not uncommon for people to live side by side for years without ever saying hello or learning each other's name. However, there are numerous benefits of being on good terms with those who live next door, and it is not as hard as you'd think.

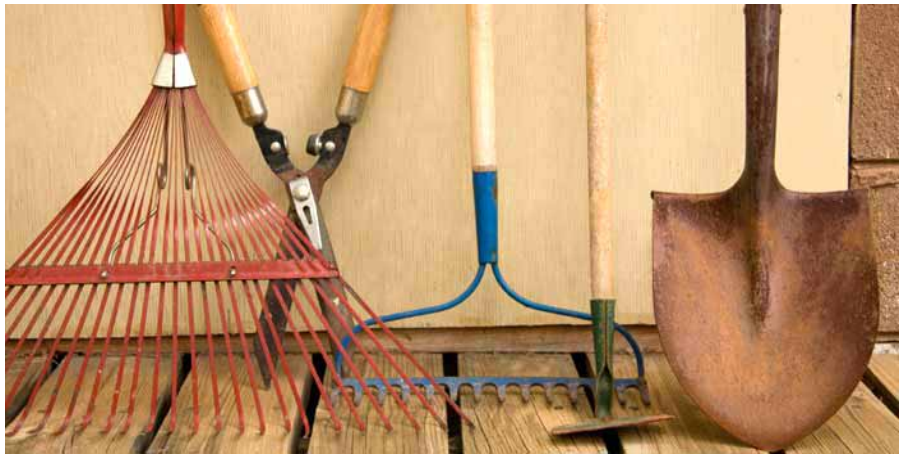
You could start with saying hello, giving people time to warm to the idea of knowing their neighbour a little better. Don't be discouraged by people who aren't interested in getting to know you, as not everyone will wish to. Here are a few ideas:

- **Introduce yourself:** Go and introduce yourself to your neighbours when you first move in. This can be a good excuse to meet each other.

Sharing surplus veggies is a nice way to get to know your neighbours

- **Give simple gifts:** Give neighbours a small gift at a festive holiday, or offer them some veggies, eggs, honey or jam you have produced if you have surplus.
- **Look out for each other:** Once you've chatted over the fence a few times, you can start to offer to look out for each other, such as collect their mail or water their garden when they go on holiday, and ask them to do the same for you. Small things like this build trust.

There are many opportunities available for volunteering, and a remarkable amount of work in our community is undertaken by volunteers.



- **Resources Register:** As a next level, if you have built a rapport with several neighbours on your street you could start a "Skills and Stuff" register for the street (you can name it what you like). Such a register could include details such as people's names, contact details, items available to share (such as a ladder/ drill/wheelbarrow), skills people have that they are willing to share, and things they are interested in (eg. 'love looking after animals'). This allows people on the street to connect with others who have something they are interested to borrow/learn or about which they might not otherwise know was there. Sharing resources also reduces waste. This way every household does not need to each own a cordless drill, wheelbarrow etc. which may well lay idle for much of its lifetime.

- **Street garage sale:** You could arrange a street garage sale where several households in your street hold a garage sale on one particular day.

- **Sharing meals:** Sharing meals is another great way for people to interact. A portable pizza oven could be purchased as a shared resource, and people from the street could meet on a regular night to share a meal, each bringing along some pizza toppings.

- **Bulk-buying co-op:** A group of neighbours could form a bulk buying co-op to share the cost of larger containers of common household products such as flour, bicarbonate of soda and washing detergent. This reduces costs and also packaging, as people can collect their share of the goods in reusable containers rather than use throw-away packaging commonly found in the supermarket.

These are only a few ideas. The rest is up to you and the people in your area to negotiate and determine what means of community building and support will suit you best.

4.1.2 Community Activities

Getting involved with people who share similar interests is another great way to get to know those who live nearby. A range of engaging options is available.

Join a Volunteer Groups

There are many opportunities available for volunteering, and a remarkable amount of work in our community is undertaken by volunteers. Being involved in a group also allows you to build relationships with like-minded people. Some examples of existing groups and relevant resources include:

- **Friends Groups**: Friends Groups are formed to care for local bushland areas, of which we are fortunate to have in the Shires of Kalamunda and Mundaring. Friends groups undertake a great deal of valuable work in looking after these special places. *For more information contact the Shire of Kalamunda or Shire of Mundaring Environmental Team.*

- **Volunteering Opportunities:** Both the Shire of Kalamunda and Mundaring offer a range of opportunities for volunteering, including working with the elderly, and in tourism, the libraries and events and festivals. *See the 'Useful Resources and Programs' section for further details.*

Thriving vegetables at the Forrestfield Primary School Community Garden

- **Community Gardens:** Community gardens are "places where people come together to grow food and community"[63]. Each is unique, depending on the location, the people involved in the garden and the community surrounding it. *Your local Shire has information about gardens in your area, and local schools sometimes have community gardens.*

- **Community Directory:** Another resource is the Community Directory of each Shire. These include a list of associations, clubs and volunteering opportunities such as caring for injured wildlife.

Share Your Skills

Another way to get involved in your community is to share your skills. You may be surprised how many great skills you possess, and how many people are interested to learn them. For example, you could run a short course on any one of a number of helpful topics, such as gardening skills (composting, tool maintenance, chicken care), knitting and crocheting, basic computer skills, professional writing, cooking, song writing and more.

Create a "Skills and Stuff" register to encourage members to share things, get to know each other better and build trust.

Setting up resuable coffee cups to reduce waste. Photo courtesy of Lesley Thomas

Even with groups that are less obviously sustainability focused, such as sporting clubs, there is often a good base of community involvement where people already know each other.

For existing groups you could take the initiative to enhance the community interaction and move to more sustainable practices through actions such as:

- **Create a "Skills and Stuff" register** to encourage members to share things, get to know each other better and build trust; and
- **Organise a "Green Team" subcommittee** to investigate ways to make your club's operations more sustainable, such as car-pooling to reduce pollution, avoiding plastic plates and packaging when running events, and encouraging reusable water bottles instead of throw-away plastic ones.

4.1.3 Useful Resources and Programs – Building Community

There are many wonderful community groups you can get involved with in both Shires. There are too many to list in this limited space below, however many of them are listed in each Shire's Community Directory.

Resource	**Description**	**Website** (then search for Resource)
Shire of Mundaring Community Directory	Directory of local community services and activities in areas such as health, recreation, conservation and environment, seniors and community organisations.	www.mundaring.wa.gov.au
Shire of Kalamunda Community Directory	Directory of local community services and activities in areas such as health, recreation, conservation and environment, seniors and community organisations.	www.kalamunda.wa.gov.au
Shire of Mundaring Community Events Calendar	A calendar of community events, with community groups welcome to submit events for inclusion on the calendar.	www.mundaring.wa.gov.au
What's On in the Shire of Kalamunda	Calendar of fêtes, fairs, sporting events, concerts, festivals, market stalls and fund raising events in Shire of Kalamunda.	www.kalamunda.wa.gov.au
Shire of Kalamunda – Volunteers	Volunteering opportunities in Shire of Kalamunda.	www.kalamunda.wa.gov.au
Shire of Mundaring – Volunteer Vacancies	Volunteering opportunities in Shire of Mundaring.	www.mundaring.wa.gov.au

Even with groups that are less obviously sustainability focused there is often a good base of community involvement where people already know each other.

4.1.3 Useful Resources and Programs – Building Community *(cont.)*

Resource	Description	Link / Contact Details
Men's Sheds	Men's Sheds provide a safe and engaging environment where men from all walks of life are welcome to come along and work on a project of their choice in their own time, or just have a yarn and a cuppa. This relieves isolation, loneliness and depression faced by many, and allows men to participate in projects that improve their health and wellbeing.	• *Kalamunda Men's Shed* – 20 Falls Road, Lesmurdie www.kalamundamensshed.org.au • *Foothills Men's Shed* – Anderson Road Community Centre, Anderson Road Forrestfield P: 9453 2006 or 9453 9938 • *Mundaring Community Men's Shed* 3205 Jacoby Street, Mundaring. P: Shire of Mundaring on 9290 6666
Hills Sustainability Group (HSG)	The HSG is made up of people living in the hills who are interested in environmental and sustainability issues. Their goal is to encourage the community to adopt a more sustainable lifestyle. The group organise events to promote awareness and build community, and have several interesting ongoing projects.	www.hsg.org.au
Community Gardens	This website provides resources and support for people running or wanting to establish a community garden, and has a search tool for you to find a community garden in your area.	http://communitygardenswa.org.au

5. Acronyms and Abbreviations

AC	Alternating current (electricity)
ACEr	Achieving Carbon Emissions reduction program
ATA	Alternative Technology Association
ATU	Aerobic Treatment Unit
BOM	Bureau of Meteorology (Australian Government)
CERP	Carbon Emissions Reduction Program
CFL	Compact fluorescent lamp
CO_2-e	Carbon dioxide equivalent
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DC	Direct current (electricity)
DOH	Department of Health (State Government)
EHCMP	Eastern Hills Catchment Management Program
EMRC	Eastern Metropolitan Regional Council
ERL	Energy Rating Label
EV	Electric vehicle
E-waste	Electrical and electronic waste
GDD	Greywater diversion device
GTS	Greywater treatment system
HDPE	High density polyethylene
HHW	Household hazardous waste
ICLEI	International Council for Local Environmental Initiatives – now known as 'ICLEI – Local Governments for Sustainability'
LED	Light emitting diode
LETS	Local Exchange Trading System (a community currency system)
MEPS	Minimum Energy Performance Standards
MRF	Material Recovery Facility
NRM	Natural resource management
OSH	Occupational Safety and Health
PV	Photovoltaic (eg. PV system)
SEDO	Sustainable Energy Development Office (State Government - now defunct)
SEN	Sustainable Energy Now Inc.
SEWPAC	Department of Sustainability, Environment, Water, Population and Communities (Australian Government)
STC	Small Scale Technology Certificate
WELS	Water Efficiency Labelling and Standards scheme

Though many people live in suburban areas with neighbours in close proximity, it is not uncommon for people to live side by side for years without ever saying hello or learning each other's name.

6. End Notes

1. The CSIRO and Bureau of Meteorology's State of the Climate 2012 report observes that "Southwest Western Australia has experienced long-term reductions in rainfall during the Winter half of the year", and the report predicts decreases in rainfall are likely to continue in the coming decades in south-west Western Australia during Autumn and Winter. State of the Climate report: www.csiro.au/en/Outcomes/Climate/Understanding/State-of-the-Climate-2012/

Also the Water Corporation's *Water Forever Whatever the weather - Drought-proofing Perth 10-year Plan* released in November 2011 notes that in the past ten years reduced rainfall and changes in rainfall timing have greatly reduced run-off into dams around Perth. So there is serious concern that rainfall is decreasing in our area. Document available online: www.watercorporation.com.au/_files/waterforever/10_year_Water_Supply_Strategy.pdf

2. 'Groundwater' Water Corporation Website - www.watercorporation.com.au/G/groundwater.cfm.

3. Australian Institute of Urban Studies.

4. Bureau of Meteorology website: www.bom.gov.au/climate/data/

5. Department of Health 'Urban Rainwater Collection' brochure, 2011. Available online: www.public.health.wa.gov.au/cproot/1807/2/urban_rainwater_collection.pdf.

6. Ibid.

7. See the Living Greener water website for further information: www.livinggreener.gov.au/water/rainwater

8. www.livinggreener.gov.au/water/greywater.

9. Lanfax Laboratories website www.lanfaxlabs.com.au.

10. Water Corporation–Waterwise Specialists www.watercorporation.com.au/W/waterwise_specialists.cfm

11. Available for download at the Department of Health Website: www.public.health.wa.gov.au/

12. www.public.health.wa.gov.au/3/667/2/greywater_.pm

13. See Department of Health's website for the most current list of approved systems: www.public.health.wa.gov.au/

14. Graph sourced from the 'Waterwise Gardens Information Sheet' - Water Corporation www.watercorporation.com.au/_files/waterwise/Waterwise_Gardens_Sheet_WIPB.pdf

15. www.watercorporation.com.au/

16. Gardening Australia Factsheet – 'Combating Nitrogen Drawdown' Presenter Angus Stewart, 07/02/2009. Available online: www.abc.net.au/gardening/stories/s2485140.htm

17. Water Corporation 'Water Saving Ideas – Soil Improvement' brochure, Dec 2011. Available online: www.watercorporation.com.au/_files/PublicationsRegister/11/Water_Saving_Ideas_Soil_Improvement.pdf

18. www.watercorporation.com.au/

19. Further information on the WELS scheme is available here: www.waterrating.gov.au/

20. Water Corporation 'Showerhead Swap – Frequently Asked Questions' brochure. Available online:www.watercorporation.com.au/_files/waterwise/Water_Efficiency_Projects/Showerhead_Swap_FAQ.pdf

21. Water Corporation website – Showerhead Swap program page: www.watercorporation.com.au/S/showerhead_swap.cfm?uid=1961-7353-4372-4599

22. WELS website www.waterrating.gov.au/products/index.html.

23. Water Corporation website – Toilets To Go: www.watercorporation.com.au/T/toilets_to_go.cfm?uid=2229-9249-4440-6350.

24. Living Smart / Perth Solar City brochure 'An Introduction to Saving Water' available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_intro_saving_water.pdf.

25. Water Corporation website 'Saving water in your home' www.watercorporation.com.au/W/waterwise_home.cfm?uid= 9664-1521-7474-9756.

26. Department of Health – Composting Toilets: www.public.health.wa.gov.au/3/665/2/composting_toilets.pm.

27. Water Corporation website 'Detecting and repairing leaks' www.watercorporation.com.au/L/leaks.cfm.

28. Living Smart – Perth Solar City brochure 'How Can I Help the Planet?' available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_help_the_planet.pdf.

29. Available online: www.csiro.au/Outcomes/Climate/Understanding/State-of-the-Climate-2012.aspx and may be downloaded at: www.csiro.au/en/Outcomes/Climate/Understanding/State-of-the-Climate-2012/~/link.aspx?_id=2CF9DB89B8C3460F83BEAC6C98D1A7EE&_z=z

Recycling is a process where waste materials are broken down into their raw state and then reconstituted into new reusable products.

30. CSIRO and BOM State of the Climate 2012 six page snapshot document. Available online: www.csiro.au/news/~/media/CSIROau/Divisions/CSIRO%20Marine%20%20Atmospheric%20Research/StateOfTheClimate_CMAR_PDF%20Standard.ashx p1.

31. Living Smart / Perth Solar City brochure 'How to Read Your Bills and Track Your Consumption – Water, Gas, Electricity' available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_read_bills_track_consumption.pdf.

32. Ibid, adapted from table on p2 (water use figures omitted).

33. Information on Synergy's Green Energy options: www.synergy.net.au/at_home/gogreen.xhtml

34. Sustainable Energy Development Office, Government of Western Australia, brochure 'Simple ways to save energy', August 2007.

35. Sustainable Energy Development Office, Government of Western Australia, brochure 'Simple ways to save energy', August 2007.

36. Living Smart / Perth Solar City brochure 'How Can I Help the Planet?' Available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_help_the_planet.pdf.

37. The Department of Transport Living Smart brochure 'How to adjust your water heater' gives step by step instructions. Available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_adjust_your_water_heater.pdf.

38. Department of Transport Living Smart brochure 'How to Fix a Leaking Tap'. This brochure gives step by step instructions on how to change a tap washer. Available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_fix_leaking_tap.pdf.

39. Department of Transport Living Smart brochure 'How can I help the planet?'. Available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_help_the_planet.pdf.

40. Government of Western Australia Sustainable Energy Development Office brochure 'Energy Efficient Housing' May 2009. Also Murdoch University School of Engineering and Energy website: www.see.murdoch.edu.au/resources/info/Res/sun/index.html.

41. Some great resources for passive design include a book by Paolino, Sam (1992) *Living With the Climate. Graphic Systems,* Perth. And also by the Australian Government Department of Climate Change and Energy Efficiency (2010) *Your Home Technical Manual – Australia's Guide to Environmentally Sustainable Homes,* 4th Edition, p91. Available online: www.yourhome.gov.au/technical/index.html

42. Heat conduction of building materials is a complex topic, and the amount of heat your windows conduct will depend on the type of windows, type of glazing (eg. double glazing), and even the materials from which the frame is made. Ask a window specialist for more information, if you are building a new house or replacing existing windows.

43. Australian Government Department of Climate Change and Energy Efficiency (2010) *Your Home Technical Manual – Australia's Guide to Environmentally Sustainable Homes*, 4th Edition, p91. Available online: www.yourhome.gov.au/technical/index.html

44. Australian Government Department of Climate Change and Energy Efficiency (2010) *Your Home Technical Manual – Australia's Guide to Environmentally Sustainable Homes*, 4th Edition, p83. Available online: www.yourhome.gov.au/technical/index.html

45. Government of Western Australia Office of Energy – Figures given on Energy Smart Thermometer.

46. Living Smart – Perth Solar City brochure 'How Can I Help the Planet?' available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_help_the_planet.pdf

47. See the Federal Government's Energy Rating website for more information on the labelling program, and a comparator of products showing their efficiency and star rating. www.energyrating.gov.au/

48. Living Smart / Perth Solar City brochure 'Natural Heating and Cooling for a Comfortable Home', available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_Natural_heating_cooling.pdf

49. Synergy 'Home Renovator' interactive website: www.synergy.net.au/at_home/energy_efficient_renovator.xhtml

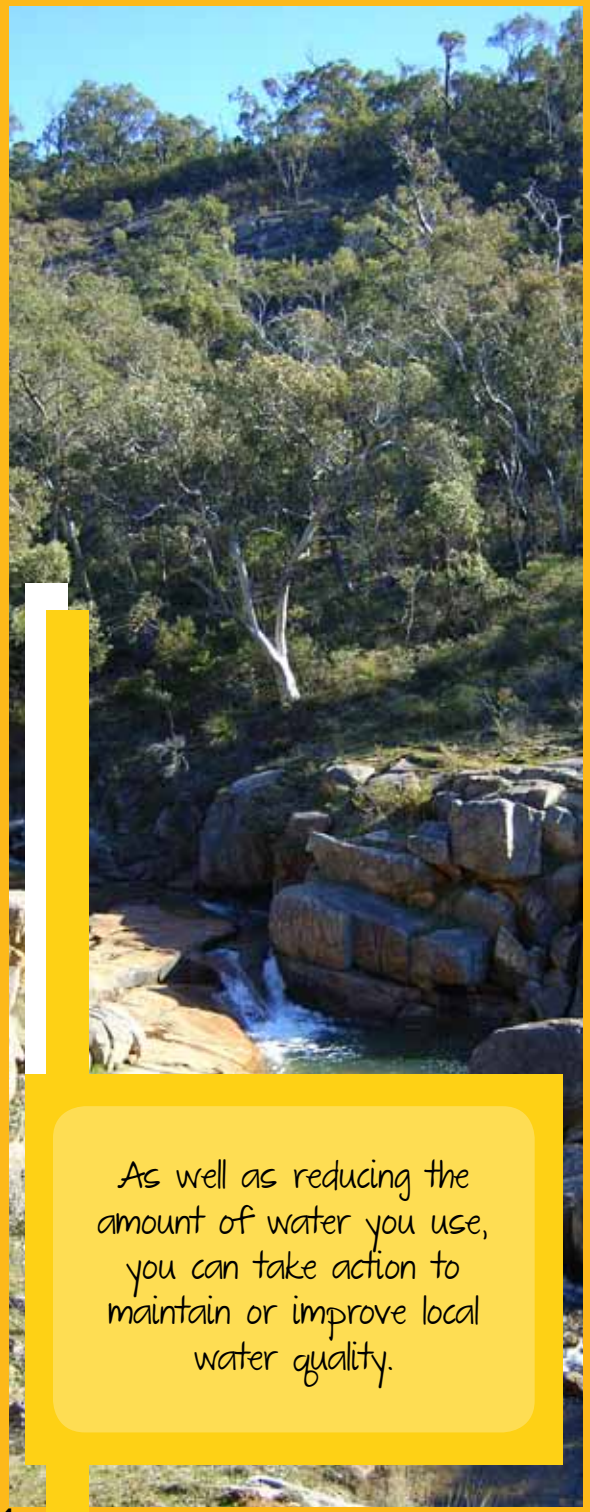
50. Sustainable Energy Development Office, Government of Western Australia, brochure 'Simple ways to save energy', August 2007.

51. See the Energy Rating Website for more information: www.energyrating.gov.au

52. Living Smart – Perth Solar City brochure 'How Can I Help the Planet?' available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_help_the_planet.pdf

53. Department of Transport Living Smart brochure 'How to set up your fridge' Available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_Set_up_your_fridge.pdf

54. The R-Gang website contains further information on collection sites: www.rgang.org.au/fluorescent-light-recycling-master.html



As well as reducing the amount of water you use, you can take action to maintain or improve local water quality.

55. Sustainable Energy Development Office, Government of Western Australia brochure 'Lighting', May 2009.

56. Living Smart / Perth Solar City brochure 'Solutions to Standby Power'. Available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_Solutions_standby_power.pdf

57. Department of Climate Change and Energy Efficiency (2011) 'National Greenhouse Gas Inventory - Accounting for the Kyoto Target - December Quarter 2010 '. pp 10-11. Available online: www.climatechange.gov.au/publications/greenhouse-acctg/national-greenhouse-gas-inventory-2009.aspx

58. Australian Government Living Greener website - 'Travel' page. www.livinggreener.gov.au/travel

59. Department for Planning and Infrastructure brochure 'The Truth About Travel in Perth – Facts and Myths', available online: www.transport.wa.gov.au/mediaFiles/AT_LS_P_truth_about_travel_in_Perth.pdf

60. SEWPAC 'Plastic Bags' www.environment.gov.au/settlements/waste/plastic-bags/index.html

61. Clean Up Australia Day website 'Plastic Bag Facts' www.cleanup.org.au/au/Campaigns/plastic-bag-facts.html

62. www.environment.gov.au/settlements/waste/ewaste/about.html

63. Nettle, Claire (2010). *Growing Community: Starting and nurturing community gardens.* Health SA, Government of South Australia and Community and Neighbourhood Houses and Centres Association Inc. Quoted on: http://communitygardenswa.org.au/display/index/gardens-what

Shire of MUNDARING

shire of kalamunda

7000 Great Eastern Highway
Mundaring WA 6073
T: (08) 9290 6666
F: (08) 9295 3288
shire@mundaring.wa.gov.au
www.mundaring.wa.gov.au

2 Railway Road
Kalamunda WA 6076
T: (08) 9257 9999
F: (08) 9293 2715
kala.shire@kalamunda.wa.gov.au
www.kalamunda.wa.gov.au