How to reduce greenhouse gas emissions, save money and maintain quality of life

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Introduction

This booklet is designed to educate the Australian community towards:

- Awareness of the causes of global warming, sources of greenhouse gases in Australia and emissions abatement measures.
- Sustainable, energy efficient domestic consumption habits that reduce greenhouse gas emissions.

Global Warming and its Causes

Global warming is caused by increasing atmospheric concentrations of gases emitted by human activities, primarily combustion of fossil fuels. These emissions are occurring at a rate that is double the capacity of the Earth's oceans and forests to assimilate them. CO2 concentrations in the atmosphere are now over 380 ppm, which is higher than any measured in ice core records over 400,000 years and is increasing at 2.5 % per year. The IPCC points to the need for reductions in global emissions of around 40 per cent by 2050 and 75 per cent by 2100 in order to limit global warming to between 1.2 deg. and 2.3 deg.C by the year 2100 (IPCC, 2005).
The main sources of anthropogenic greenhouse gas emissions are, in order of magnitude:

- Stationary energy generation
- Agriculture and land clearing
- Transport
- Industrial processes

Emissions are first and foremost a problem created by the affluent industrialized nations. The USA and Australia have greenhouse gas emissions averaging 22 and 28 t per head respectively, compared to less than 1 t for many developing nations, including China. The sustainable level of emissions has been estimated to be about 3.5 t for every person on planet Earth (Lenzen,1997).

Emission abatement and the Kyoto Protocol

The Kyoto Protocol is a legal international agreement under which 162 industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990, by 2010. The goal is to lower emissions from six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12. National targets range from 8% reductions for the European Union and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland."*(Wikipedia, 2005*). The KP came into force in Feb 2005. Participating nations have introduced emission abatement schemes in the form of carbon taxes or 'cap and trade' CO2 trading schemes.

However, Australia and America have refused ratify the Protocol and have not enacted emissions abatement schemes and are excluded from participating in CO2 trading schemes with KP signatory nations.
The main reasons given by Australia's current government have been that Australia exports a lot of 'emissions-intensive' mineral and agricultural products and that the KP does not limit emissions from Third World countries.

Although large proportion of Australia's emissions are from primary resources exports, there is great potential to reduce emissions from these industries by energy efficiencies and changing energy sources from coal to renewable fuels and gas. Mandatory Energy Efficiency Audits have been recently enacted by the Australian Government for the 200 largest corporate emitters.

However, Australia still does not have a national CO2 abatement scheme, such as carbon trading. The Kyoto Protocol nations, including the EU, Japan and Russia have a 'cap and trade' carbon trading scheme and 'the price of carbon' is currently about A$30 per tonne of CO2 emitted. This means that companies reducing their emissions gain

credits that can be sold to companies that continue to emit above an allocated 'cap'.

Australia has joined the Asia Pacific Partnership on Clean Development, in which the United States, Australia, the People's Republic of China, India, Japan and South Korea agreed to cooperate on development and transfer of technology which enables reduction of greenhouse gas emissions. These countries are major coal producers and consumers and their major focus is cleaner coal combustion and geo-sequestration.
The US and Australia, which account for over 25% of the world's man-made emissions, have not enacted an emission abatement scheme.
To achieve the emissions reductions of 50-60% that are required to stabilize greenhouse gases in the atmosphere by the middle of the century and avoid catastrophic climate change (>2degree temperature rise), all of the world's major nations must join the same protocol, with a world-wide emissions abatement scheme. Without the fiscal incentives provided by carbon trading and carbon taxes, significant emissions reductions are unlikely.

The issue of emissions from the developing world is a vexed one, but it is clear that high consumption 'western' lifestyles contribute a large portion of greenhouse gas emissions. Figure 2 clearly illustrates how per capita emissions relate to lifestyle and consumption.
It is generally agreed that China and India, with rapidly expanding economies and increasing emissions, will need to be included in a global emissions abatement scheme.

Fig.1.1. Sources of greenhouse gases globally *(IPCC, 2005)*

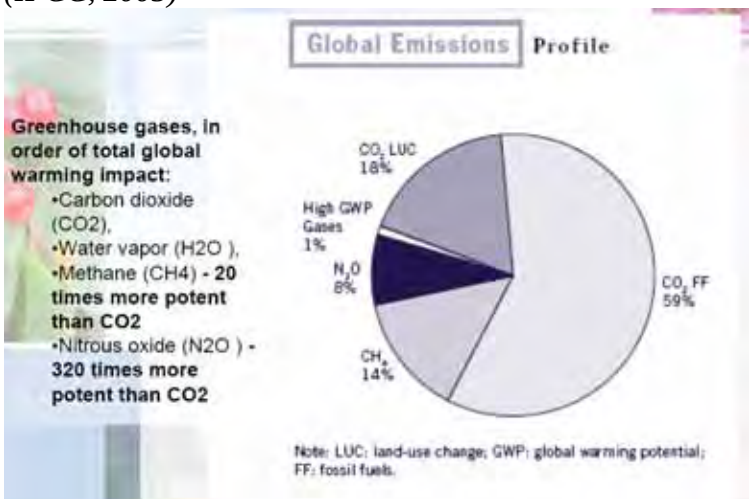
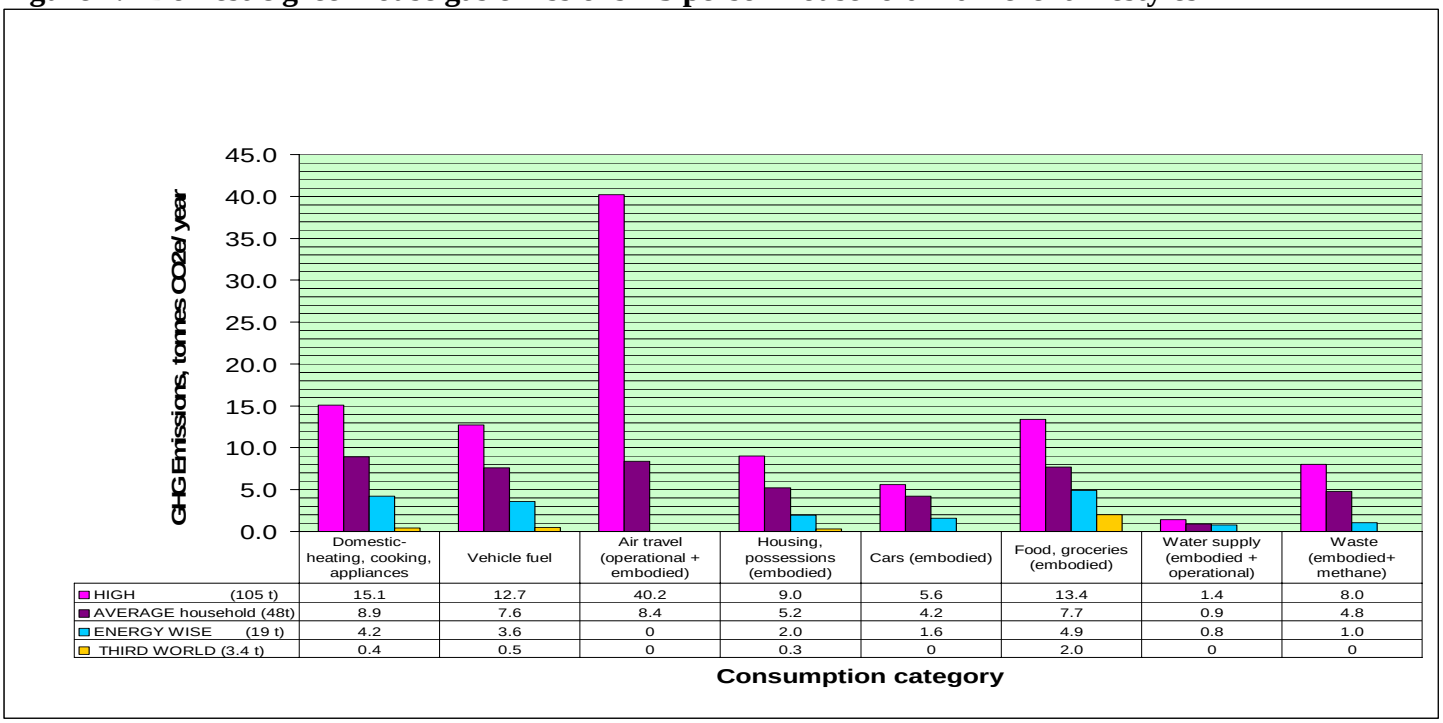


Figure 1.2 Domestic greenhouse gas emissions – 3 person household – different lifestyles



	Domestic-heating, cooking, appliances	Vehicle fuel	Air travel (operational + embodied)	Housing, possessions (embodied)	Cars (embodied)	Food, groceries (embodied)	Water supply (embodied + operational)	Waste (embodied+ methane)
HIGH (105 t)	15.1	12.7	40.2	9.0	5.6	13.4	1.4	8.0
AVERAGE household (48t)	8.9	7.6	8.4	5.2	4.2	7.7	0.9	4.8
ENERGY WISE (19 t)	4.2	3.6	0	2.0	1.6	4.9	0.8	1.0
THIRD WORLD (3.4 t)	0.4	0.5	0	0.3	0	2.0	0	0

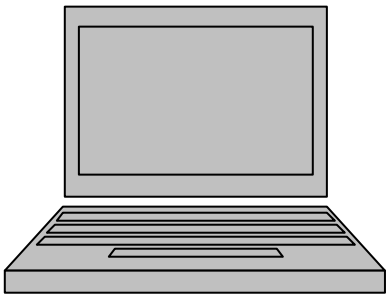
Domestic Sources of Greenhouse Gas emissions

Australians produce, on average 28 tonnes of greenhouse gas (GHG) emissions* per person Of these, about 13 tonnes are from our domestic energy use and consumption − about 58 % from consumption of home energy, food and goods and 42% from transport for private purposes. By making informed decisions in all aspects of home and transport energy consumption, most Australians can reduce the emissions for which they are responsible by half or more.

Emissions from an average Australian household of 3 can be classified as follows:

1. **Car travel** – 27% fuel use for privately owned vehicles (public transport bus/ train contributes <1%)
2. **Air /overseas travel** −15%. Mainly fuel emissions from jet aircraft; also other aircraft and ocean liners
3. **Home energy** − 15%. Mainly electricity; gas and wood generally contribute <2%.
4. Embodied emissions of **food, water and groceries** − 22%.
5. Embodied emissions of **house, vehicles appliances and other possessions – 12%**
6. Embodied emissions of **waste** −11%. Packages, containers, papers and methane emissions from landfill.

Figures 1 and 2 are pie charts of energy and emissions for a 'statistical average' Australian household (*Australian Bureau of Statistics Year Book, 2001*; *Rose, 2003)*, produced using the ***GHG-Energy Calculator***



Greenhouse Gas Emissions and Energy Calculator

Want to estimate your energy consumption and emissions? Do your own audit in a few minutes using *GHG-Energy Calc* on http://www.carbonneutral.com.au or http://www.wacollaboration.org.au

The Calculator is designed to encourage self-auditing of energy use and emissions by households and small businesses. It estimates all energy and emissions resulting from our consumption of energy and goods:
1. **Direct energy and emissions** from fuel and electricity used.
2. **Upstream energy and emissions** from the extraction/ refining of the fuels and generation of the electricity that we use.
(1+2 = full cycle energy and emissions)
3. **Embodied energy and emissions** from the production and manufacture of:

- Food, groceries and water that we consume and municipal solid waste.
- Vehicles and other transport modes, housing and other possessions.

** Greenhouse gas emissions are expressed in tonnes of carbon dioxide equivalents (t CO_2e)*

******* *The energy used in the production of all goods, e.g. food, vehicles, houses, containers and packaging is termed* ***Embodied energy****. Most of the embodied energy comes from fossil fuels, and the greenhouse gases emitted in the process are called* ***Embodied emissions*** *(EE).*

Figure 2.

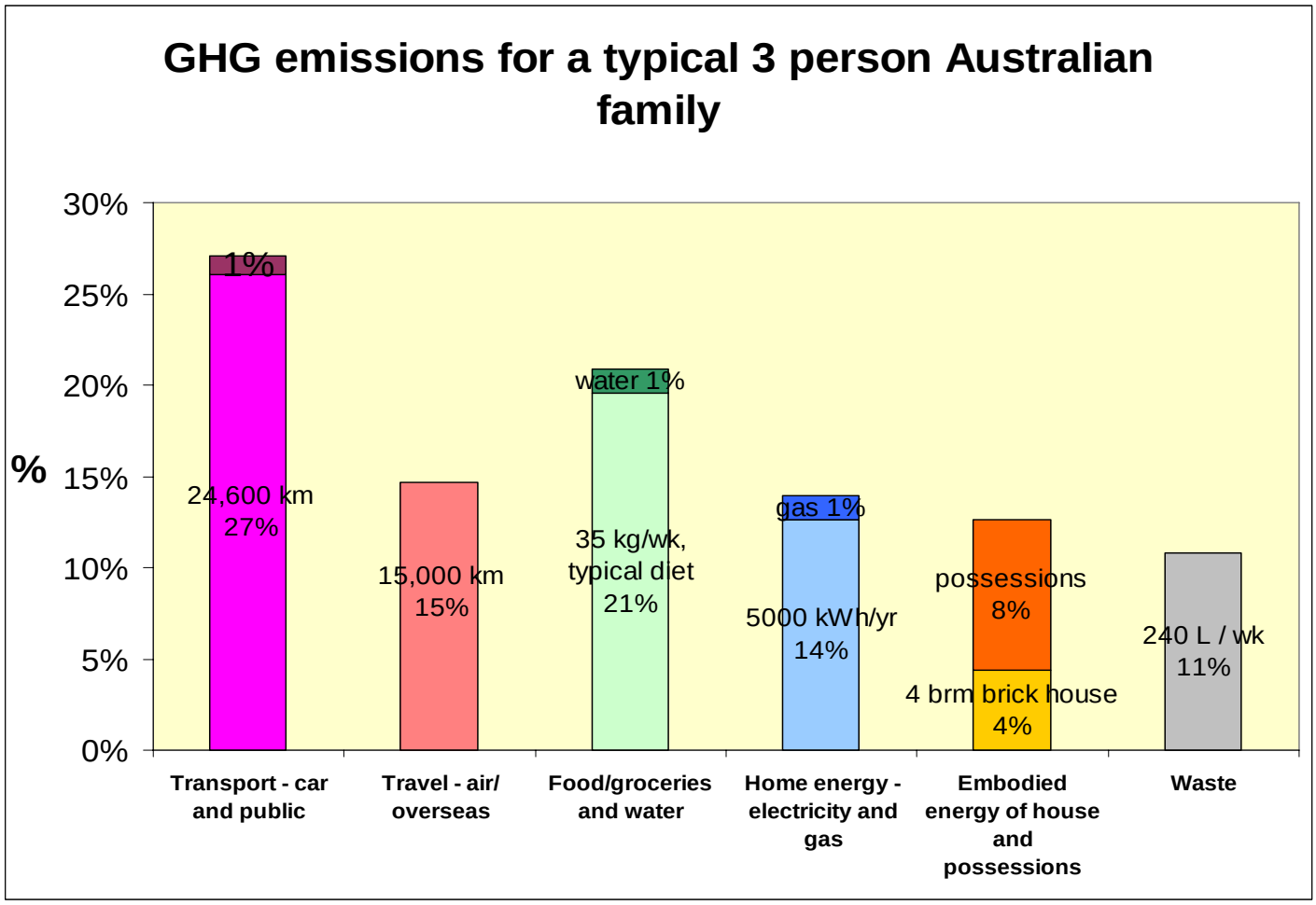
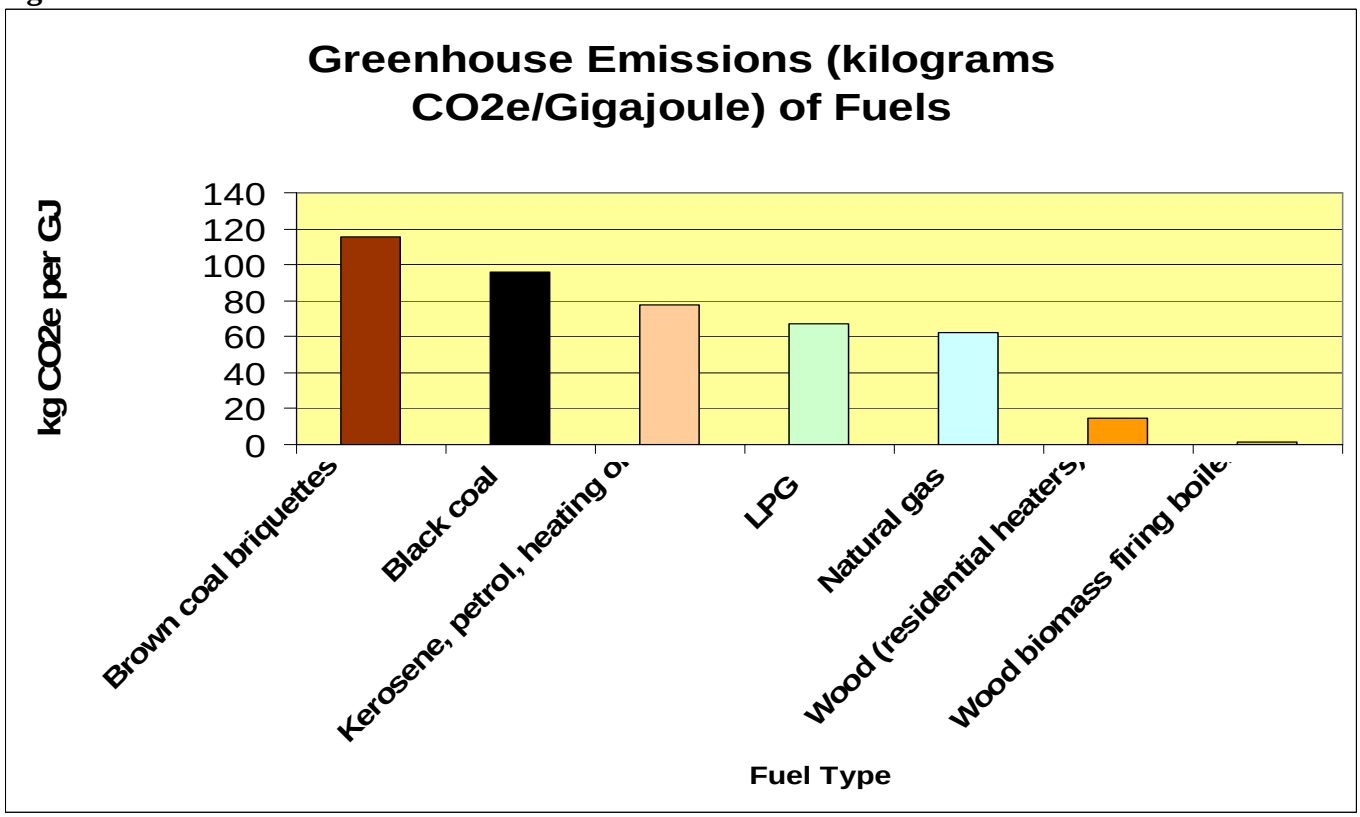


Figure 3.



Greenhouse gas emission checklist

If you are serious about reducing greenhouse gas (GHG) emissions, start with your own household or small business activities/ items that produce most GHG emissions. The check list below summarizes the 6 major areas of domestic energy consumption and emissions. Use *GHG-Energy Calculator* to estimate your emissions and use a 'scorecard' approach to see where to most effectively reduce your 'annual GHG emission score'.

1. Are you a frequent flier?

If so, air travel will produce more GHG emissions than anything else you do. For example an economy return trip by jet aircraft to Europe for one person results in about 10 tonnes of greenhouse gas emissions (20-30 tonnes if traveling business or first class). The real cost of air travel is not paid by travelers today. A pre-WW II international agreement makes aviation fuel virtually exempt from tax.

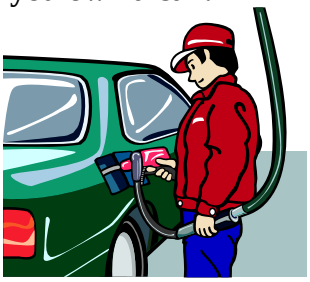
Transport is a major contributor to global warming and pollution. You can help change government and corporate action by:

- Voting for political parties that have policies of ratifying the Kyoto Protocol, enacting emissions abatement schemes, improving bus, train and bicycle transport and increasing tax on aircraft fuel.
- Purchasing a smaller, more efficient vehicle from a company with good sustainability accreditation.
- Switching from driving your own car to going by bus, train or bike wherever possible.

The 'Oil Peak'

Over 50 % of the world's oil reserves have already been used and the remaining oil will be more difficult to extract. Oil production will 'peak' before 2010, after which the rate of extraction will decline. As world demand for petroleum products is increasing to unprecedented levels, the prices of petrol, diesel, jet fuel and petroleum products such as plastics, fertilizers will continue to rise. Inefficient use of oil now is wasting a non-renewable resource, and if we don't reduce our oil consumption now, the burden of scarcity will more on future generations

2. Do you own a car?



Traveling in large vehicles that are not utilized to capacity is the most polluting activity that Australians do. If you travel the average distance of 16,600 km per year on your own in a large car, add 8.5 tonnes to your scorecard (2.5 t of embodied emissions and 6 t of fuel emissions). Traveling the same distance with 4 people in the car, GHG emissions are 2.2 t per person and by bus, only 0.8 t. If your household uses two medium to cars for commuting, these are likely to contribute about 15 t of greenhouse gases and car transport will be by far your greatest source of emissions.

Although a fuel excise of 38% on petrol and diesel is paid to fund roads and road trauma, this is low compared to the other OECD nations most of which pay 60–95c/ L *(Australian Institute of Petroleum, 1999)*. There is a compelling case to levy a carbon tax on road and air transport fuels. This would ensure that users contribute towards the real cost of emissions abatement in proportion to their emissions.

3. Do you have electric space and water heating; are your appliances efficient?

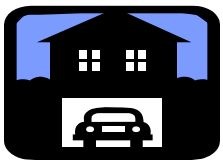
Coal-fired electricity is the most polluting form of energy in terms of greenhouse gas emissions. In Australia, 80% of electricity is from coal fired power stations (*Australian Bureau of Statistics, 2002*).

Gas heating appliances produce only 1/6th as much greenhouse gas emissions as electric equivalents. Solar appliances produce even less. Home energy emissions account for 24% of the total on average and of these 43% are from space and water heating. Cut your home energy emissions by up to 50% (about 5 tonnes) or more by:

- Converting from electric to gas or solar water and space heating systems.
- Insulating the home.
- Using 4-5 star efficiency rated electrical appliances.
- Switching appliances off at the power point when they are not being used.

For more details, see 'Simple ways to save Energy' on www.sedo.energy.wa.gov.au/uploads/simple_ways_4pg_39.pdf

4. Are your house, cars and possessions used to capacity?



Energy is used in the production and manufacture of everything we own. This energy, termed the embodied energy, varies according to the type and weight of materials, and also the manufacturing processes used. The resulting embodied emissions can be apportioned over the life of the product, for example:

- A typical car built in Australia with a life of 15 years accounts for 1.9 t / year in embodied emissions or about 1/4 of the emissions produced by operating that vehicle.
- The average Australian double brick and tile house of 185 sq. metres, with a life of 80 years and average furnishings, plus the household's possessions accounts for about 4.5 t of embodied emissions per year.

Down-sizing house and car to half the sizes stated above would reduce embodied emissions by about 3 tonnes per year and fuel/ energy emissions by over 6 tonnes.

5. Do you consume much meat, dairy, and highly processed food?

If so, your emissions score for food is likely to be about 3 t / year / person in your household. This can easily be reduced by 1.5 t per person (4.5 t for the household of three) by minimizing consumption of:

- Red meats, dairy products and other meats.
- Foods, drinks or groceries in glass or plastic bottles, cans or cartons.

Replace some or all of your meats, diary and butter with nut and grain based foods (breads, pastas and pulses such as soy and lentils) and vegetable oils. To reduce packaging/ container waste, eat home cooked food, home- brewed drinks. Purchase products with minimal packaging

6. How much do you throw in the bin?

Embodied fossil fuel energy contained in the waste we throw out and methane from landfill accounts for an average of about 1.4t of emissions per year for every Australian. By reducing, reusing, recycling and composting this figure can easily be halved.