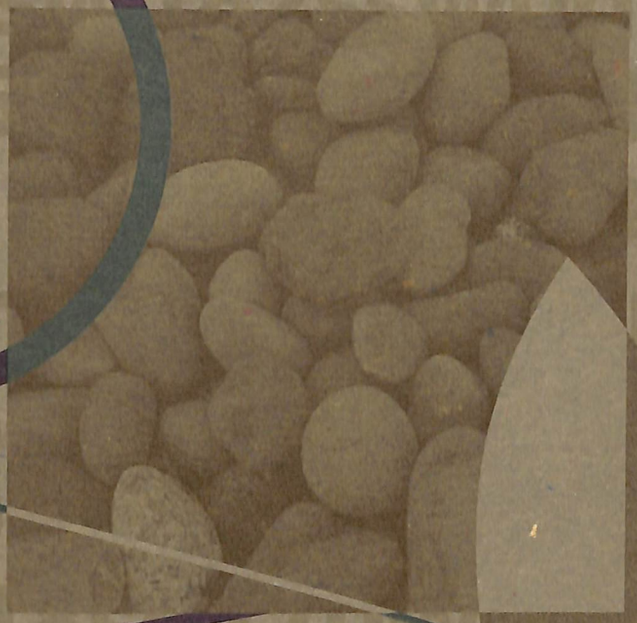
# Best Practice Ecotourism

## A Guide to Energy and Waste Minimisation



Commonwealth Department of
TOURISM

# Best Practice Ecotourism

**A Guide to Energy and Waste Minimisation**

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# Foreword

Ecotourism offers Australia a great opportunity to develop a long-term, sustainable tourism industry, generating jobs and wealth while at the same time protecting our most precious assets—our magnificent and unspoilt natural environments.

To realise this potential, the ecotourism industry must be based firmly on ecologically sustainable principles. For ecotourism operators this means a commitment to good environmental practices, especially good energy and waste minimisation practices.

Increasingly, Australian tourism enterprises are paying much closer attention to managing the impacts of their activities on the environment. Why? Quite simply because the rewards are there. Good environmental practices benefit a company's bottom line and meet the needs of discerning international and domestic markets. In other words good environmental practice is good business practice—it makes good economic sense.

This energy and waste minimisation guide has been developed to assist ecotourism and nature-based tourism operators move further down the track to achieving best practice. The need for the guide was identified in the National Ecotourism Strategy, launched in March 1994, and is one of a number of initiatives funded under the Government's $10 million National Ecotourism Program.

*Best Practice Ecotourism* is the result of a 12-month investigation of tourism-related energy and waste minimisation initiatives in Australia and overseas, including a national consultation process with Australian industry and government. It aims to provide operators with the practical means to evaluate their current practices and offers a number of suggestions for improving the energy and waste management of 25 identified activities. A compendium of relevant Federal, State and Territory Government agencies, assistance programs and non-government contacts for additional advice and guidance is also included.

I wish you well with your use of this guide and with the subsequent improvements you may make to your business.

Michael Lee
Federal Minister for Tourism

November 1995

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# Section one
# Getting started

## Current industry practices in energy and waste minimisation

Ecotourism and nature-based tourism operators are genuinely concerned about the impact of their activities on Australia's natural and cultural environments. At the same time, there is a growing awareness that generating waste and consuming energy amount to significant business costs.

There are many examples of environmental best practice and innovation within the ecotourism industry and operators are interested in sharing their experiences and successes in this area. However, there is considerable scope for the industry to embrace an increasing range of new practices and technologies in energy and waste minimisation.

In November 1994, the Commonwealth Department of Tourism commissioned the Australian Conservation Foundation (ACF) to carry out a study to investigate cost-effective energy and waste minimisation practices relevant to ecotourism and nature-based tourism operators.

The research findings on current industry practices quoted in this guide were established through an extensive research and consultation process undertaken by the ACF, and included:

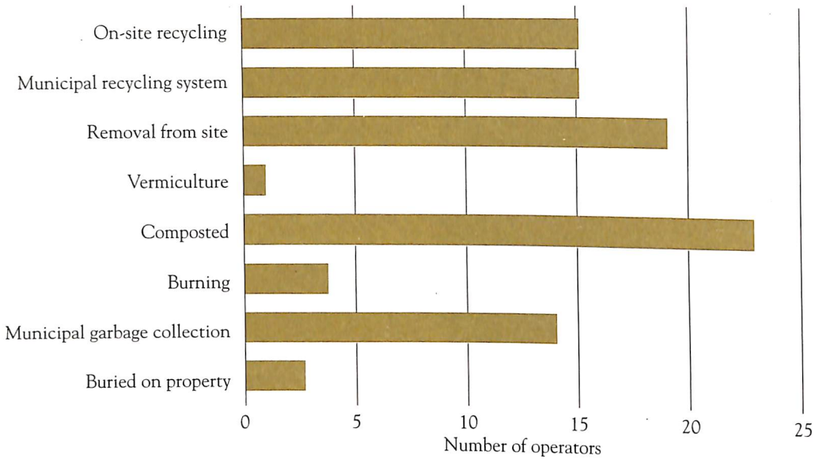
- a national and international literature review of energy and waste minimisation practices in the tourism and hospitality sectors;
- wide distribution of a newsletter and written survey to tourism operators, industry associations, government agencies, and energy and waste management bodies inviting input to the guide;
- an in-depth telephone survey of 110 nature-based tourism operators; and
- a series of visits to nature-based tourism sites in most States and Territories and face to face interviews with operators.

Achieving best practice in energy and waste minimisation (whether ecotourism or mainstream tourism) can often be a complex and time consuming process. This guide has been produced to help simplify this process by providing practical information and advice to assist operators in meeting their environmental and business objectives.

### Current waste minimisation practices

Waste minimisation has received considerable attention from ecotourism and nature-based tourism operators. Some examples of successful waste minimisation practices include: using income generated by an in-house bottle recycling program for a local area interpretation project, using reusable plastic containers and utensils on tours, and reusing grey water to irrigate a rainforest reforestation project.

**Figure 1 Methods of solid waste management in accommodation facilities**




Research for this guide, in particular a survey of 110 operators, showed that recycling and re-use tend to be well understood and well supported by operators as shown in figure 1. The survey also showed that:

- 83 per cent of operators preferred purchased goods made from recycled materials, goods with minimal packaging or goods that can be readily re-used or recycled. Of these operators, 87 per cent were prepared to pay extra for such goods;
- reducing environmental impact was seen as the main benefit of a waste minimisation program followed by enhancing operator reputation;
- the main method of sewage disposal for tour operators was provided facilities such as in national parks;
- septic facilities were the main method of sewage disposal by accommodation operators;
- the two main methods of solid waste management for tour operators were removal from site and municipal garbage facilities;
- 44 per cent of accommodation operators took steps to minimise the impact of stormwater run-off;
- glass and aluminium were the materials most recycled by tour operators; and
- composting, removal from site, municipal recycling and on-site recycling were found to be the main methods of solid waste management in accommodation facilities.

Ecotourism and nature-based tourism operators are heavily dependent on public infrastructure such as visitor centres, toilets, cooking facilities and shelters in parks, recycling programs and waste disposal facilities. Where these are lacking, particularly infrastructure for recycling, operators find it more difficult to achieve high standards of environmental performance. In addition, many ecotourism operators are dependent on mainstream tourism operators for support services including transport, accommodation and catering. Where the operations of these services are inconsistent with those of ecotourism operators, the credibility of the overall service can be undermined.

## Current energy minimisation practices

Overall, energy consumption is not given as much attention as waste minimisation by the Australian ecotourism industry. Nevertheless, a number of operators are achieving results in energy minimisation. Examples include:

- eliminating noise pollution from generators and saving on running costs by using solar powered refrigeration in safari trailers;
- using two-wheel drive vehicles (instead of 4WD) and matching vehicle capacity to the size of tour groups. This practice contributes to fuel economy; and
- running an office in a remote location on solar and water energy with the benefit of no electricity bills.

The majority of ecotourism operators use fuel economy information when purchasing vehicles and over half regularly train staff in energy-efficient driving, equipment operation and building management. For tour operators, the main form of energy used is diesel fuel (32 per cent), followed by LPG and petrol.

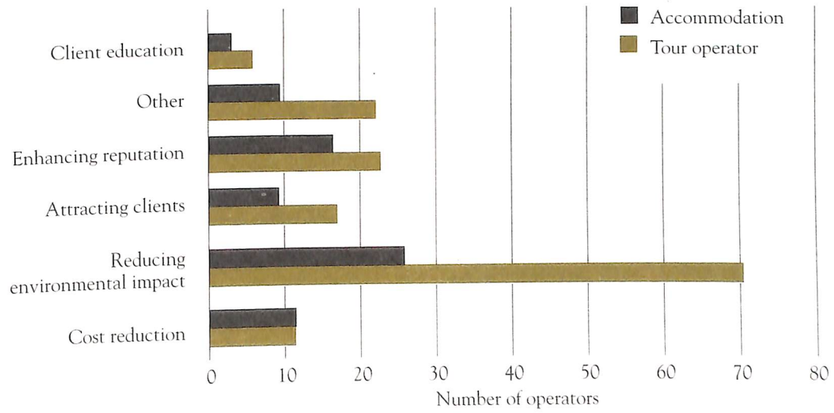
Most accommodation facilities are connected to the electricity grid, but some use independent power supply systems that rely on expensive and inefficient diesel power generation. Very few facilities appear to use renewable energy sources. This can be attributed to a number of factors such as lack of capital to invest in what are seen as low priority aspects of developments and lack of institutional support such as advice, financing and maintenance. Also, many accommodation facilities have built-in design problems that cannot be fixed without significant capital expenditure.

## Towards best practice in energy and waste minimisation

Improving environmental performance does not have to increase costs or reduce comfort and convenience. As better environmental practices are being sought, more solutions which enable environmental, financial and client service goals to be met simultaneously are being found. For example, good, passive solar building design reduces the financial and environmental costs of heating buildings while improving client comfort. Not changing towels or bed linen daily unless clients request it lowers cleaning costs and reduces environmental impact as well as extends the lives of these items (generating further financial and environmental savings).

Simple solutions may not always be available, however, and choices may need to be made on the basis of which goal(s) is seen as more important in a particular circumstance. For example, more expensive waste treatment methods may be needed where environmental sensitivity precludes off-site discharge. But even here, additional benefits may exist or can be developed. Protecting the environment enhances the tourism product, and responsible actions of tourism operators are positive, marketable commodities. Indeed, many ecotourism operators recognise this and regard improving their reputations as a major benefit of a waste minimisation program, as shown in figure 2.

**Figure 2 Benefits of waste minimisation programs**



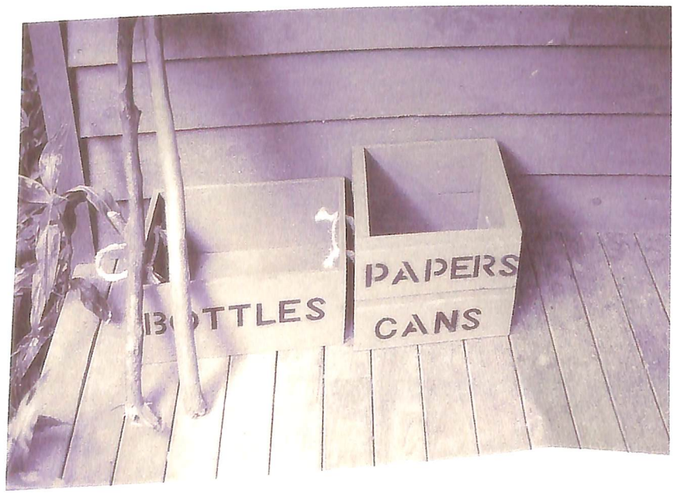
Energy and waste minimisation practices can be used as business assets by:

- including them in promotional literature and other advertising;
- using them as a basis for magazine stories or articles in local papers and among printed tour guides;
- preparing and displaying information about them as part of an educational program;
- organising tours or talks about energy and waste issues or including them where appropriate, in existing tour programs; and
- offering clients rewards or discounts for good practices such as travelling by public transport, participating in recycling, or consuming the least amount of energy or water.

As tourism operators move towards best practice, they are sometimes concerned that they will disappoint clients who want maximum convenience, or who feel their holiday mood may be spoiled by reminders of their individual environmental responsibility. This is a legitimate concern as some good environmental practices may require changes in behaviour, however, such concern is easily overstated.

Most people seeking ecotourism experiences are likely to respond positively to well communicated, environmentally responsible practices—indeed, they often expect operators to perform to high environmental standards.

**Attractively presented recycling programs are likely to be well received by visitors.**




There are a number of strategies which can help to ensure positive responses to energy and waste minimisation practices by clients. Among these are:

- ensuring potential clients are informed about environmental practices and explaining why they are being used;
- providing explanatory material on why specific environmental practices have been adopted and how they reduce environmental impacts;
- offering options for those who prefer more conventional practices. For example, if a shampoo dispenser is installed, also provide small containers of shampoo, along with an explanation of the environmental benefits of using the dispenser;
- ensuring that environmentally-preferable equipment works well. For example, the quality of showers provided by water-efficient showerheads varies greatly, so careful selection is critical;
- seeking options for environmentally constructive trade-offs. For example, using solar water heating and collecting rainwater may balance the installation of a spa bath;
- providing feedback on performance, including comparisons of current performance against previous performance, so clients feel a sense of achievement and participation; and
- focusing on practices which deliver significant environmental benefits. It is better to get a few big things right than to become bogged down in many minor issues. Proper monitoring of performance will help focus on major issues.



## Assessing costs and benefits of energy and waste minimisation

There seems to be a common belief that adopting best practice in energy and waste minimisation will add to costs, particularly capital costs. This is usually not the case, though where it is, a trade-off can be made between environmental and financial goals. In such circumstances, it may be useful to classify elements of an operation as essentials, assets or costs.

**Essentials:** Where certain energy and waste minimisation practices are essential, the challenge is to implement them as cost-effectively as possible. For example, a facility near a national park must ensure that its wastes do not affect the park's ecosystems. Economical options to meet that goal could include, for example, sharing the facility with other nearby operations.

**Assets:** Good energy and waste minimisation practices are typically potential assets, they can add perceived value to the service offered, and thereby add to income and profitability. In this case, promoting the practices is as important as implementing them cost-effectively. For example, the opportunity to stay in super-energy-efficient, accommodation unit which offers superb comfort is attractive to the environmentally conscious traveller. Promoted effectively this can be quite profitable.

**Costs:** Even where a good practice is seen as a cost, it is worth asking if it can be converted into an asset. What at first appears to be a cost may be revealed as a benefit if a more comprehensive assessment is carried out. For example, effective insulation and energy-efficient building design can cut the capital cost of heating/cooling equipment and energy supply infrastructure, as well as reduce ongoing operating costs and improve client satisfaction. Even where initial capital costs are increased, savings in ongoing operational costs often offer net financial benefits.

Additional financial benefits can often be gained. For example, the value of many businesses is calculated as a multiple of their profitability. If energy savings can improve profits, they also increase the value of the business.

### Comprehensive cost–benefit analysis

A cost-benefit analysis should include all costs and benefits over the life of an operation. Usually many costs and benefits are ignored in the cost-benefit sum, especially environmental costs and benefits. To use economists' jargon, these costs and benefits are 'externalised'. This can have serious consequences both financial and environmental. One example is the massive costs associated with the clean-up of many contaminated sites, resulting from past failures to incorporate the cost of properly managing and disposing of hazardous materials.

Some of the approaches used for cost-benefit analyses are outlined below.

**Does it seem like a good idea and can I afford it?** Many people carry in their heads a set of unconscious purchasing criteria. In small businesses, a subjective judgment will often be made based on personal beliefs about the benefits and the availability of funds. While environmental values may be taken into account, a lack of clearly articulated criteria often leads to decisions which add to costs and cause undue environmental impacts. For example, installing an energy-efficient heating/cooling system in a poorly-insulated building can add to costs without minimising environmental impact.

**Purchase cost comparison:** A common way of comparing costs is to consider only purchase price. This concern about the upfront costs is often exacerbated by limited capital and the need for vigilance over cashflow. This approach can damage a business as it ignores ongoing operating costs, future replacement costs, quality of service and environmental impacts. It should not be used.

Ongoing financial costs and environmental impacts should be used as much as possible, and compensating benefits will often be revealed. Doing this is not always easy, but methods for carrying it out are gradually becoming simpler and more widely available.

**Payback period comparison:** In a payback period comparison, the time it takes to repay the extra capital cost of the additional feature is calculated. For example, the payback period for a solar water heater may vary from three to fifteen years, depending on location and fuel cost. This is a very pessimistic comparison method, as it focuses on the direct financial payback and tends to ignore the broader savings and benefits. Moreover, it looks at options as costs to be repaid rather than as investments on which returns are to be gained.

Many aspects of ecotourism operations, if subjected to a narrow application of this test, would not be adopted. Applying payback period comparisons to investments in environmental goods shows that those investments are seen as marginal activities rather than as fundamentals of the business.

**Lifecycle cost comparison:** This approach, estimates the total whole of life costs and benefits of each option. The level of sophistication used can vary markedly. This approach is in the right direction as it encourages consideration of costs and benefits in a broader context. Two examples involving choices of lights and photocopiers illustrate this approach.

- A compact fluorescent lamp may cost $25 and use $25 worth of electricity over its 8000 hour life. In comparison, the eight incandescent globes it replaces (because they have shorter lives) cost around $8, but use $100 of electricity. Other costs include the cost of labour for replacing globes (eight times more often for the incandescents), and the inconvenience and client complaints if globes fail more often.
- Photocopiers use large amounts of electricity and paper, some copiers use $2000 worth of electricity and $20 000 worth of paper (5 tonnes) over their lives. Selecting an energy-efficient copier with double-sided copying and reduction capabilities, learning to use these features efficiently, using recycled paper and copying on to the back of non-essential, printed-on-one-side paper can save thousands of dollars while dramatically reducing environmental impacts.

*Guidelines for making calculations of lifecycle costs are published in many sources, including the Department of Primary Industries and Energy's 1994 publication, Financial Evaluation of Energy Management Measures*

## Energy and waste principles: a broad comparison

Energy can be used more or less efficiently. With greater efficiency, the same task can be done with less energy, less environmental impact and less money. However, energy cannot be re-used or recycled—the same fire cannot provide heat several times over.

A waste is a material which has, or is believed to have, no further use. While much effort is now directed at using materials more efficiently and at recovering materials from what were previously regarded as waste streams, the waste minimisation and materials recovery industry will still take some time before it matches the scale and sophistication of the energy minimisation industry.

A familiar concept is the waste management hierarchy comprising the four Rs of reduce, re-use, recycle and (energy) recovery, to which, for the sake of completeness, a T for treatment should be added. It is useful to think of a similar, but shorter hierarchy for energy management, as shown in figure 3. Where practical, preference should be given to management techniques that are higher up the hierarchies.

### Figure 3 Energy and waste management hierarchies

| Energy | Materials/waste |
|---|---|
| Reduce | Reduce |
| Renewable | Re-use |
| Non-renewable | Recycle |
| | Recover energy |
| | Treatment |



Reducing both energy and materials consumption can be achieved by increasing efficiency (doing more with less) or by doing less. In some circumstances, doing less will be an important part of the experience being sought by clients. Re-use and recycling of materials are well accepted and useful waste minimisation strategies often bring financial benefits.

The energy efficiency of some processes can be increased by using waste heat. For example, waste heat from refrigeration or air conditioning equipment may be used to heat water. Concerns about emissions from burning some wastes or in some locations may mean that recovering of energy from the burning of wastes is not an option. In such circumstances, disposal may need to be carried out, following treatment to reduce the risk of environmental impact. However, waste disposal should always be regarded as a failure to find an environmentally sound use for a particular resource.

Renewable energy sources are diverse, and the technologies for their cost-effective application are improving rapidly.

Non-renewable (fossil) energy sources must be assessed both for their local effects (for example, impact of accessing fuel, air pollution) and their contribution to global warming.

## Minimising energy: identifying the issues

### Setting up

The biggest opportunities to save energy usually occur during the design, construction, refurbishment and replacement stages. The decisions taken at these stages can lock in long-term energy efficiency or inefficiency and influence the environmental impact of energy use for many years. It is, therefore, critical to seek quality advice at these times. This guide provides some advice and contacts where more detailed information can be sought.

**Crystal Creek Rainforest Retreat in northern New South Wales has been designed to make the most of natural breezes and shade from surrounding trees.**

When consultants and advisors are used to design and specify buildings and infrastructure, clear guidelines on energy objectives must be provided. Arrangements should be made to ensure that consultants account for energy performance outcomes, and financial incentives might be established for exceeding benchmarked performance. Clear guidelines should be provided on how cost comparisons (for example, use of lifecycle analysis) are to be carried out. Consultants should be encouraged to share information where it might reduce overall costs. For example, a heating specialist could identify the major heat loss areas of a building so that an architect could modify the building design to reduce the capacity and capital cost of the heating system.

Often, a team approach is not followed in design and construction projects. Professional inputs are often passed along a linear chain and are not subject to close questioning or the exchange of professional knowledge. This is not good practice, let alone best practice, as the results often show.

Many contracts simply pay consultants a percentage of the project budget. This may not encourage energy efficient, environmentally sound or low-cost design.

### Purchasing

Just as the design of a building locks in energy use, the type of equipment purchased locks in energy use for many years. Lifecycle estimates of costs and benefits, including environmental impacts, should be considered in selecting new appliances and equipment.

### Existing operations

In almost all existing facilities and operations, there is potential for substantial energy savings. To start, it makes sense to conduct an evaluation of existing energy use to identify major components. While an energy auditor can be engaged to do this, a lot can be achieved by operators and staff. Indeed, because operators and staff can monitor changes in energy use over time, and in response to the modification of equipment or behaviour, they can often achieve large savings by relying on their experience. Effectively involving staff is good for morale, improves implementation and creates opportunities for staff to educate and inform clients.

It is essential that the energy data collected are regularly reported to management in simplified, summary form. Reports should be accompanied by explanations of trends, information on progress in implementing changes and proposals for further action.

The following actions will help identify inefficient use of energy and opportunities for improvement:

- collect data from past energy and fuel bills and graph them to identify seasonal trends, sharp changes (possibly related to the construction of additional facilities or installation of new equipment) and other variations;
- train staff to read electricity and gas meters, and then read the meters at intervals to determine which activities consume the most energy. For example, comparing energy use at low occupancy with that at high occupancy indicates the scale of energy overheads which are a financial and environmental drain even when no clients are present. Comparing rates of energy use overnight and at different times of the day can help identify the amount of energy used in cooking, lighting, etc. Comparing energy use when certain equipment has been switched off or left on can help identify sources of inefficiency;
- calculate energy use per guest-night, passenger-kilometre or other relevant criterion and report on this at regular intervals. Results can be incorporated into educational materials for clients; and
- build up an inventory of energy-using equipment and estimates or measurements of its energy consumption, so that informed decisions can be made when vehicles or equipment are replaced, buildings refurbished or facilities extended.

## Minimising waste: identifying the issues

Strategies for minimising waste go far beyond recycling materials and using composting toilets. They must also reflect local circumstances, including the waste management infrastructure available and the nature of the ecosystems that may be affected. However, unlike energy infrastructure, where choices are most likely to be dominated by matters relating to inputs to an operation, waste infrastructure considerations are more likely to relate to the outputs of an operation. Ecotourism operators are often dependent on facilities provided by local government for waste management. This can create special problems, particularly in poorly serviced areas.

For ecotourism operators, setting waste management priorities can be challenging. While it is important to reduce large contributors to waste, clients may be more concerned about the minor, but more visible waste items, such as the containers used for shampoo. Also, where effective waste management practices may affect the quality of a client's tourism experience, client satisfaction and even business viability may be affected.



### Identifying and quantifying waste streams

Before strategies for minimising wastes can be developed, some understanding of what the wastes are, how they arrive at a site and what function they play is needed. Looking at an operation as a system, with material inputs (such as newspapers, food, fresh water etc.) and outputs (such as waste paper, sewage, grey water etc.) helps to identify the processes that generate wastes.

Records of the number of newspapers and quantities of copying paper, shampoo, detergent, cleaning agents, etc. purchased can be reviewed to identify the quantities of materials entering an organisation. Records of quantities of waste removed can also be examined, and spot checks carried out to estimate quantities. On this basis, major contributors to waste can be identified.

### Reducing waste streams

The first step in a waste minimisation strategy is to reduce consumption of the raw materials that generate waste. Waste can be reduced by a variety of strategies including:

- purchasing food and materials in bulk, while avoiding over-ordering;
- avoiding over-packaged items;
- providing dispensers for shampoo, coffee, sugar etc. rather than packaged single serves;
- installing water-efficient appliances (for example, efficient showers, low-volume, dual flush or dry toilets, aerated taps (spring-loaded, where appropriate);
- implementing appropriate maintenance programs which prolong equipment life;
- establishing catering practices which minimise food wastage through portion control, self-service, appropriate food storage, post-mixing of drinks, and pre-ordering of meals;
- cooking without fats or oils; and
- using composting toilets to reduce waste water volumes.

### Re-using materials

Re-use minimises resource consumption and waste volumes by increasing the number of times a product is used before disposal.

Options include:

- re-use for the same purpose, (for example, re-using containers, mugs, and cooking utensils); and
- re-use for a different purpose, (for example, grey water may be used to water gardens).

### Recycling materials

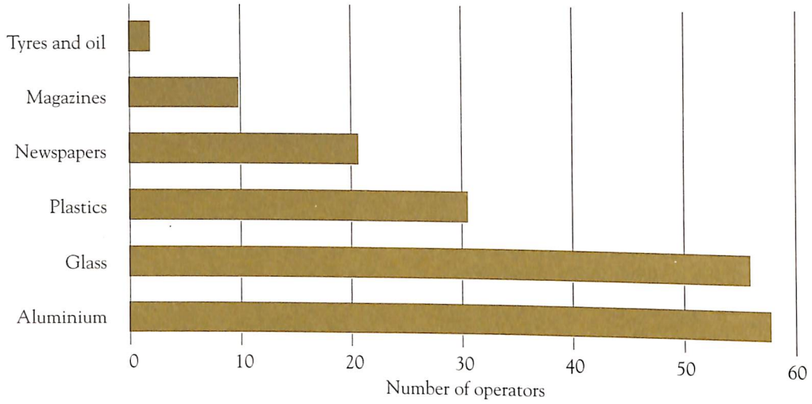
Recycling involves recovering materials that would otherwise have been thrown away and reprocessing them into useful products. Because of the energy and cost involved in transport and reprocessing, recycling is generally less environmentally beneficial than waste reduction or re-use. However, recycling reduces litter, facilitates the recovery of resources, and may result in significant reductions in the use of energy relative to the energy required for making products from virgin materials.

Collecting often widely dispersed waste materials for recycling and feeding them back into the production system can be a difficult task. For many operators a critical problem is the lack of comprehensive recycling infrastructure, particularly in more isolated areas. In the survey of ecotourism operators mentioned earlier, 68 per cent of operators rated lack of recycling infrastructure as a barrier to waste minimisation compared to 18 per cent who saw cost as a barrier. This means that, no matter how enthusiastic operators are to practise recycling, their ability to recycle may be limited.

Tourism operators have found that the types of materials accepted for recycling often change without explanation. Prices for recycled materials are often very volatile and follow world commodity prices. While this is an issue for the industry, local governments are moving towards longer-term, performance-based contracts for recycling collectors which should help to alleviate the problem.

Recycling is (mistakenly) often seen as being more important than waste reduction or re-use. Guests are quite likely to be critical of operators who are not seen to be involved in recycling.

**Figure 4 Recycling in the ecotourism industry**




In general, the rate of recycling in the ecotourism industry is much lower than the rate of recycling in households, where participation now exceeds 90 per cent in better-performing municipalities. As shown in figure 4, aluminium and glass were the only materials being recycled by a majority of surveyed operators (55 and 57 per cent, respectively), with plastics (31 per cent), mainly PET, trailing in third place. Newspapers (21 per cent) and magazines (10 per cent) were being recycled by relatively few operators, and reflects extreme past market volatility and unreliability (and relatively low volumes of these materials in many operations). About two per cent of operators claim to be involved in tyre and oil recycling, a relatively low figure. Possibly some garages and workshops are recycling these materials without operators knowledge.

Organic (food and vegetation) wastes are a significant component of the waste stream for many operations. These may be processed on-site through composting or worm farming (vermiculture) and the end product used as a soil-conditioner or nutrient source. Human wastes can similarly be recycled via composting toilets.

Recycling (and re-use) of wastewater is facilitated by keeping grey water (effluent from washing operations) and black water (effluent from toilets) streams separate. While water of any quality can be treated to drinking water standard if necessary, the lower the level of contamination the more easily it can be treated. Simple filtering and disinfection processes will allow grey water to be recycled through flush toilets and urinals.

### Products made from recycled materials

Using products made from recycled materials '*closes the loop*' by creating markets for recycled materials. While most Australians are now enthusiastically recycling materials (supply push), the need to purchase products made from recycled materials (market pull) has generally been less well recognised.

Most ecotourism operators surveyed expressed a preference to buy goods made from recycled materials and a willingness to pay a premium price for such goods. Most said that they were prepared to pay a premium of up to 10 per cent, but more than 25 per cent of operators said they were prepared to pay more. A lack of clear, reliable information is thwarting some operators' intentions in this area. For example, some of the 'recycled' toilet paper being sold is made mainly from industrial offcuts, rather than from the post-consumer waste that an uninformed consumer might expect.

There is significant scope for operators to buy a wider range of recycled products for their businesses (for example, retreaded tyres, containers made from recycled material, recycled concrete for use in buildings and paths etc.).



### Recovery of energy

Burning of waste, both to recover energy and to reduce the volume being landfilled, is not much practised in Australia. Large-scale burning of mixed waste streams (mass burning) has been opposed by many community groups because of concerns about emissions and because it may offer a convenient excuse for avoiding a serious commitment to materials recovery and recycling. In addition, stronger controls on open air burning, such as backyard incineration and the torching of landfills, have been introduced over the last decade.

Nevertheless, there is scope for energy recovery from materials such as paper and cardboard and non-chemically-treated timber, particularly in isolated areas where the recycling of these materials is difficult.

Less than five per cent of ecotourism operators surveyed used burning (with or without energy recovery) as a form of waste management.

Anaerobic (air-free) digestion of organic wastes is an option which produces a relatively clean-burning fuel (methane) and a high quality soil conditioner. Like building composting toilets, it requires some care and effort to get right. If properly applied and managed, anaerobic digestion can make useful contributions to energy and waste management systems.

### Treatment

The fundamental aim of waste minimisation is to reduce waste volume and the hazards associated with waste treatment and disposal. The focus is on on-site treatment of the small amounts of waste being generated. A small but growing number of businesses are now committed to the goals of zero off-site discharge of liquid waste and zero disposal of solid waste to landfill.

### Litter

Litter is not simply an aesthetic problem—it is a waste of material resources. Littered glass can start fires; littered plastics can injure and kill animals, birds and fish; toxic materials can leak from discarded articles and containers to enter food chains; and so on.

Clearly, litter has no part in a quality ecotourism operation. Operators need to ensure that they and their clients do not contribute to litter problems.

## Taking an integrated approach

### Changing thinking caps

Many people, when planning their tourism operations, automatically rely on electricity to supply their core energy requirements, using gas or wood heating for any energy gaps. If a sewerage system or municipal landfill is available, these are often the core of waste management practices. Septic systems and on-site burial/burning may be used. These can be costly, both to the hip pocket and to the environment. Some of the waste disposal methods might still look cheap, but community expectations and costs are rising rapidly.

It has often been assumed that energy supply and waste disposal are the answers. But in rushing too quickly to those options not enough attention may be paid to making sure the right questions were asked in the first place.

Taking a different approach may reveal large potential benefits. Starting from the tasks that must be carried out to satisfy needs (such as, providing food, comfortable shelter, clean clothes, access to natural attractions etc.), allows a designer to develop an optimal energy and materials system. The ways in which the amount of energy and materials required can be minimised are considered first, followed by an evaluation of the supply and treatment options available.

### Design processes

The following questions should be asked when developing an environmentally-sound energy and materials system:

- What is the task? For example, making a pathway safe after dark, making a lounge room comfortable year round, providing clean bedding and towels for clients.
- Can the task be eliminated, or its size reduced, by re-arranging routines, changing site layout, better ventilation, etc.?

- Can the amount of energy and materials required be reduced by, for example, insulating shading, and using high-efficiency appliances, cold water detergents, double-sided paper, and non-paper documents etc.?
- Which appliances or technologies are most suitable? Can they be re-used, and recycled at the end of their useful life?
- Can the energy or materials be supplied by renewable sources? For example, can clothes be dried on a clothesline under cover (instead of in a dryer); can solar heating rather than electrical or gas heating be used; can timber from sustainably-managed plantations be used?
- Of the energy supply options (both renewable and non-renewable) which performs the task at the desired level with minimal lifetime environmental and financial costs?
- Of the waste treatment and disposal options, which performs the task at the desired level with minimal lifetime environmental costs?

## Energy and waste self-audit: an overview

An environmental audit can be used to assess a business' environmental performance and to monitor its progress in achieving environmental targets. The audit might include the environmental performance of all buildings, operations and activities.

A self-audit overview has been included to help operators set priorities for action to reduce energy consumption and waste production and implement them using the Reference Sheets provided in section 2.

The first step in this process should be to establish an environmental policy and environmental targets for the business. In other words, do you want environmental best practice to be an integral part of your business? If so, what are your environmental objectives and how will you communicate them to your staff, suppliers and customers?

Background information to assist you in undertaking an audit is contained in section 1 (Minimising Energy and Minimising Waste) of this guide. It is recommended, however, that an energy and waste management professional be contracted to undertake a thorough assessment.

### Waste

**1. List the waste produced at your site or as part of your operation.** Identify the type of waste and all inputs by examining invoices, including those for food, fuel, paper, office supplies, equipment, cleaning products etc..

- Liquid waste, e.g. grey water from washing. Is it disposed to sewer or on site?
- Solid waste, e.g. paper. Is it organic or non organic?
- Gas or heat, e.g. from a generator.
- Hazardous waste, e.g. chemicals.

**2. List the sources of the waste.** For each of the waste products identified in point 1, identify their source.

- How did it arrive at your site?
- Did you produce it as a result of your operation?
- Was it produced by one of your employees, or by your visitors?

**3. Identify the quantities of waste you are dealing with.** Expressed as cubic metres, tonnes, kilograms, or litres.

**4. Estimate what the waste is costing you.** Remember to consider not only the direct costs of waste but also the indirect costs, e.g. labour cost of removal and running costs for vehicles.

- Cost to purchase, e.g. packaging.
- Cost of disposal, e.g. vehicle costs, staff time, tip fees.

**5. Identify how you can improve on the use and disposal of waste.**

- Reduce the need for the item in the first place or explore alternatives.
- Reuse the item several times or for other purposes.
- Recycle the item as part of the operation of the business, e.g. recover heat as an energy source. Avoid mixing waste streams as this can prove to be costly. Purchase recycled products where possible.
- Dispose of (or treat) the item in an environmentally sensitive way.

**6. Setting targets and taking action.**

Determine savings by calculating:

- the current cost of disposal;
- the cost saved through waste minimisation, e.g. re-use or recycle;
- any revenue from the sale of waste; and
- finally the cost reduction.

The cost reduction may be expressed as a percentage in information programs to assist understanding by employees and visitors.

Set realistic targets for each waste product that you have identified in terms such as reduce the cost of waste disposal by 50 per cent over three years.

### Energy

**1. Identify the type of energy being used at present.** Remember to consider both direct energy and indirect energy used. Identify all inputs by examining purchase invoices, including fuel, gas, electricity etc.

**2. Identify the energy source and quantity.** Expressed as kilowatts, litres or dollars.

- Renewable, e.g. solar, wind.
- Non renewable, e.g. electricity, gas, petrol, diesel.

**3. Identify what the energy is costing.** Check bills and check costs against specific items of equipment and/or activities. Include the cost of appliances, e.g. sauna, spa, airconditioning.

**4. Identify how you can improve on the use of energy or change the source.** This may involve consideration of whether a particular activity is necessary, e.g. lighting/heating/cooling rooms when not in use. Identify energy costs per unit, e.g. cost per visitor night, and identify seasonal variation.

**5. Setting targets and taking action.**

Calculate savings in a similar way to that outlined above and set realistic targets such as reduce energy consumption/cost by 50 per cent over five years.

Involve employees and customers in solving energy and waste minimisation problems. Communicate to customers your energy and waste minimisation policies and practices.

# Section two

# Reference sheets

This section provides practical information on how to minimise waste and energy use in most activities associated with fixed facilities and tour operations. The Reference Sheets should be used in conjunction with the techniques described in section 1 of this guide, which provides a framework for action.

Most of the suggestions provided here are associated with fixed facilities. The main reasons for this are:

- fixed facilities are, generally, much larger and more complex systems than transport vehicles. As a result, their potential environmental impacts are likely to be greater, as is the number of actions available to minimise waste and energy use;
- fixed facilities offer more readily available energy and material inputs and waste treatment/disposal facilities. Generally there is a separation between where actions (consumption and disposal) are carried out and where environmental impacts occur (out of sight). Fixed facilities also have more complex, highly-engineered systems for supply and removal; consequently, users of these facilities can often assume that minimising waste and reducing energy consumption is someone else's responsibility.

While much of the information and many of the suggestions that follow relate to the design and operation of fixed facilities, they should not be seen as being relevant only to facility operators. Many tour operators use a range of fixed facilities as an essential part of their tours. If these facilities are not using energy efficiently and are not disposing of waste in an environmentally safe manner they are likely to affect the reputation of any tour which uses them.

Ecotourism operators should consider the energy and waste minimisation practices of any facility he or she uses. Both tour operators and accommodation providers should select the services they use on the basis of energy efficiency and waste minimisation practices.

In many of the publications reviewed for this guide, waste and energy minimisation tended to be treated separately. For example, in selecting a preferred option for hand drying in communal toilets a primary emphasis on waste management led some guides to strongly advocate electric dryers in preference to paper or cloth towels, while others, focussing on energy minimisation, selected paper or cloth towels. Where possible, an integrated approach has been taken in preparing the Reference Sheets.

The individual Reference Sheets focus on the tasks involved in supplying services in a tourism operation and explore how these might be performed in ways that minimise energy and waste. Focusing on these tasks rather than viewing energy and waste minimisation as ends in themselves was considered to be the best means of pursuing an integrated approach to the issues. This approach also allows consideration of a business' operational requirements and the likely impact of energy and waste minimisation practices on guests and the quality of their tourism experience.

Land Transport

## To move clients, staff or goods

ort is the major energy impact of tourism. For tour operators, it is the main direct impact, while for facility operators, it is a major indirect impact.

### el to ecotourism destinations

**Action** Encourage longer stays

- If tourists stay in one area for a longer period (for example due to discounts or interesting packages involving more than one operator) transport energy use per tourism day is reduced. Energy consumption for long-distance travel is often the largest single energy factor in a holiday.

**Action** Encourage clients to use fuel-efficient transport

- Packages that encourage clients to travel from major cities to ecotourism destinations by train or bus (rather than car) can be developed, and the trip itself can be integrated into the tourism experience with information materials, timetables, organised meals enroute or stop-offs at sites of environmental interest.
- Transport from airport or city to a destination can be provided or coordinated to reduce energy use. Some State regulations exclude small operators from hiring vehicles to provide this service, but operators can still encourage clients to share transport.

### travel

**Action** Use transport more effectively

- Where staff have to travel long distances to a site, carpools or a staff bus could be organised, or arrangements with existing bus services negotiated to reduce energy use. A nine to eleven seat, diesel minibus uses about as much fuel as an average six cylinder car.
- Staff travel may be combined with guest transport and/or delivery of supplies.
- On-site, staff may find that bicycles are convenient, quiet and save fuel.
- Mobile phones, radio communications or improved operational systems can be used by staff to organise their activities more efficiently and reduce travel.





### Travel on tour

**Action** Reduce vehicle use

**Issues**

- Walk and use non-motorised transport such as bicycles whenever feasible.
- The distance travelled can be reduced by planning tours and support vehicle routes and schedules.

**Action** Select fuel-efficient vehicles

**Issues**

- The Department of Primary Industries and Energy publishes its annual *Fuel Consumption Guide* for passenger vehicles, some four-wheel drives and light commercial vehicles.
- Diesel-powered vehicles are 20 to 40 per cent more fuel-efficient than their petrol counterparts.
- Appropriate vehicles can reduce fuel consumption per passenger. For example, the Australian made OKA can carry 14 people while using the same amount of fuel as a conventional five to seven passenger four-wheel drive vehicle. In many cases, a conventional vehicle with limited slip differential, suitable tyres and, possibly, a winch, can carry out tasks for which more expensive and less fuel-efficient four-wheel drives have often been used.
- A light vehicle with a trailer is often suitable when larger capacity is required, and is also more fuel-efficient than using a large vehicle for all purposes.

***'Diesel-powered vehicles are 20 to 40 per cent more fuel-efficient than their petrol counterparts.'***

**Action** Drive for fuel-efficiency

**Issues**

- A computerised fuel consumption monitor can provide feedback to drivers to help them develop driving techniques that optimise fuel efficiency.
- Driver training courses can help improve fuel efficiency and safety.
- Driving at 90 km/h instead of 110 km/h on the open road consumes 20 per cent less fuel for most vehicles.

***'Driving at 90 km/h instead of 110 km/h on the open road can consume 20 per cent less fuel.'***

**Action** Maintain optimum vehicle performance

**Issues**

- Regular servicing saves fuel. Fuel efficiency can be maintained by keeping an engine in tune, wheels aligned, etc. Monitoring fuel consumption helps identify when a vehicle needs tuning.
- When servicing, ensure that used oil is recycled. Most service stations can arrange for recycling, otherwise contact your local council.
- Reduce rolling resistance and fuel consumption by keeping tyre pressures at the recommended levels.

## Setup and operate vehicles for fuel-efficiency

- Air resistance caused by pack racks and large trailers can increase fuel consumption by 10 per cent or more. Use air deflectors, aerodynamic fairings and tarpaulins to reduce drag. The tailgate of an empty trailer should be removed, folded down or fitted with a tarpaulin, so it doesn't act as a wind-catcher.
- A normal car engine consumes more than 1.5 litres of petrol per hour of idling. Larger engines consume much more. Switch engines off instead of leaving them idling.
- Total weight makes a difference. An extra 50 kilograms can add 2 per cent to fuel consumption in urban conditions or off-road work.

## Minimise environmental impact of used tyres

- Millions of worn vehicle tyres make a major contribution to Australia's waste volumes. Make sure yours don't add to this problem.
- Running tyres at recommended pressures and maintaining correct wheel alignment prolongs tyre life.
- Using retreaded tyres where possible gets the most out of each tyre carcass.
- Tyres which are too worn for road use may still be suitable for on-site use on trailers or other vehicles.
- Many tyre retailers will take old tyres for recycling (although, in some cases, a small fee may be charged). These tyres are recycled into useful products such as rubber matting, soaker hoses etc.

## stories

Victorian-based operation, uses suitably sized two-wheel drive vehicles our-wheel drives to save fuel.

xperience in eastern Tasmania uses a 12-seater Toyota HiAce bus with a llect clients at Launceston, and to return them there after their holiday. The s an opportunity for clients to begin to get to know each other. Cradle odge in Tasmania's highlands uses an 18-seat Mazda bus to bring staff from to work each day. This saves transport fuel and reduces the danger associated g on slippery roads. Some staff stay on-site, avoiding the need to use transport ng at the Lodge.

Expeditions in Western Australia uses Australian-made OKA four-wheel es, which carry 14 passengers while consuming about as much fuel as r-wheel drive vehicles.

ek Rainforest Retreat in Queensland has reduced transport fuel use per guest ed its business by extending tour duration. According to a staff member, 'By s of a least a few days, we can reduce the energy cost per day. It also means o relax more and absorb more, rather than rushing from place to place.'

ment of Conservation and Land Management in the Kimberley region of stralia has reduced transport fuel use in the Windjari Gorge Park and several luring the wet season by making these areas self-maintaining. Rubbish bins moved and visitors now take out their own rubbish, so rangers no longer ct and dispose of the rubbish.

Land Nature Tours bases its tours on walking and cycling. This avoids the and the ncumbent cost and fuel consumption.





REFERENCE SHEET


# Task To move clients, staff or goods on water

Water-based travel can be an important component of energy consumption for island-based facilities and tour operations.

**Action** **Select fuel-efficient water transport**

**Issues**

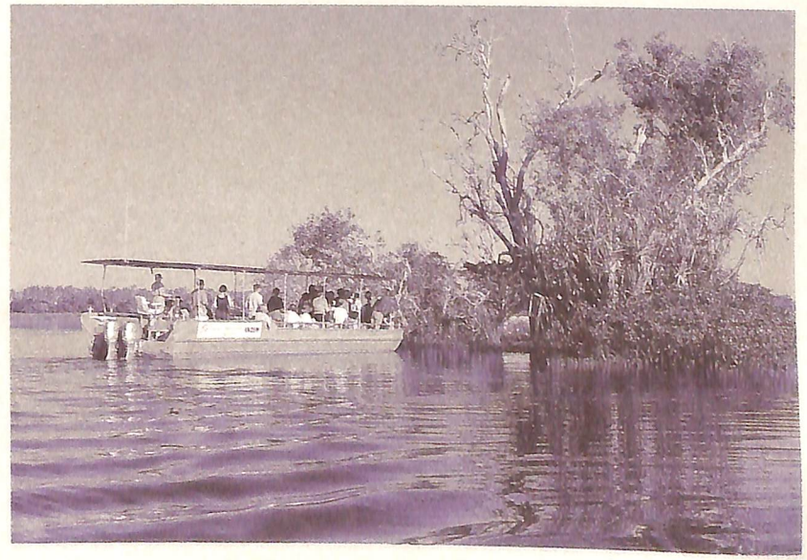
- Sailing is much more fuel-efficient than motorised water travel. Use sailboats in preference to motorboats, when feasible.
- Standard fuel consumption data for boats are not available because of the variety of hull/fitout/engine combinations. Record fuel consumption data and swap information with fellow operators to identify fuel-efficient options.
- Diesel engines are more fuel-efficient than petrol ones, and diesel fuel has a lower fire risk. Light Fuel Oil (LFO) has no environmental benefits over diesel fuel, and costs about the same as diesel fuel.
- Four-stroke engines are generally quieter and more fuel-efficient than conventional two-stroke engines.
- New boat designs and engine technologies (such as orbital engines for outboards) are becoming more fuel-efficient. Collect comparative information when buying a new boat.

**Four-stroke outboard engines provide quieter and more energy efficient tours at Yellow Waters in Kakadu National Park, Northern Territory.**

**Action** **Operate boats more efficiently**

**Issues**

- Fuel consumption of most boats increases dramatically at high speed. Reduce speed by a few kilometres per hour and save fuel.
- Ensure engines and drives are properly maintained, and that hulls are kept clean to minimise drag.
- Leaving an engine idling for long periods wastes fuel. Switch it off.
- Minimise and eliminate oil leaks from motors and drives by good inspection and maintenance practices.



### Avoid dumping sewage

- More harbours are providing sewage pump-out facilities for boats, to reduce the dumping of nutrient-rich wastes in often-sensitive marine environments. Use facilities if they exist, and seek their provision if they do not.

**stories**

s West Coast Charters uses wind-powered yachts for its operation, and saves 000 per annum on fuel. The reduction in noise pollution is attractive to

w Waters Resort in Kakadu in the Northern Territory has replaced all of its e outboard engines with four-stroke alternatives. These are quieter, cheaper to se less fuel and emit less smoke and oil.





REFERENCE SHEET


## Task — To drive equipment to provide a wide range of services

Energy is often discussed as if it were a commodity rather than a means of providing a wide range of services. In section 1, attention was drawn to the importance of first clearly defining the tasks to be done, then identifying the most efficient way of performing those tasks, and finally supplying the minimum energy required with the least environmental impact. Refer to section 3 for details on energy specialists that can help to define your requirements in this area.

**Action** — **Minimise supply needs**

**Issues**

- The key to minimising supply needs is to select energy-efficient equipment and use it efficiently. Details on energy-efficient equipment appear in Reference Sheets 4–6, 8 and 10–15.

**Action** — **Maximise the efficiency of energy supply**

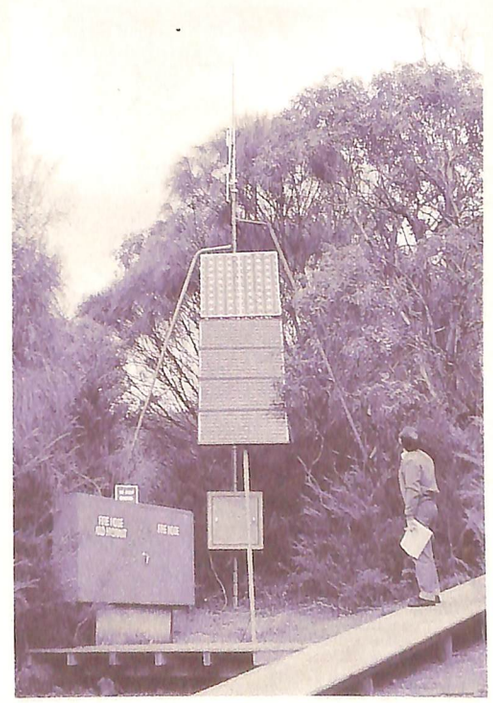
**Issues**

- Producing electricity by burning fuels is less efficient than burning fuels at the place where heat is needed, as in gas cooking and solid fuel heating.
- By using energy sources other than electricity for heating, hot water and cooking, the cost of electricity connection and wiring may be reduced.
- Opportunities for recovering heat should be explored. See Reference Sheet 7.

**Action** — **Investigate non-grid electricity supply options**

**Issues**

- Non-grid energy supply options include renewable energy sources such as photovoltaic cells, wind and micro-hydroelectricity, and non-renewable diesel or petrol generators.



**Modular renewable energy systems like this one at Freycinet Experience in Tasmania, are affordable, non-grid electricity options.**

- The quietness and environmental benefits of renewable energy sources make them preferable to fossil fuel-fired generators.
- Generator capacity should be carefully matched to the electrical load. For small, variable loads, batteries can be charged by a generator which doesn't have to run when loads are very low.
- Modular renewable energy systems are now available which incorporate photovoltaic cells, batteries, an inverter (which converts low voltage DC electricity to 240 volt AC) and, if required, a back-up generator.
- It is widely believed that diesel generators must be heavily loaded to achieve good efficiency and avoid excessive wear. This leads people to use energy wastefully in the belief that conserving energy will not reduce energy costs. Diesel generators do not have to be heavily loaded to achieve good efficiency and avoid excessive wear. In practice, many diesel generators can run efficiently at around 30 per cent load.
- In large facilities with diesel generators, three generators of varying size, including one unit with a capacity to deal efficiently with the minimum steady load, are preferable to fewer, larger units.

**Action Issues**

## Choosing energy options on tour

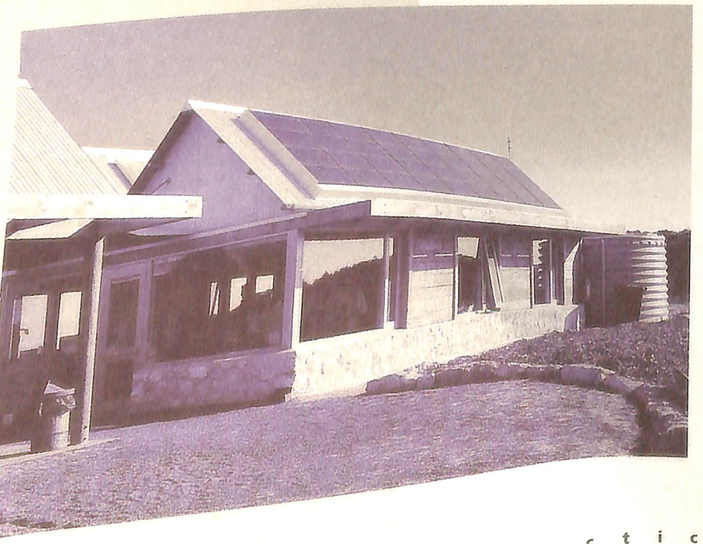
- For lighting, fluorescent lamps powered by rechargeable batteries are most efficient, and mantle-type LPG or kerosene lamps are next best.
- Rechargeable batteries charged by vehicle alternators and/or renewable energy sources such as photovoltaic cells can provide energy for lighting and refrigeration.
- If wood is used for energy, care should be taken to determine that its source is ecologically sustainable. It is desirable to establish a fuelwood lot to satisfy long-term wood requirements.

**Action Issues**

## Choosing dry cell batteries

- For a small number of low-power portable items (such as calculators and radios) non-battery options using built-in solar panels are available.
- Despite using hazardous cadmium, rechargeable NiCad batteries are assessed as being environmentally-preferable to single-use batteries as they can be re-used many hundreds of times. Following action by the Trade Practices Commission, all batteries bearing a recycling symbol can be returned to distributors for recycling. So buy batteries bearing the recycling symbol and contact your distributor for information about how to return them.
- Mercury-free, single-use dry cell batteries (including alkaline cells) can be disposed of, however, for each recyclable NiCad battery, a bucketful of single-use batteries may be used.

**Photovoltaic solar panels provide most of the electricity for Seal Bay Visitor Centre on Kangaroo Island, South Australia.**





- Recharging devices are being marketed with claims they can recharge alkaline batteries up to 10 times and heavy duty batteries up to three times. Tests by several consumer organisations have questioned the accuracy of these claims. Even if they are true, a rechargeable NiCad battery returned to the manufacturer at the end of its life would still appear to be the environmentally-preferred alternative.

### Success stories

Diesel generators provide electricity at Victoria's Wilson's Promontory National Park. Simple changes, including replacing some electric heaters with LPG, and improving the management of lighting, have reduced diesel fuel consumption by 15 per cent and reduced peak electricity demand. Savings of $15 000 per annum have been achieved for an outlay of $5 000, and risks associated with fuel haulage have been lowered.

Odyssey Safaris in the Northern Territory no longer uses generators when on tour. Its portable fridges are run from vehicle alternators, spare batteries and a photovoltaic panel. LPG lights are used to avoid the need for additional electricity.

Forest Walks, in Tasmania, runs its office on solar and water power (micro-hydro), and is not connected to the electricity grid. All the appliances and equipment used are selected for their low energy consumption.

The power station at Queensland's Great Keppel Island Resort has been designed to allow for a wide range of electricity loadings without the need to artificially load the diesel generators, which wastes fuel. Three generators of 515 kVA, 750 kVA and 1150 kVA are installed, which allows efficient supply of demand ranging from 180 kVA up to around 2000 kVA, to cope with varying occupancy levels. A generation efficiency of 33.7 per cent has been achieved. Financial benefits include lower overhaul costs and lower fuel costs (especially during quiet periods).

***'Diesel generators do not have to be heavily loaded to achieve good efficiency and avoid excessive wear. In practice, many diesel generators can run efficiently at around 30 per cent load.'***


## To ensure that buildings are comfortable and functional

ted with the challenge of making buildings comfortable, many people think of tive heating and cooling equipment. But properly-designed buildings require ing and cooling energy, and cheaper, simpler heating and cooling equipment to ards of comfort higher than can be achieved in buildings that are not energy lling insulation in buildings not only provides comfort but also shuts out noise.

### Limit heat flows through ceilings and walls

- Insulation reduces the heat flow through walls and ceilings by up to 90 per cent. Australian Standard 2627 lists recommended cost-effective insulation values for locations throughout Australia. These call for, at a minimum, reflective foil insulation in the walls and foil plus 50 mm blanket in the roof in mild climates, and at least R1.5 batts in walls and R3 bulk insulation in ceilings in colder climates.
- Installation of reflective foil is recommended in sunny areas or climates with cold, clear nights, as it improves comfort and acts as a vapour barrier. Reflective foil requires an airspace next to the shiny surface to act as an insulator. Ensure that foil is not sandwiched between the ceiling lining and the roofing, as this negates its insulating properties.
- In hot humid climates or cold climates, a vapour barrier will minimise the risk of condensation in the insulation and possible damage to the building structure.
- Light-coloured, well-ventilated roofs are cooler than dark ones.
- Shading roofs and walls reduces heat gain. Trees, verandahs and pergolas can also be attractive.

### Limit heat flows through windows

- Heat is lost through single-glazed windows ten times faster than through insulated walls. Double glazing or a tight-fitting curtain almost halves this loss; double glazing with 'low-E' glass cuts heat loss by about 70 per cent.
- Curtains and blinds are most effective when they seal tightly around the window. Fitting a pelmet can double the effectiveness of a curtain.
- In direct sun, a square metre of window allows in as much heat as that emitted by a single bar radiator. It is therefore important to shade windows from direct sun in hot weather. This cuts heat gain by 80 per cent.



Action Issues

Action Issues



- North-facing windows can collect large amounts of solar energy in winter. However, windows that are too large can lead to summer overheating and large heat losses during winter nights.

### Control ventilation and draughts

- Where heating or air conditioning is used, limit air leakage into a building and avoid running exhaust fans for long periods, as excess outside air increases energy consumption for heating and cooling.
- Controllable cross-ventilation, aided by ceiling fans and windows and louvres that seal tightly when closed, can avoid or limit the need for artificial cooling. The climate of an area must be understood before constructing a building so windows can be located to take advantage of breezes.

### Designing for energy efficiency

- The size and shape of a building, and the sizes and zoning of areas within it, influence total energy consumption.
- Using rules of thumb to design for energy efficiency can be misleading. Heat flow calculations and computer analysis should be used to identify major areas of heat gain and loss.
- Building design contracts should provide calculations for energy consumption and estimates of capital and running cost for a range of design options. Intelligent application of energy-efficient design principles can often achieve large ongoing savings at little or no extra capital cost when savings in the cost of heating and cooling equipment are considered.

### Success stories

The main building at Kingfisher Bay Resort, Fraser Island, Queensland, has many energy-efficient design features to achieve year-round comfort, despite Fraser Island's warm climate. These include shading by native trees and roof overhangs; ventilation via louvred walls, large doors and windows located near the ceiling; ceiling fans under high ceilings; and light-coloured roofing.

The accommodation units at Freycinet Lodge in Tasmania are fully insulated. They have moderately sized windows and heavy, lined curtains with pelmets, as well as entrances which act as air-locks to limit cold draughts.

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## To maintain comfortable conditions in buildings when building design strategies cannot achieve them

ny of a tourism operation, the building, the availability of energy, and the nfluence the approach to heating and cooling, including whether heating or e used, and the extent to which they are used. Heating and cooling costs can o half of energy costs, and can have environmental impacts through greenhouse and air pollution. Making buildings energy-efficient (see Reference Sheet 4) not energy consumption, but also reduces required heating and cooling capacity by rds, and allows simpler heating and cooling equipment to provide adequate

### Select energy-efficient heating and cooling equipment

- Timer controls and thermostats are important components of heating and cooling equipment. Each zone of a building should be controlled separately.
- When a building has a number of spaces used at different times which are to be heated and/or cooled, use separate equipment in each area or ensure that a single heating/cooling system can be zoned and that distribution losses (including heat gains/losses through ducting and pipes, etc) are low under the full range of likely operating conditions.
- The most efficient equipment possible should be used to minimise ongoing operating costs and energy use. Energy labels rate the energy efficiency of domestic gas heaters and electric reverse-cycle air conditioners, while modern wood heaters are tested for efficiency to Australian Standard 4012.
- For cooling in dry climates, evaporative cooling is far more energy efficient than refrigerative cooling, unless the building being cooled is designed and constructed to be very energy efficient. Running a ceiling fan when air conditioning is operating will save energy, as the fan provides comfort at a higher thermostat setting.
- Open fires are generally very inefficient. Use a properly designed wood heater where possible. Open fireplaces of improved design, which have insulated backs, double skins and dampers, are less inefficient than standard open fires. Providing an outside air inlet near a fireplace allows a fire to draw air from the inlet, rather than creating draughts as it draws cold air from a room.
- Where electric heating is required, electric reverse cycle air conditioners (heat pumps) are around three times as efficient as electric fan heaters.





**Action** **Select an environmentally-preferable fuel**

**Issues**

- Solar powered or passive solar is the most environmentally preferred source followed by wood (from sustainable sources and used in an efficient, low-emission wood heater). High efficiency gas/LPG or electric heat pumps come third.

**Action** **Operate heating and cooling for efficiency**

**Issues**

- When an area is unoccupied, heating and cooling should be switched off (or, in extreme climates, set to a minimum level). The use of key tag switches in accommodation units ensures that heating and cooling are used only when the unit is occupied.
- Filters (if fitted) can restrict airflow and reduce efficiency if they are not cleaned regularly.

### Success stories

Coconut Beach Resort in Queensland's Daintree region does not have air conditioning in its luxury accommodation units. Instead, the units have been designed to use natural cross-ventilation and shading from surrounding trees to provide comfort in a style consistent with the area's natural character. The lack of air conditioner noise and the closeness to nature of the open architecture is appreciated by clients. The capital and running costs of air conditioning have also been avoided. The operators ensure that inbound tour operators do not organise for visitors to go from a northern hemisphere winter to a tropical wet season without some time to acclimatise.

The Northern Territory's Yellow Waters Resort has reduced the extent to which unoccupied units are air conditioned. This measure prevents mould growth in the hot humid climate and reduced diesel generator fuel consumption and cost dramatically.


## To provide hot water for bathing, dishwashing, clothes/linen washing, and for some recreational activities

t water generates around one-fifth of total greenhouse gas emissions from the r and can generate half of the greenhouse gas emissions from accommodation

### Install water-efficient showerheads

- See Reference Sheet 13, Handwashing, Showering and Bathing.

### Install low-flow taps with aerators

- See Reference Sheet 13, Handwashing, Showering and Bathing.

### Encourage conservation of hot water

- Hints for clients and staff on conserving hot water can be provided, such as:
  - fill electric jug from cold tap; and
  - don't rinse dishes under running hot water.

### Prevent hot water leaks and drips

- Enormous amounts of hot water can be wasted owing to leaky tap washers. Check for drips regularly.
- Pressure-temperature relief valves on hot water services can dump many litres of hot water per day. A way to check for leaks is to connect a hose to the hot water pipe from the pressure-temperature valve and put it in a 4litre container. If the container overflows in a day it indicates that a lot of hot water has been used or the valve should be replaced.

### Selecting a hot water service

- Heating of water with solar energy (and gas/LPG boosting rather than electricity) is preferred on environmental grounds, followed by heating with wood (from sustainable sources), with gas/LPG (with higher energy rating preferred), then with fossil fuel-generated electricity. If roofs are shaded, electric heat pump hot water units could be a solution.
- If finances are tight, install solar hot water for communal facilities and most-used accommodation.



**Action Issues**

- Where a large refrigeration or air conditioning plant is installed, it may be possible to use waste heat from those systems to provide hot water for nearby buildings.
- Instantaneous gas/LPG hot water units do not have pilot lights, so they use gas only when supplying hot water. They save $30 to $90 per annum compared with standard natural gas units, and much more if LPG is used. Some instantaneous hot water units require quite large gas supply pipes, which can be expensive to install over long distances.

### Limit losses from hot water services and fittings

- Losses of heat from storage tanks and pipes can be equivalent to the energy in the hot water delivered. For example, daily losses from electric hot water units are from 2 to 5 kWh, equal to the energy used to heat 40 to 100 litres of water. For gas storage units, daily losses are equivalent to supplying 80 to 120 litres of hot water. Extra insulation (for example, foil-backed fibreglass blanket) can be installed around tanks and pipes, although this is difficult with externally-mounted units and many gas units unless a weatherproof shelter is built around them.
- Losses from electric hot water tanks and gas pilot lights can cost $1.20 to $7 a week per unit. Tanks and pilot lights in accommodation which is not likely to be used for more than a week should be switched off.
- Where hot water pipes are exposed to the environment they should be insulated, especially in cold climates. The green plastic insulation commonly used is inadequate; insulation should be at least 10 mm thick.
- If hot water service thermostats are set higher than necessary, tanks lose more heat. Check the temperature of hot water by holding a thermometer under running hot water. If it's hotter than 55–60°C, consider lowering the thermostat setting. A lower thermostat setting not only reduces the risk of scalding, but also increases the chance of running out of hot water, so a balance must be sought. Not all electric hot water units have adjustable thermostats. Some require an electrician to make adjustments because the thermostat control is close to electrical components.

***'Losses from electric hot water tanks and gas pilot lights can cost $1.20 to $7 a week per unit'***

#### Success story

The Jemby-Rinjah Lodge, in New South Wales' Blue Mountains, uses LPG instantaneous water heaters to minimise electricity use. In new accommodation, high efficiency Rinnai instantaneous units with electronic ignitions are used, and wasteful pilot lights (and the annoyance of re-lighting them when they blow out) are avoided.

NCE SHEET

overing
eat

## To use heat that would otherwise be wasted

ses generate heat as an unavoidable by-product. Up to three-quarters of energy n end up as waste heat, unless methods of using it are determined.

### Identify possible heat sources

- Significant sources of waste heat include diesel generators, refrigeration and air conditioning plant, and laundry facilities.

### Identify possible uses for recovered heat

- Possible uses for recovered heat include water heating, heating of buildings and greenhouses, clothes drying, and air conditioning.
- Start by looking for uses of heat close to its source.
- Even where heat requirements are greater than the amount of heat that can be recovered, waste heat can do part of the job.

### Having identified possible uses for recovered heat, seek advice

- The energy advisory centre (see section 3) is a good place to start when seeking advice on using recovered heat.

**story**

resorts, Queensland's Green Island generates its own electricity. Unlike most waste heat from the generator engines is put to good use. Cooling water from s (which is at 70–80°C) is circulated through a heat exchanger which heats n the swimming pool. This system of recovering waste heat has reduced the heating fuel required to be transported to the resort.



REFERENCE SHEET

# Lighting

**Task**

## To provide lighting where natural light is inadequate, to increase the visibility of signs or displays, and to enhance safety and security

Lighting generates around one-quarter of the greenhouse gas emissions from the services sector, and involves high costs for operators.

**Action**

### Switch off lights manually when they are not required

**Issues**

- Providing staff with training and clients with information can encourage them to switch off lights and can explain why controls operate the way they do.
- If staff visit rooms immediately after the rooms have been vacated, they can switch off unnecessary lights and equipment.
- Many people believe that it is more energy efficient to leave fluorescent lights on when they are not needed. This is not the case. While switching fluorescent lights on and off more frequently reduces their life slightly, it is cheaper and environmentally preferable to switch fluorescent lights off when they are not required.

**Action**

### Use key-tag switches and automatic controls to switch off lights when they are not required

**Issues**

- Key-tag switches ensure lights are not left on in unoccupied units, as all equipment linked to the key-tag switch is turned off when the key tag is removed (which happens whenever the occupant leaves the room). Using key tags for appliances such as air conditioners, as well as lighting, improves potential benefits.
- Automatic controls (timers, movement and light sensors) can switch or dim lights. Care needs to be taken in setting up automatic controls, and performance must be monitored (for example moving branches can keep lights on).

**Action**

### Make use of natural light

**Issues**

- Compact light-tubes with reflective lining (for example Skytube or Solatube) provide much more daylight than conventional skylights of the same size, so they cause fewer heating and cooling problems.

- Large areas of glass for daylighting can cause glare and discomfort, as well as increase heating/cooling costs. Good design is essential. One square metre of roof glazing can allow up to a kilowatt of summer heat to enter—as much heat as a single bar radiator produces. Reflective glazing will only reduce this to 200 watts per square metre, which is 20 times the heat that would enter through the same area of an insulated ceiling. Small areas of roof glazing can provide a lot of light. For example, one square metre of clear roof glazing in direct sun provides light equivalent to that supplied by about 30 fluorescent tubes.
- Roof glazing is not an effective way of collecting solar energy during winter, as the sun is low in the sky. North facing windows work much better in winter and are easily shaded in summer.
- Ventilated skylights can waste energy and cause uncomfortable draughts. Install acrylic plastic sheet near ceiling level to stop air leakage and improve insulation.

### Make the most of the available light

- Dark, textured walls can absorb up to 90 per cent of light, while light-coloured walls reflect up to 90 per cent of light.
- Overhanging trees and verandahs can block out a lot of natural light. Where it is aesthetically and environmentally appealing, trim back vegetation (good for fire prevention, too) and use adjustable shading instead of wide verandahs. Where verandahs are used, paint surfaces light colours to reflect more light, and insert small transparent sections in the roofing to allow light to enter.

### Reduce excessive lighting levels

- A light meter can be used to check that light levels comply with Australian Standards. A list of requirements is included in AS 1680.1. These requirements are often exceeded at considerable cost and no benefit.
- Removing a proportion of fluorescent tubes or light globes, or replacing them with lower wattage ones lowers light levels.

### Select energy-efficient lighting

- The most basic feature of an energy-efficient lighting system is conveniently-located and labelled switches.
- Desk lights, along with lower background lighting, can provide plenty of light where it is needed, while saving energy.
- Fluorescent lights are the most efficient practical option for most applications apart from some outdoor uses such as street lighting, for which specialist advice should be sought because of the design issues involved. Fluorescent lights are at least three times as efficient as low voltage lights and five times as efficient as incandescent lights.
- A wide variety of fluorescent tubes is available, including tubes that provide light that is warmer in colour than that provided by the widely used stark white tubes. Triphosphor fluorescent tubes provide more light per watt and better colour.
- Low voltage lighting is not low energy lighting. If used, it should be restricted to critical display applications. Lower wattage globes (for example 20 or 35 watt) are preferable to the more widely used 50 watt low voltage globes.

**Action**

**Issues**

- Efficient reflectors may increase light output by up to 30 per cent. Opal coverings may reduce it by 25 per cent, and dark tinted covers can reduce it much more.
- For portable lighting, battery-powered fluorescent lamps are much more efficient than conventional torches. Recently, quartz globes have become available as alternatives to traditional globes. These provide more light for the same power consumption, but are still much less efficient than fluorescent alternatives.

### Maintain lighting equipment

- Dirty light covers can reduce light output by up to 50 per cent.
- Old fluorescent tubes which have run for more than 10 000 hours may produce 30 per cent less light than new tubes. Replacing all lamps at one time on a regular basis makes sense. It can also facilitate recovery of the small amounts of mercury in fluorescent tubes by creating a large supply of old tubes at one time (see below).

**Action**

**Issues**

### Dispose of old lamps and ballasts in an appropriate way

- Fluorescent and other types of discharge lamps contain small amounts of hazardous chemicals such as mercury or sodium, which should be recovered. Their glass and metal content can also be recovered for recycling. Specially designed lamp crushers such as the Australian-made SELDCo unit, are available for this purpose. Call your local council or State environment authority to find out where the nearest SELDCo unit is located.

***'Dirty light covers can reduce light output by up to 50 per cent.'***

### Success stories

The Jemby-Rinjah Lodge, at Blackheath in New South Wales' Blue Mountains, uses compact fluorescent lights in its accommodation units and its central building. Many of the lights are installed in attractive fittings that are locally-made by Eco-Deco from recycled materials. These lights reduce energy consumption by lighting and the contribution of lighting to peak electricity demand by up to 80 per cent. This approach not only cuts energy bills but also helps maintain total electricity demand within the limits of the electricity supply, thus avoiding the capital cost of a new transformer.

Freycinet Lodge in Tasmania uses key-tag switches to control appliances and lights in accommodation units, and light sensors and timer controls to switch outdoor lighting on and off. Porch lights and path lights, which are on for long periods, use compact fluorescent lamps.

Cradle Mountain National Park's Visitor Centre in Tasmania uses compact fluorescent lighting in most areas. Quartz-halogen lights are used to illuminate displays and, after a recent energy audit, globe wattages have been halved.

Karri Valley Resort in south-west Western Australia has just installed compact fluorescent lamps in half of the light fittings in its chalets, and in the reception area. Timer controls are used extensively throughout the resort to switch lights off and on at appropriate times.

REFERENCE SHEET

# Toilets

## Task

## To dispose of human wastes in a way that does not adversely affect human health or the environment

Toilets must dispose of human waste safely and hygienically. Sensitive ecosystems can be adversely affected by the nutrients in human wastes, and the environment may also be affected by large quantities of contaminated water that are consumed and released by toilets. Reducing the amount of water used by toilets also reduces the amount of energy used and the costs involved in water pumping and treatment.

## Action

## Select an appropriate toilet system

## Issues

- The range of options for disposing of human waste includes:
  - water-based toilets (with various sewage treatment systems);
  - dry toilets, including composting and pit toilets; and
  - no toilets (free disposal).
- Public toilets are usually available in heavily used areas. If these are not up to environmental or aesthetic standards, the council or authority which maintains them should be notified.
- Free disposal of human waste may be appropriate in areas that are not heavily travelled.
- Low volume dual flush toilets (3 litre/6 litre) should be used in accommodation with access to sewers. Ultra-low flush toilets which use less than 2 litres per flush, are also available.
- A variety of on-site treatment systems exist for flush toilets (see below).
- Dry toilets, including pits and composting toilets (see below) are viable options where water supplies are limited and on-site treatment is desirable.
- Chemical toilets are another option and are sometimes used on tours.

## Action

## Managing free disposal

## Issues

- Free disposal is a viable option only in little-used areas, as the nutrients released can affect local ecosystems. It is important to deal responsibly with human faecal waste to avoid exposure to gastroenteritis and Giardia.
- Disposal of human waste should occur at least 100 metres away from any water source.
- Waste should be buried 15cm deep, in some areas where this is not possible covering with rocks is more practical.
- Toilet paper should be buried with the waste or if not possible it should be removed from a site in sealable plastic bags.





## Action

## Managing sewer-connected systems

## Issues

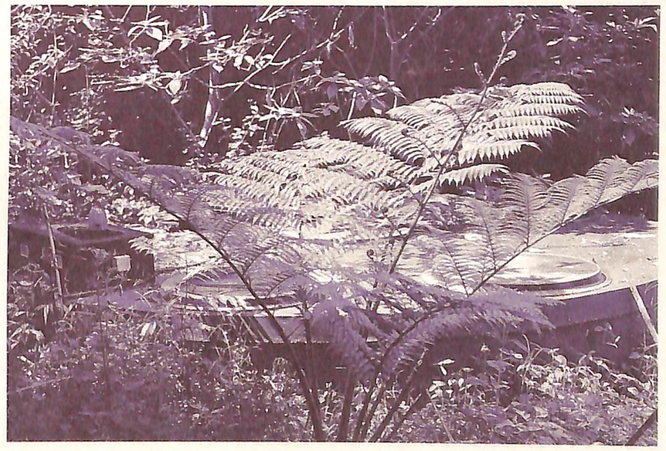
- If your establishment uses a community sewage system, find out how the sewage is processed and the standards to which it is treated, so that you may be able to demonstrate to your clients that the system is environmentally responsible.
- Roof run-off and grey water (usually from bathrooms) can be collected and used for toilet flushing. However, grey water should be filtered and disinfected before being used again to minimise health risk.
- Minimise use of chemical cleaners and deodorants in toilet water, and check that those used break down quickly and do not harm the sewage treatment process.
- Low volume (3/6 litre) cisterns are not designed for connection to standard toilet pans. They require a specially-designed low volume trap.

## Action

## Managing on-site water-based systems

## Issues

- Minimise water consumption by selecting low volume dual flush toilets.
- The most common on-site, water based system for small facilities comprises a septic tank and a soakage area for effluent, where micro-organisms in the soil complete waste treatment. Where soils are heavy or the water table is close to the surface, evaporation trenches or mounds, or evaporation ponds, may be required. Wetlands, reed beds, woodlots or gardens can be irrigated with sewage effluent. Sludge must be pumped out at intervals.
- Aerobic treatment systems are now available for small-to-large scale facilities. Air pumps speed bacterial breakdown. Final effluent may be treated by ultraviolet light, micro-filtration, and/or chemicals. Each of these methods require regular maintenance and monitoring by trained staff. While these systems can achieve high standards, their complexity and cost mean there could be value in sharing facilities with neighbours.



**Aerobic sewage treatment systems are now available for small to large scale facilities. Siting of these facilities is also an important consideration.**

- Anaerobic treatment systems, which produce biogas (a potential fuel) and sludge (which can be used as a fertiliser substitute), are used in some large treatment plants and intensive farms. These are not widely used in Australia.

## Action

## Managing dry toilets

## Issues

- Fans are used in commercial composting toilets to draw air through the composting chamber to evaporate liquids, provide air for the biological breakdown of wastes and remove odours. In sunny climates, a black-painted vent pipe may replace a fan.

- Some composting systems use worms to speed up decomposition. The moisture content must be kept down so the worms don't drown.
- Pit toilets should not be located near water sources or in depressions or runoff areas.
- Compostable kitchen scraps can be added to dry toilets.
- Moisture levels must be monitored as biological activity will stop in toilets that are both too wet or too dry.
- In cold weather, biological activity slows. Locating the toilet in a sunny spot out of prevailing winds can help maintain biological activity, as can insulation of the composting compartment. Drawing the air supply from a heated room, instead of from outdoors, can maintain biological activity.

**Action** **Managing toilets on tour**

**Issues**

- Some tour operators use chemical toilets, which use a chemical brew to flush and treat wastes. These toilets must be emptied into a mains sewer. Another type of chemical toilet is the honey-loo, which uses glutaraldehyde, a sugary substance, instead of normal chemicals.

**Action** **Managing client response**

**Issues**

- Some ecotourism operators feature their composting toilets in their promotion materials.
- It is important that composting toilets are well maintained and odours are controlled to ensure visitor confidence in these systems as well as their effective operation.

### Success stories

The Fitzroy Falls Visitor Centre in New South Wales has a large experimental composting toilet facility, which copes with 8 000 to 16 000 visitors per week, and uses both conventional composting toilets and worm-boosted ones.

The Jemby-Rinjah Lodge in New South Wales' Blue Mountains uses composting toilets in its holiday cottages, and the operator has found they work well. Air from inside a cottage is supplied to the composting container. As the air flows from the heated living area, it warms up the toilet/bathroom and ensures that biological activity continues in winter. Financial savings have balanced the capital costs, while the systems ensure there is no impact on the adjacent national park.

Rangers at Cradle Mountain National Park in Tasmania have worked with experts at the University of Tasmania's Centre for Environmental Studies to develop a practical dry toilet for use in cold, wet climates. The toilet is designed so that solids are suspended in a wire mesh container in a closed compartment while liquids are evaporated off by air moved by a solar-powered fan. Biological breakdown reduces the volume of solids. The remaining solids are removed during maintenance visits.

Cradle Mountain Lodge has installed a tertiary treatment plant for sewage, which is monitored daily to ensure that effluent does not impact upon the adjacent national park. The nearby Visitor Centre shares this facility.

A ventilated improved pit toilet has been developed by the Centre for Appropriate Technology in Alice Springs. Its spiral entrance path darkens the toilet's interior, making it less attractive to flies and more private, while the ferro-cement roof helps keep it cooler. A black-painted vent pipe uses solar heat to increase airflow and reduce odours.





REFERENCE SHEET


## Task To prepare food

Cooking food and keeping it hot can be a very energy-intensive process. For example, running a bain-marie uses as much electricity as about 50 fluorescent lights.

**Action** **Select environmentally-preferable fuels**

**Issues**

- Conventional electric cooking, using electricity generated from fossil fuels, usually has a greater environmental impact than cooking with gas/LPG, but microwave and other new electric technologies (such as induction cooking) are more efficient than conventional electric hotplates and, in some cases, gas.
- Extra electrical wiring required to handle electric cooking loads can be expensive. Total system costs, including tariff penalties for high electricity demand associated with cooking, should be considered.
- Using wood for open fires in many sensitive areas should be avoided. Fireplaces can be visually unattractive, ash can contaminate the environment, visitors may cause damage to valuable habitat while scavenging for wood and replenishing wood supplies consumes transport fuel. It is preferable to use fuel stoves which use LPG, and petroleum based fuels. Alternative efficient cooking stoves (like those designed for developing countries, which are simple but fairly efficient) may be appropriate and use reduced quantities of wood.
- Be aware of fire restrictions, do not use fuel stoves or fires on days of total fire ban, do not light fires during hot windy weather and be aware of local restrictions which may prohibit the lighting of fires in sensitive environments and require the use of fuel stoves only (such as alpine areas).

**Action** **Select efficient cooking equipment**

**Issues**

- In commercial kitchens, a large proportion of cooking energy may be wasted as equipment is held on stand-by in case it is needed. Equipment that can reach operational condition quickly and be turned off when it is not needed should be selected.
- Keeping food warm consumes a lot of energy; running a bain-marie can cost 50 cents an hour. Minimise the time food is kept hot. Where food must be kept hot, keep it in insulated, closed containers rather than open stainless steel trays.

**Action** **Use cooking equipment efficiently**

**Issues**

- It takes less energy to reheat equipment than to leave it on in case it is needed. Switch equipment off when it is not needed.

- Allowing large exhaust fans to operate unnecessarily consumes excessive electricity, and can remove heated or cooled air from a building unless a separate air supply is provided.
- Good cooking practices include using lids on pots, using efficient cooking appliances (such as pressure cookers and microwave ovens) in preference to less efficient options such as conventional ovens, and using the lowest suitable cooking settings. It takes seven times as much energy to turn water into steam as it does to heat water to its boiling point from room temperature.

**Action** **Use other kitchen equipment efficiently**

**Issues**

- Urns, coffee percolators and toasters use large amounts of electricity if they operate for long periods. When purchasing these appliances select well-insulated, efficient equipment that can reach operating temperature quickly and is easily operated. As no standard tests exist for the energy efficiency of these appliances, check the thickness of insulation. Ensure thermostats are fitted where appropriate, ask for energy-efficiency data and, if necessary, test-run equipment to see how quickly it heats up.
- Heat losses from boiling water units can cost from $60 (for small units) to $250 (for large units) annually. Install the smallest suitable unit—5 litres is usually adequate—and switch it off when it is not needed. A small boiling water unit has much lower heat losses (and operating costs) than an urn. Fitting a timer switch to turn off a boiling water unit overnight saves $25 to $100 of electricity per year, depending on the size of the unit.

***'Fitting a timer switch to turn off a boiling water unit overnight saves $25 to $100 of electricity per year, depending on the size of the unit.'***

**Action** **Plan meals to minimise cooking energy requirements**

**Issues**

- Offering salads and quick-to-prepare meals can minimise cooking energy requirements.
- Carefully selecting items on a menu can limit the variety of cooking equipment used for a given meal.
- Bulk preparation and storage, and efficient reheating equipment, can minimise wastage of food and energy.

### Success stories

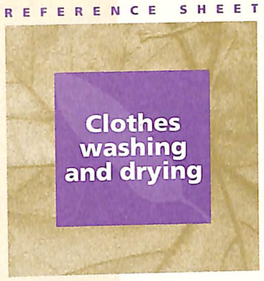
Forestry Tasmania has replaced wood-fired barbeques with LPG units. This reduces the problems associated with wood, including theft and damage to vegetation. It also reduces transport fuel use, as sites need to be checked less often.

The Jemby Rinjah Lodge in New South Wales' Blue Mountains uses gas cooking as part of its overall strategy to minimise the cost of on-site electricity supply infrastructure (additional wiring and a transformer), to reduce environmental impacts of energy use by moving away from coal-based electricity, and to make a progressive shift to renewable energy.





REFERENCE SHEET




## Task To wash and dry clothes, linen and towels

Washing and drying clothes may consume large amounts of energy. One load of washing may use up to 200 litres of water (of which a third may be heated), and up to a kilowatt-hour of electricity (costing 12 to 20 cents) may be used to dry each kilogram of washing.

### Washing

**Action** **Minimise hot water usage for clothes and linen washing**

**Issues**

- Try to reduce the number of washing loads to be done. Encourage clients to use towels and linen for more than one day. Use signs to explain procedures and how they help the environment by reducing energy, water and detergent use.
- A partially-filled washing machine wastes energy and water. Fully load washing machines according to manufacturers' instructions.
- Cold water washing is most energy-efficient. Use the lowest washing temperature that cleans satisfactorily.
- Front-loading washing machines, which use much less water and detergent, and are gentler on clothes, are preferable to top-loading machines.
- The phosphorus compounds in many detergents contribute to environmental problems such as algal blooms. Many detergents now carry 'NP' (No Phosphorus) and 'P' (reduced Phosphorus) labels. Given that N is the chemical symbol for nitrogen and P stands for phosphorus, these may cause confusion among some consumers.

***'One load of washing may use up to 200 litres of water (a third of which may be heated).'***

### Drying

**Action** **Remove as much water as possible**

**Issues**

- Some modern washing machines have high spin speeds which extract far more water than other slower models. When next buying a washing machine look for one with a spin speed of 1000 rpm or more. This high water extraction rate makes open-air drying quicker and reduces the energy consumption of clothes dryers by up to half.

**Action** **Use clothes lines**

**Issues**

- Clothes lines use good old-fashioned solar/wind technology.
- In rainy climates, clothes lines can be under cover, but wind movement should not be cut off as it is important for drying.

- Even if clothes are not fully-dried on a clothes line and are placed in a clothes dryer to complete the task, energy consumption by the dryer will be reduced.

**Action** **Use waste heat or solar heating for dryers/drying rooms**

**Issues**

- See Reference Sheet 7.

**Action** **Consider natural gas/LPG dryers**

**Issues**

- Natural gas/LPG dryers are commonly available in sizes that suit various commercial requirements, but domestic units are also available.

**Success story**

The Centre for Appropriate Technology in Alice Springs has developed a washing machine which uses only one bucket of water and is manually operated to achieve the washing action. This is very useful for arid environments and no electricity is needed.





REFERENCE SHEET


## Task To clean dishes, pots and pans, and kitchen utensils

Dishwashing consumes water, energy (in the form of hot water) and chemicals (in the form of detergent) and generates water which requires treatment.

### In accommodation

**Action** **Minimise hot water usage for dishwashing**

**Issues**

- Scrape excess food off dishes rather than rinsing it off with water. If rinsing dishes as well, put the plug in the sink. Rinsing dishes under running hot water can waste several litres of water per minute.
- Inefficient stacking of dishwashers is very common. Fully load dishwashers and pack efficiently to use their capacity effectively.

**Action** **Select an energy and water-efficient dishwasher**

**Issues**

- Different dishwashers and wash programs use very different amounts of water and energy. Choose the most water-efficient dishwasher and use a water-efficient cycle. For domestic models, refer to energy labels or *Choice* magazine. For commercial models, ask the manufacturer about energy and water consumption.
- Washing up in a domestic sink uses around 15 litres of water. Larger commercial sinks may require 40 litres per fill. In comparison, water-efficient domestic dishwashers use as little as 15 litres on economy cycles (generally to wash more dishes than can be washed in a sink).

***'Washing up in a domestic sink uses around 15 litres of water. Larger commercial sinks may require 40 litres per fill.'***

**Action** **Select low-environmental impact detergents**

**Issues**

- The phosphorus compounds in many dishwashing detergents may contribute to environmental problems such as algal blooms. Many detergents now carry 'NP' (No Phosphorus) and 'P' (reduced Phosphorus) labels. Given that N is the chemical symbol for nitrogen and P stands for phosphorus, these may cause confusion among some consumers.
- Reputable manufacturers of detergents for commercial use now provide detailed Material Safety Data Sheets on request. Always ask for these and compare them.
- As some cleaning products are not compatible with some waste treatment systems, it is wise to check.

## On tour

**Action** **Wash dishes instead of using disposable paper and plastic dishes**

**Issues**

- On principle, ecotourism should not involve undue use of disposable items, no matter how well the waste is managed.
- Cups can be colour-coded and assigned to specific individuals for a day, instead of being washed repeatedly.
- Dishes can be scraped clean and stored in sealed bags until the end of the day, when all the washing up can be done at one time. This saves time and water.
- Do not use detergents or soaps if dishwashing waste water will be discharged directly into the environment.
- Wash all dishes at least 50 metres away from lakes and streams, scatter the wastewater so that it filters through the soil before returning to the stream.

### Success story

Odyssey Safaris in the Northern Territory uses colour-coded cups assigned to individual clients for drinking. They are washed by staff at the end of each day. Unbreakable plastic plates and dishes and stainless steel cutlery are also used. This approach saves storage space, money and time, and creates a positive environmental image.





REFERENCE SHEET

# Hand-washing, showering and bathing

**Task** **To achieve personal hygiene while minimising environmental impact from water supply (including water heating), soaps and shampoos and dryers**

These activities may consume more than half of the hot water used in a tourism operation.

## Water use

**Action** **Install water-efficient showerheads**

**Issues**

- Water-efficient showerheads vary greatly in cost and the quality of shower delivered (some of the cheaper ones are among the best while the more expensive ones are not as good). When shopping for shower heads, try some first and buy the cheapest that works well. To gain an AAA water efficiency rating showerheads only have to meet a standard of 9 litres per minute. Some currently on the market achieve 6 litres per minute but most people do not like using them. Models that combine showering quality with a flow rate of 6 litres per minute are being developed.
- User satisfaction with water-efficient showers is much lower if there is excessive air movement in a bathroom (from an exhaust fan or draughts), as the moving air evaporatively cools the person's body. Install an exhaust fan away from the shower, and do not wire the exhaust fan into the bathroom light switch.
- To keep existing showerheads but save water, insert a flow control disc/washer. These cost $2 to $5 and are available in 12, 9 and 6 litres per minute versions. Standard showerheads have flow rates of 18 to 24 litres per minute.

*'To keep existing showerheads but save water, insert a flow control disc/washer.'*

**Action** **Fit tap aerators and flow controls**

**Issues**

- Aerators reduce water flow and improve wetting. They are an integral part of many modern tap fittings or can be retrofitted to older taps.
- Tap flow controls vary from simple washer-like devices to systems which balance water flow and pressures throughout a building.
- Where low-flow taps are installed, 10 mm pipes may often be used instead of 15 mm pipes, reducing cost and heat losses in pipes, and halving the amount of water that must be drawn off before hot water reaches the tap.

**Action** **Avoid mixer taps**

**Issues**

- Most people use mixer taps with the mixer arm straight-ahead when they want only cold water. In this position, the tap delivers 50 per cent cold water and 50 per cent hot water, thus wasting hot water.

**Action** **Select baths carefully, to limit water requirements**

**Issues**

- Standard baths hold 125 litres, while large spa baths hold 500 litres. Select an appropriate size.

**Action** **Prevent leaks**

**Issues**

- To prevent leaks select long-lasting tap washers and regularly inspect taps for leaks. Taking meter readings when little activity is occurring helps identify water loss.

**Action** **Ensure taps are not left running**

**Issues**

- Spring-loaded taps can be used in public/communal facilities but would probably be seen as a bit draconian in private facilities unless there were severe water shortages.

## Soaps and shampoos

**Action** **Use liquid dispensers**

**Issues**

- Many operators have expressed concern about the excessive use of packaging materials involved in providing small serves of soap and shampoo. However, concern has also been expressed that clients would respond adversely to wall-mounted dispensers. If installing bulk dispensers, accompany them with explanatory material and still provide individual serves of soap and shampoo to clients who request them.

**Action** **Minimise use while camping**

**Issues**

- In cases where washing waters are discharged straight into the environment, soaps and shampoos should not be used. If this is considered too stringent, do not use soaps anywhere near bodies of water.
- Wash 50 metres away from streams and lakes and scatter the wastewater so it filters through the soil before returning to the stream.

## Drying

**Action** **Encourage the reuse of cloth towel before washing**

**Issues**

- Many facilities are now successfully encouraging clients to use towels several times before putting them out for washing. The key to their success is providing information to clients and asking the clients to decide when towel-washing is desired.

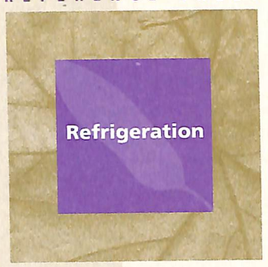


**Action** **Choosing between paper towels, electric hand dryers, and continuous roll cloth towels**

**Issues**

- Many operators are seeking the definitive answer as to whether paper towels, electric blowers or continuous roll cloth towels are the best environmental option for drying hands in communal toilets. There is no simple answer. Recycled paper towels are preferable to non-recycled ones. Electric hand dryers with movement sensors are preferable to those with a push button timer. Continuous roll cloth towels without ready access to low impact laundering either on-site or within a short distance may not be a good environmental option unless usage rates are very high. Choosing between these alternatives will depend on operational efficiency and client preferences.

REFERENCE SHEET




## Task To preserve food and beverages, and to chill drinks

Refrigerators play an important role in preserving food. Their energy use can generate up to 10 per cent of greenhouse gas emissions from accommodation units and 5 per cent of total emissions from a tourism operation.

### Refrigeration in accommodation

**Action** **Switch off equipment when it is not needed**

**Issues**

- Refrigerators in vacant rooms do not have to run if no perishable items are left in them and should therefore be switched off.
- Refrigerators with non-perishable drinks in them can be switched off overnight, achieving savings of up to 30 per cent. Time switches could be used to do this automatically.
- In quiet periods, refrigerated goods can be consolidated into a smaller number of refrigerators, so some refrigerators can be switched off.

**Action** **Switch off lights**

**Issues**

*'Lighting for a drink vending machine can cost up to $120 a year to run.'*

- Continuously operating internal lights in glass-fronted refrigerators and coldrooms use power directly and adds to the cooling load, making the compressor work harder. A 40-watt fluorescent tube and its ballast create a total load of around 80 watts. Unless the lights are really needed, they should be disconnected or switched off.
- Lighting up display signage on a drink vending machine can cost up to $120 a year to run, and generates a tonne of greenhouse gas. Unless the lights are really needed, they should be shut off.

**Action** **Manage refrigeration equipment and supplies**

**Issues**

- Running refrigeration equipment too cold by 1 degree can increase running cost by 5 per cent. Maintain correct internal temperatures of all refrigerators.
- Regularly check to ensure that doors shut properly and clean door seals to reduce running costs and slow build-up of frost.
- Put delivered cold goods into refrigerators immediately to ensure they do not warm up.
- Non-perishable goods such as soft drinks do not need to be stored in refrigerators until a few hours before they are served but should be kept in a cool place to minimise energy required to chill them.





**Action** **Ensure refrigerator operation is not impaired by installation**

**Issues**

- Good ventilation around coils on the backs of refrigerators is essential. Installing a bar-fridge in a timber cabinet without ventilation–common practice in motels–can increase running cost by 50 per cent and overwork the unit, so it cannot produce ice. Inlet and outlet ventilation slots, each at least 50 square centimetres, should be cut in the cabinet to allow substantial airflow. If noise is a problem, the refrigerator should be mounted on a rubber mat and the timber cabinet lined with sound-absorbing material.
- Refrigeration units should not be placed in direct sun. The running costs for a glass-doored refrigerator can be doubled and the fridge's contents warmed if the fridge is in direct sun.
- Refrigerators should not be located near hot equipment or in hot rooms. A 5°C increase in room temperature can increase running costs for refrigerators by 30 per cent.

**Action** **Select suitable size and type of refrigeration equipment**

**Issues**

- Larger refrigeration units usually use more energy although many cheap bar fridges can consume large amounts of energy.
- Many commercial refrigeration units are much less efficient than domestic models of comparable capacity and cost more to buy. Evaluate whether a domestic unit will do the job.
- Where it is important to minimise electricity use, such as, in instances when an establishment is not connected to the electricity grid, gas/LPG refrigerators can be used. Although more expensive to operate, gas refrigerators are silent.

*'Installing a bar-fridge in a timber cabinet without ventilation can increase running costs by 50 per cent as well as overwork the unit.'*

**Action** **Use energy consumption data**

**Issues**

- The energy consumption numbers on energy labels of domestic refrigeration units are more useful than star ratings, as they give actual energy consumption. An annual saving of 200 kWh gives a lifetime (10-year) saving of around $300 and prevents the emission of two tonnes of greenhouse gas.
- Ask potential suppliers of commercial equipment for data on running costs (in writing) so comparisons can be made. If they cannot provide such information, request them to measure energy consumption before you will consider buying, or advise the supplier in writing that you will return the appliance if its running cost is too high.

**Action** **Avoid energy-guzzling equipment**

**Issues**

- Running a drink vending machine can cost $300 or more annually and generate more than two tonnes of greenhouse gas. Running a glass-fronted fridge may cost $200 to $600 annually. Minimise the number of refrigerators used.
- Avoid using open refrigerated cabinets, as they are very inefficient. Where they are required, fit them with insulating blinds that can be pulled down overnight, or plastic strips that trap cold air but allow access to the produce in the cabinet.

**Action** **Use waste heat from refrigeration equipment**

**Issues**

- Use the waste heat generated by large refrigeration systems to heat water, provide space heating or dry clothes/linen (see Reference Sheet 7, 'Recovering Heat').

## Refrigeration on tour

**Action** **Use non-perishable food**

**Issues**

- While on tour, use nonperishable foods which do not require refrigeration. Options include dried, tinned, vacuum-sealed, UHT-treated and long shelf-life foods. Aesthetics and client preferences will influence the degree to which these foods can be used.

**Action** **Explore alternatives to refrigeration**

**Issues**

- Frozen food and drinks, kept in a very well insulated container, will remain cold for several days. Frozen containers of drink are particularly effective in cooling and can be used instead of ice blocks. Doubling the insulation thickness of a container can more than double the time food stays cold.
- To reduce the amount of food requiring refrigeration, obtain food while on tour when possible.
- At campsites, use Coolgardie safes or streams for cooling.

**Action** **Select an appropriately-sized, energy-efficient refrigerator or freezer**

**Issues**

- Portable refrigerators and freezers range in size from 35 to 150 litres, and are available as fridges, freezers or combined fridge/freezers.
- Portable units are either 12 or 24 volt DC, and 240 volt AC, or LPG fridges. LPG fridges are effective if power is not available. Twelve and 24-volt refrigeration systems can be run off car batteries, a dedicated battery during longer stops, or from photovoltaic panels, 240 volt fridges can be run from batteries with an inverter or from generators (which tend to be noisy and bulky). Many LPG fridges can also use electricity but are very inefficient when used this way.
- No standard tests or listings of energy efficiency exist for portable fridges, so ask suppliers for written information on energy consumption. High compressor efficiency and effective insulation are critical, as they can more than halve the rate of battery drain and the size of photovoltaic panel required. Doubling the thickness of insulation can halve energy consumption.



### Success stories

Wild Quest Safaris, Northern Territory, uses photovoltaic cells to run the refrigeration units in its trailers. Solar power reduces running costs and eliminates the need for noisy generators.

Odyssey Safaris in the Northern Territory uses 60-litre Trailblazer 12 volt refrigerators on tour. The brand was chosen because of its excellent insulation. The units run from the vehicle battery when on the move, and from a spare battery charged by a solar panel when stopped.

Bungaree Earth Cottages in New South Wales are not connected to the electricity grid. LPG refrigerators are used to minimise electricity requirements, so that the number of photovoltaic cells needed to provide for basic services (lighting, radio) can be kept to an affordable level.

REFERENCE SHEET


## Task

## To carry out administrative, clerical, research, educational and information transfer activities

Office equipment uses significant amounts of electricity. A desktop computer can cost $100 per annum to run and a photocopier $300 if left on most of the time. Office equipment also uses a lot of energy indirectly, through its consumption of paper.

***'A desktop computer can cost $100 a year to run and a photocopier $300 if they are left on most of the time.'***

## Action

## Issues

### Select energy-efficient office equipment

- As no energy labelling scheme or information database covering office equipment exists in Australia at present, purchasers have to rely on the manufacturers' data on energy use, unless they can measure it themselves. A booklet entitled *Energy-efficient Environment-friendly Office Equipment*, available from the Western Australian Office of Energy, provides guidelines for purchasing energy-efficient office equipment.
- Computers, monitors, printers, faxes and photocopiers that comply with the US Environment Protection Agency's 'Energy Star' criteria (which manufacturers normally promote) are generally energy-efficient. These have relatively low energy consumption and low energy 'sleep modes', which reduce power consumption when the equipment has not been used for a specified period of time.
- Laptop computers use around one-tenth as much energy as desktop computers, while inkjet printers use less energy than most types of laser printers.
- Computer monitors can consume 50 to 90 watts of power. To buy the most efficient check the manufacturers' power rating. 'Energy Star' monitors also have 'sleep' modes. Some models can be used with existing computers if suitable software is installed. Smaller screens tend to use less energy. Soon, energy-efficient liquid crystal displays will replace standard monitors in many applications.
- Most office equipment consumes most of its total energy when on standby or idling. Select equipment with the lowest standby power consumption.
- Use the double-sided copying capability of photocopiers and printers to cut paper consumption.

## Action

## Issues

### Select environmentally-preferred equipment

- For advice on environmentally-preferred packaging see Reference Sheets 17 and 19.
- Copiers and printers should be designed to use recycled paper without voiding the warranty. Seek such copiers and printers when purchasing.
- Some printers have refillable ink or toner cartridges and long-life components. These components are environmentally preferable to (and cheaper than) shorter-lived replaceable components, even where a recycling program is in place for these components.
- Some equipment is designed for easy disassembly (including having markings to identify different types of plastics), and some manufacturers will take back old equipment for remanufacturing or recycling. Check for these features when purchasing.

## Action

## Issues

### Operate equipment efficiently

- Modern computers are designed to be switched off when not in use. Indeed, switching off is likely to prolong their lives, as the hard disk is less likely to fail if it runs for shorter periods.
- If a computer has to stay on because it is linked to a network, the screen–which uses more energy than the computer itself–can still be switched off when it is not needed.
- Sleep modes on 'Energy Star' equipment should be set up and checked regularly to ensure they are operating correctly.
- Paper use can be minimised by using electronic data storage and transmission, double-sided copying and photo-reduction.
- Double-sided copying saves paper and reduces the indirect energy consumed in production of paper. Older copiers are often unreliable in doing double-sided copying. Newer models perform well, but it is important to show users how to operate this feature and to encourage its use.
- In rural areas where power quality and reliability may be poor, a laptop computer is not only much more energy-efficient but also more reliable than a desktop unit.
- Sharing one printer among several computers rather than providing several printers reduces standby energy consumption (unless the printers have very efficient modes).





15. OFFICE EQUIPMENT

REFERENCE SHEET


## Task — To keep records and communicate with clients and colleagues

Fine writing papers used in offices and for much advertising material comprise 30 per cent of the paper used in Australia.

*'Photocopying and printing on both sides of the paper and photo-reducing cuts paper use by up to 75 per cent.'*

### Action — Reduce paper use

**Issues**

- Electronic storage and transfer of information eliminates the need for paper. Many of those who are opposed to electronic storage and transfer did not grow up with computers. Always ask: 'Do I need paper to do this?' and if you quickly answer 'Yes', ask the question again, and think harder before answering. Often paper use is simply a habit.
- Photocopying and printing on both sides of the paper and photo-reducing cuts paper use by up to 75 per cent.
- Use circulars and pin-up notices, rather than distributing multiple copies.
- Many forms, receipts and dockets comprise multiple copies produced on chemically-treated paper. Rationalise the size and number of copies of forms, receipts and dockets.

### Action — Re-use paper

**Issues**

- Paper that has been printed on only one side can be re-used for internal purposes in photocopiers, printers and plain paper faxes or be bound into notepads. When the first-printed side does not contain sensitive information, the second printed side may be used for external communication. It might include an appropriate footer, such as 'Second side of paper being used to save trees'.
- Re-use envelopes, pasting a label over the old address if necessary.

### Action — Buy recycled paper

**Issues**

- When and whether to use recycled paper is a complicated issue. Preferably paper from 100 per cent, post-consumer waste should be purchased. Finding a path through the range of more or less clearly labelled partially recycled and mixed industrial/post-consumer waste paper can be difficult. The best that can be done is to ask questions and go for paper with the maximum post-consumer waste percentage that can be found.
- Print advertising material on recycled paper.





### Action — Recycle office paper

**Issues**

- Some office waste is currently recycled into white cardboard packaging and some into office paper. As it is preferable for office paper waste to be recycled into office paper, seek avenues to ensure office paper is recycled this way.

### Action — Recycle on-site

**Issues**

- Office papers may be used in composting, in worm farms or as mulching agents. While these uses provide a single extra beneficial use, off-site recycling which permits several cycles of beneficial use is normally preferred, where practical.

### Action — Burn papers to recover energy

**Issues**

- When all sensible options for recycling office papers have been exhausted, burn remaining paper.
- Burning for heating is far preferable to burying these materials in landfills where anaerobic decay and methane emissions may occur.

**Success stories**

Freycinet Lodge in Tasmania has an office paper recycling program. Proceeds from sale of the paper will be used to fund an interpretative hide for the local area.

Reef Promotions in Queensland and Yarra Valley Ecotours in Victoria use recycled paper wherever possible.

REFERENCE SHEET


## Task To reuse and recycle solid materials

The Australian Government has a target of reducing the amount of solid waste going to landfill by 50 per cent (on a weight per capita basis) between 1990 and 2000. Attaining this target requires a significant reversal of past trends of ever-increasing solid waste generation. Many businesses have significantly reduced their solid waste streams in the last few years, and municipalities are beginning to replace household 240-litre garbage bins with 120-litre and 80-litre bins. General actions that can be taken to minimise the generation of solid waste are outlined in this Reference Sheet. More specific actions that can be taken for particular materials are given in Reference Sheets 16 and 18–23.

**Action** Minimise packaging

**Issues**

- Where packaging is necessary seek re-used or recycled packaging.
- Seek opportunities to buy material in bulk or as concentrates.
- Ensure that packaging is re-used or recycled.
- Select packaging made out of a single material (for example, cardboard boxes with cardboard spacers, rather than polystyrene spacers) to facilitate recycling.

**Action** Buy re-useable items

**Issues**

- Purchase re-useable items, such as cloth towels rather than paper towels and refill pouches of products such as detergents, rather than new bottles.

**Action** Buy re-used, remanufactured and recycled products

**Issues**

- An increasing range of re-used, remanufactured and recycled products is becoming available. About half of the components of some new photocopiers are re-used or remanufactured and manufacturers are prepared to provide warranties. Ask potential suppliers to provide details about the recycled input of their products.
- The Western Australia Office of Waste Management has produced *The Recycled Products Buying Guide for Western Australia*. Authorities in some other States are in the process of producing similar guides. (See section 3 for details.)





**Action** Access recycling systems

**Issues**

- Kerbside recycling systems are the most effective way of collecting a range of recyclable materials, although these systems are not often available to commercial operators. Ask your local council to make kerbside recycling systems available to commercial operators.
- Take materials to recycling centres as part of your normal work routine.
- Where a material cannot be recycled locally, clients may be prepared to take limited quantities home with them to place in their local recycling systems.
- When on tour, aim not to dispose of any (non-health-threatening) material which can sensibly be recycled.
- Flatten and squash recyclable containers to minimise their volume, and reduce the cost of transporting them, particularly where transport distances are long.

**Action** Recycle on site

**Issues**

- The main opportunities for recycling waste on site are likely to be the recycling of organic waste through composting, worm farming or anaerobic digestion (with energy recovery in the latter case). If too much compost is produced for use on site, it may be possible to find beneficial off-site uses.

**Action** Recover energy

**Issues**

- When all other options for recovering and recycling materials have been exhausted, recover energy from waste materials by burning them for heat.

### Success stories

Trek About Tours in Alice Springs, Northern Territory, uses modified tray trucks as its visitor transport vehicles. These vehicles have a detachable pod which seats 14 to 17 passengers. To cut down maintenance costs, vehicles are traded in every two years and the pods are refurbished and re-used lasting the life of two or three tray trucks.

Wildman River Lodge in the Northern Territory and Freycinet Lodge in Tasmania both buy breakfast foods in bulk and avoid the large amounts of packaging associated with individual serves.

**Trek About Tours in the Northern Territory uses vehicles with detachable, reusable passenger pods. These last the life of two or three tray trucks.**

REFERENCE SHEET


## Task To provide shelter

The generation and disposal of solid waste from building construction and demolition is a major problem in Australia. Construction and demolition waste is estimated to comprise about 20 per cent of the weight of material currently going to landfill. Until very recently this problem received very little attention.

### Action Prepare and implement waste minimisation plans

**Issues**

- Ask potential building contractors for a waste minimisation plan. Many contractors may be unfamiliar with such plans, but if their preparation starts to become a key selection criterion they will quickly get the message. Ensure that all subcontractors are effectively included in the waste minimisation plan.
- The preparation and implementation of waste minimisation plans is a new area of activity in which knowledge is growing rapidly. Seek advice from local and state government bodies on how to go about it. The Recycling and Resource Recovery Council in Victoria (listed in section 3) has funded projects by Fletcher Construction which are good examples. The Waste Management Association of Australia (also listed in section 3) is working in the area as well.

### Action Make accurate estimates of materials required and avoid over-ordering

**Issues**

- The size and shape of pre-fabricated materials should be considered carefully to minimise unused offcuts. Some thought and effort at the time of ordering can bring large financial savings as well as environmental benefits.
- Purchase recycled building material whenever possible.

### Action Identify ways to re-use or recycle any materials unavoidably left over

**Issues**

- Use suppliers who will take back unused materials (including offcuts).
- Re-using and recycling will avoid waste disposal costs and may generate income from the sale of surplus materials.

### Action Minimise packaging

**Issues**

- Where packing is necessary, use re-used or recycled packaging.
- Flatten cardboard boxes before putting them into building skips for easy recovery.



### Action Keep waste streams separate to facilitate re-use/recycling and to reduce environmental risks

**Issues**

- Mixing waste streams makes it far more difficult and costly to extract useable materials.
- The demolition and refurbishment of buildings may generate hazardous waste items, including PCBs in lighting capacitors that are more than 20 years old and mercury in fluorescent tubes. These should not be landfilled. Seek advice on disposal from State/Territory environmental authorities.

**Success story**

Fletcher Construction in Victoria compared conventional waste disposal and recycling at two construction sites. The environmentally-preferred approach reduced the volume of waste going to landfill by 43 per cent and achieved savings of 55 per cent on waste removal costs. Based on this experience, the company is now working hard to minimise wasteful ordering, to further reduce material waste and reduce costs.

18. BUILDING MATERIALS

REFERENCE SHEET


## Task To provide reading material and packaging

Australia has been recycling newspapers and cardboard, particularly industry offcuts, into packaging materials for over 100 years. Before 1994, when a new machine was commissioned by Australian Newsprint Mills at Albury, NSW, newspapers and magazines were not recycled back into newsprint in Australia. The international market for newspapers and magazines has been particularly volatile over the past five to ten years. The current situation is buoyant and expected demand and prices for recycled newspaper and cardboard for the next few years are good.

*'Australia has been recycling newspapers and cardboard, particularly industry offcuts, for packaging materials for over 100 years.'*

### Action Minimise purchases of newspapers and magazines

**Issues**

- Supply newspapers and magazines in communal areas rather than to individual units. Alternatively, consider not supplying newspapers or magazines at all (this should be weighed up against client preferences).

### Action Look for recycled content

**Issues**

- Where packaging is necessary to protect the goods purchased, make the recycled content of that packaging a purchasing criterion. Always prefer cardboard/paper to polystyrene.
- Ask about the recycled content of newspapers and magazines you plan to supply.

### Action Access recycling systems

**Issues**

- Recycling mills use different materials. Some require newsprint/magazines/advertising materials, others a mix of cardboard/office paper waste. If the material supplied is contaminated by unwanted material it may require expensive sorting or be dumped. Unfortunately, the information on these matters supplied by recycling collectors and depots is often unclear. If this is the case, find out exactly which materials can be recycled directly from the collector.
- Flatten cardboard boxes to increase their density and reduce transport costs for recycling.
- See also Referencce Sheet 17.

### Action Recycle on-site

**Issues**

- Newspaper and cardboard may be used in composting or worm farms or as mulching agents.



### Action Recover energy

**Issues**

- Recover energy from waste newspaper and cardboard by burning when all sensible options for material recovery have been exhausted.
- Burning these materials is far preferable to burying them in landfills (particularly wet landfills) where anaerobic decay and methane emissions may occur.

**Success story**

At Coconut Beach Resort in the Queensland Daintree area, cardboard packaging is shredded and used as mulch for revegetating the area. The mulch reduces watering requirements and weed growth.

19. NEWSPAPERS AND CARDBOARD

REFERENCE SHEET


## Task — To provide packaging for drinks and food, and to transmit light (into buildings)

***'Over 80 per cent of the glass used in Australia is used for packaging.'***

Over 80 per cent of the glass used in Australia is used for packaging. Until the mid-1980s, refillable glass was the dominant form of packaging for drinks. Most glass food containers (those for tomato sauce, sandwich spreads etc) are not refilled. Under the influence of beverage container deposit legislation, refillable glass drink containers have remained popular in South Australia. In the rest of Australia, refillable containers have been largely replaced by a mixture of lighter-weight, non-refillable glass, aluminium, plastic and liquid paperboard containers. About 45 per cent of glass packaging is recycled in Australia (mostly by crushing into cullet and remelting, rather than being refilled). The rate of recycling of drink containers is much higher than the rate of recycling food containers, even though both forms of container are equally recyclable.

**Action** — **Reduce amounts of glass used**

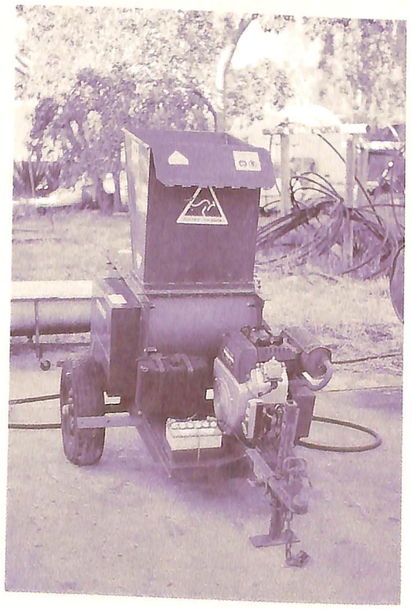
**Issues**

- Minimise the amount of glass to be recycled and disposed of by purchasing goods in bulk.
- Purchase concentrates (for cordials and fruit juices) and dehydrates (for milk and soups) wherever feasible. Aesthetics and client expectations will be the major determinants of the practicality of such options.

**Action** — **Re-use glass**

**Issues**

***Some island resorts have invested in bottle crushers to reduce the costs in transporting this waste to the mainland for recycling.***



- Some drink products, particularly those supplied by smaller, local manufacturers, are available in refillable, returnable containers. Refillable bottles are much heavier than non-refillable ones. To compensate for the additional environmental impact from their manufacture (compared to light-weight bottles) it is best that they be refilled at least ten times.
- Glass containers with flip-top lids (rather than screw tops) can often be re-used as drinking glasses.





**Action** — **Recycle glass**

**Issues**

- Well-established and widespread infrastructure exists for glass bottle recycling; therefore it is generally a lot less complicated than paper and plastic recycling.
- Local councils may have arrangements for recycling window glass.

REFERENCE SHEET


## Task

## To package food and other goods; to provide long-life, light-weight fixtures for plumbing, buildings, furniture, appliances, and transport vehicles

*'About 30 per cent of plastics in Australia are used for packaging.'*

Over the last few decades, plastic wastes, particularly plastic packaging wastes, have comprised the fastest growing part of the solid waste stream. They are a highly visible component of litter and have had a significant impact on wildlife, particularly in aquatic ecosystems. The problems arise largely because the long-life plastics are put to relatively short-term uses. However, where the long-life attributes of plastics are put to long-term uses such as in appliances and equipment, and in plumbing and gas fitting, they may have less environmental impact than alternatives, such as metal and ceramics. The light weight of plastics can also be beneficial in increasing the efficacy of products and reducing transport fuel. At present, about 30 per cent of plastics in Australia are used for packaging.

**Action**

### Reduce plastics use, particularly for short-term applications

**Issues**

- Purchase goods in bulk whenever possible.
- Select consumer durables that are packaged in recycled, cardboard and paper rather than plastic.
- Do not use disposable (single-use) plastic tableware.

**Action**

### Re-use plastics

**Issues**

- Select durable plastic packaging containers such as Tupperware, which have been available for a long time.
- Use re-useable plastic alternatives instead of single-use tableware.
- Many large plastic containers (for example, for oils, cleaners and chemicals) can be returned to their manufacturers for re-use. Select these products when available.
- When feasible, re-use durable plastic containers (for example, plastic beverage containers may be re-used as lightweight water bottles).





**Action**

### Recycle plastics

**Issues**

- Plastics recycling is even more complicated than paper recycling. With the introduction of a plastics coding system in the late 1980s many people have mistakenly interpreted the appearance of a number from 1 to 7 inside a triangle with chasing arrows to indicate that systems existed to recycle the items bearing these symbols. This is not the case; many plastic items bearing this code are not currently being recycled in Australia. The items most commonly being recycled at present are plastic bottles bearing the codes 1 (PET), 2 (HDPE) and 3 (PVC).
- If you have access to plastics recycling, whether through kerbside collection or depot drop-off, check with your recycler exactly what plastics are being collected. In some areas all bottles (shampoo, detergent, milk etc.) bearing the symbol 2 are collected, while in others only milk bottles are collected. Putting non-recyclable plastics into recycle bins can cause expensive contamination problems for the collector. If you lack information on recycling plastics, ask your collector or council to provide it. However, remember that they are not responsible for putting recycling symbols on plastics products.
- Public demand and a growing sense of responsibility within the plastics industry is expanding the range of plastics being recycled. Check up periodically to see if additional plastics items are being recycled, as the situation is likely to change quite markedly over the next few years.

**Action**

### Buy recycled plastic products

**Issues**

- An increasing range of products (for example, car battery cases, printer cartridges, some building materials and garbage and compost bins) are being manufactured with recycled plastic content. A register of recycled plastics products is available from the Plastics and Chemicals Industry Association.

**Disposal of chemical containers and their contents needs to be carefully managed.**

**Action**

### Beware of energy recovery from plastics

**Issues**

- Recovering energy from burning plastics is commonly practised overseas, often as part of mixed wastes streams, but is little practised in Australia. Emissions, particularly from chlorinated plastics such as PVC, are a major concern. The safety of such issues can be argued at length, but the potential risks to the reputation of a tourism operation from burning plastics is likely to far outweigh any benefits.

**Action** **Correctly manage hazardous material containers (and their contents)**

**Issues**

- Do not send containers from hazardous materials to the tip or empty their contents down the sewer. *Disposing of Household Chemicals* , a brochure produced by the Plastics and Chemicals Industry Association, provides general advice. Obtain advice on specific products from the manufacturer/supplier (ask for material safety data sheets) and, if in doubt, check it with your local council and the environmental protection agency/department in your state or territory.

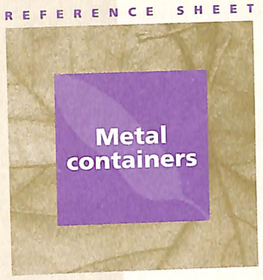
### Success story

Odyssey Safaris in the Northern Territory provides passengers with colour-coded, re-useable plastic cups for drinks which are washed by staff at the end of each day. The company also uses unbreakable plastic plates and dishes and stainless steel cutlery. These practices not only create a positive environmental image, but are cheap. The plastic require less storage space when on tour. Odyssey has calculated that the lifecycle cost of a re-useable cup plus washing is $23, while the cost of disposable cups over a year is $54 (and this does not include any costs for disposing of a large volume of used cups).





REFERENCE SHEET




**Task** **To package food and drink and a wide range of materials (for example, fuels, paints etc.)**

Australia has well-developed infrastructure for the recycling of aluminium cans and the highest rate of recycling of aluminium cans in the world. Large steel items such as cars, whitegoods, concrete reinforcing and drums are also widely recycled but until recently little attention has been paid to the recycling of steel cans. Responses to the energy and waste minimisation survey carried out for this project indicated that five times more aluminium cans than steel cans were being recycled.

**Action** **Reduce metal container use**

**Issues**

- Purchase goods in bulk where possible.
- Avoid aerosol containers by substituting them for pump action or roll-on containers. CFCs are no longer used as propellants in Australia apart from a small number of medical applications, so giving up pressure packs will not help to save the ozone layer. However, most propellants are hydrocarbons and contribute to air pollution and the greenhouse effect.

**Action** **Re-use steel containers**

**Issues**

- Many large steel containers can be returned to their manufacturers for re-use or refilling. Select products in such containers, when available.
- Seek ways to reuse smaller containers with fitted lids.

**Action** **Recycle containers**

**Issues**

- Aluminium cans fetch about 10 times the price of steel cans on a weight basis because of the huge savings in electricity achieved by recycling aluminium cans (compared with smelting aluminium from alumina). Recycling steel does not achieve such savings and there has been, until recently, a relative lack of interest by industry in recycling steel cans.
- Find out if aluminium can recyclers take other aluminium products such as foil and food trays as well.
- If you have access to steel can recycling, check if they take pressure packs as well.
- Crushing cans, or removing the ends and flattening rigid steel cans, reduce their bulk and can greatly increase the value of a given volume.

**Action** **Correctly manage hazardous material containers and their contents**

**Issues**

- Do not just send hazardous materials to the tip (or tip the contents down the sewer) when you have no further use for them. This is rarely an appropriate means of disposal. *Disposing of Household Chemicals*, a brochure produced by the Plastics and Chemicals Industry Association, provides general advice on disposing of household chemicals. For advice on specific products, contact the manufacturer/supplier (ask for material safety data sheets) and if in doubt, check it with your local council and the environment protection agency/department in your state or territory.



REFERENCE SHEET




**Task** **To provide food for energy and pleasant human modified environments**

Food and garden waste can generally be recycled on site. Garden waste is often banned from landfill to reduce the volume of materials.

**Action** **Reduce food and garden wastes**

**Issues**

- Reduce food waste by preparing appropriate quantities of food.
- Most plant food waste can be readily composted, but animal food waste can be more difficult to deal with.
- Fat and oil-free cooking is healthy and reduces problematic waste.
- Where landscaping and gardens are necessary or desired, maximise the use of local indigenous species to reduce watering, cutting and trimming, and the generation of garden waste.

**Action** **Prevent discharge of oils and fats into untreated sewage**

**Issues**

- Remove oils and fats from crockery with absorbent towels prior to washing whenever dishwashing effluent is released to an untreated sewage system. Use grease filters on sinks.
- Medium sized and large kitchen facilities should use grease traps/arresters (which require periodic pumping) before discharge. Biological dosing systems which break down oils and fats and reduce the need for pumping are receiving approval from many water and sewerage authorities. Check if your local authority has approved or recommends any. Waste grease is increasingly being used in industrial composting and fertiliser plants. Find a pump-out contractor who recycles this waste.
- Re-use cooking oils.

**Action** **Recycle**

**Issues**

- Most food and green garden material is ideal for composting or worm farming (vermiculture). However, such recycling requires active management. Compost that becomes anaerobic is not just smelly; it is generating methane—a potent greenhouse gas.
- Chip woody garden waste and use it as mulching material. This will assist with controlling weeds and reduce water requirements.
- Contact suppliers, or alternatively ask your local council or the environment protection agency/department in your state or territory to find the name of a company that recycles cooking oils and fats.

**Action** **Recover energy**

**Issues**

- Burn dried wood to provide heat.
- Where viable, consider establishing a system for anaerobically digesting food and plant materials to produce useable methane and soil conditioners.

### Success story

Great Keppel Island resort runs a worm farm to process the island's organic wastes. Cardboard, paper, garden waste, sewage sludge and some food scraps (not oils, fats and sauces) are shredded, composted for three weeks, then fed to the worms. After three to four months, the worm castings are used on gardens instead of fertiliser. This is cheaper than baling and removing wastes from the island.





REFERENCE SHEET


**Task** **To supply water, remove waste water, filter and heat pools and cool buildings**

Pumps are used in many tourism operations to supply water, remove wastes, filter pools and circulate heated or chilled water. Very large amounts of electricity can be consumed, particularly when large pumps run for long periods.

**Action** **Reduce the need for pumping**

**Issues**

- Where water is pumped to a header tank, any strategy which reduces water consumption reduces pumping requirements.
- Ensure that pumps operate only when needed.
- In many cases, pressurised water is pumped into an open container, then pumped (and re-pressurised) somewhere else. Arrange piping and controls so that water is delivered to its point of use without having to be re-pressurised.

**Action** **Choose the right-sized pump and an efficient motor**

**Issues**

- Avoid using an oversized pump and motor which unnecessarily add to capital and running costs.
- Where loads vary, install a variable speed drive to improve efficiency.
- Highly efficient motors are commercially available, and reduce energy consumption cost-effectively. Ask suppliers for written information on motor efficiency.

### Success stories

At Yellow Waters in the Northern Territory, a pump ran continuously, topping up the header tank for the fresh water supply. Excess water overflowed and ran back down to a lagoon. To reduce energy and cut costs, a float switch was been installed which switches the pump off when the header tank is full. An effluent pump which used to run continuously and required replacement four times each year is now also controlled by a float switch, which has dramatically reduced operating time.

REFERENCE SHEET


## Task

## To highlight the environmental and other benefits of energy and waste minimisation strategies implemented by ecotourism operators

While most ecotourism operations emphasise their links with the natural environment in their marketing and promotion, there is substantial scope to demonstrate a commitment to environmental best practice by implementing and promoting energy and waste minimisation strategies. After all, energy use and wastes are two major environmental impacts of human activity.

**Action:** **Explain the energy and waste minimisation actions in place in your operation**

**Issues:**

- Comparisons help highlight improvements. For example: 'In 1994 we recycled 30 tonnes of glass and metal containers, up from 20 tonnes in 1993.'
- Expressing improvements in terms of standard units makes comparison easier. One unit that could be used is energy cost per guest night.
- Provide interpretive materials and train staff to explain energy and waste issues to guests.

**Action:** **Use waste and energy issues as topics for articles and in promotional brochures**

**Issues:**

- Improvements in performance in waste and energy minimisation can be used in brochures and promotional material to demonstrate your commitment and to provide the unusual angle that might interest a journalist.
- Documented results and quotes demonstrating positive client response also provide opportunities for articles or stories in many publications.

**Action:** **Where you are concerned about possible negative reactions, ask clients what they think, conduct trials, or offer options**

**Issues:**

- There's no need to be defensive. Many waste and energy minimisation strategies make good sense to people.
- Most people, particularly those who patronise ecotourism operations, have very positive attitudes to the environment, so they are likely to welcome waste and energy activities.



- Sensitively worded explanations, combined with options, can create positive client attitudes. For example, where a shampoo dispenser has been installed but sachets of shampoo are also available, a sign might read 'Using shampoo from the dispenser in the shower avoids the need to dispose of sachets to landfill. However, sachets of shampoo are available in the cabinet if you require them.'
- Many facilities now have signs which encourage guests to re-use towels, but the message might be made more powerful if it read: 'Washing a towel uses x litres of water, y cents of electricity and z grams of detergent. Help us to avoid these environmental costs by reusing your towel. If you don't wish to re-use the towel, leave it in the bath or shower recess.'

25. MARKETING ENERGY AND WASTE MINIMISATION

# Section three
# Assistance and advice

## Government

A range of government bodies and programs can provide financial assistance and/or advice in minimising waste and energy.

## National

### EnergyCard

EnergyCard is a low interest credit card with preferential rates and terms that can be used to purchase energy-efficient products. At present, the EnergyCard can be used to purchase and install solar water heating. In the future, other energy efficient products such as home insulation, reverse cycle air conditioning, heat pumps, double glazing and solar panels will be available for purchase on the card.

No specific eligibility criteria apply. The EnergyCard can be applied for through distributors of approved energy efficient products, who can also advise about the special terms that apply to the card.

For further information contact the Energy Information Centre in your state or territory or call the EnergyCard Hotline on 1 800 803 499.

### Enterprise Energy Audit Program

The Enterprise Energy Audit Program encourages industrial and commercial enterprises in Australia to audit their energy use. It offers organisations up to $5000 per audit or 50 per cent of the cost of an energy audit, whichever is the lesser amount. Commonwealth support is reduced to 33 per cent of the fee, to a maximum of $5000, where supplementary support is provided by other governments.

Assistance is provided only where an energy audit has been undertaken by an organisation accredited by the Institution of Engineers, Australia.

To claim assistance, an application form, a copy of an energy audit report and a copy of the auditing organisation's receipt for payment must be submitted. An energy audit may be permitted for up to three separate establishments per enterprise.

For further information, contact:

Enterprise Energy Audit Program
Industry and Government Section
Energy Programs and Fisheries Division
Department of Primary Industries and Energy
GPO Box 858
Canberra ACT 2601

Tel: (06) 272 4763
Fax: (06) 273 1232

### Environmental Management: a Business Approach

The Environmental Management Program is administered by AusIndustry and provides assistance for firms to integrate environmental management into all business operations.

The program is delivered differently in each state and territory but broadly includes information and grants for the following diagnostic services:

- an environmental review of a firm's operations; and
- a report on the environmental impact of the business operations.

As the program is still being developed in some states, the level of subsidy is likely to vary. Examples of specific programs are described under the relevant states in the rest of this section.

For further information, contact:

Director, Enterprise Improvement Services
AusIndustry
51 Allara Street
Canberra ACT 2601

Tel: (06) 276 1655
Fax: (06) 276 1586

### Environment Protection Agency

The Environment Protection Agency manages Commonwealth programs and implements policies in fields such as:

- environmental impact assessment;
- waste minimisation and management;
- integrated management and environmental technologies and processes; and
- phasing-out of ozone depleting substances.

The Agency can provide information and advice on waste minimisation and on the National Environment Industries Database.

For further information, contact:

Environment Protection Agency
40 Blackall Street
Barton ACT 2600

Tel: (06) 274 1999
Toll free 008 803 772
Fax: (06) 274 1666

### National Ecotourism Program

The Commonwealth Department of Tourism's National Ecotourism Program provides funding to develop ecotourism infrastructure, monitor the impacts of ecotourism and integrate ecotourism into regional planning. Funds are made available to all levels of government and non-profit training and community organisations. Individuals, private companies and profit-making enterprises are not eligible to apply.

For further information, contact:

Director
Nature-Based and Indigenous Tourism Section
Department of Tourism
GPO Box 1545
Canberra ACT 2601

Tel: (06) 279 7126
Fax: (06) 279 7189

### National Environment Industries Database

The National Environment Industries Database (NEID) is a number of individual databases and information sources documenting the technologies and skills available in Australia to solve environmental problems. Information is available on companies providing technology for water and wastewater treatment, waste management and recycling, pollution control, cleaner production, land management and soil remediation and monitoring equipment. Other elements of the database cover environmental education courses and research and development.

The objective of the NEID is to make this information easily accessible to small and medium sized businesses wanting to improve their environment management practices. Information from the NEID can be accessed directly through Internet or via the 'ENVIROline' helpline.

For further information on 'ENVIROline', contact:

Tel: (07) 3229 8522
Freecall: 1 800 500 299
Fax: (07) 3229 8577
email: janice.emiaa@mailbox.uq.edu.au



For further information on NEID, contact:

Environment Technology and Industry Section
Environment Protection Partnerships Branch
Environment Protection Agency
40 Blackall Street
Barton ACT 2600

Tel: (06) 274 1623
Fax: (06) 274 1640
web page: /kaos.erin.gov.au/human-env/industry/ACPD2.html

### Department of Primary Industries and Energy

The Energy Programs and Fisheries Division of the Commonwealth Department of Primary Industries and Energy focuses on programs to promote innovative energy supply by increasing the use of new efficient renewable and non-renewable energy technologies.

The Department can provide useful information on energy efficiency through various publications, including industry advisory booklets and energy technology discussion papers.

For further information, contact:

Information Officer
Energy Programs and Fisheries Division
Department of Primary Industries and Energy
GPO Box 858
Canberra ACT 2601

Tel: (06) 272 3933
Fax: (06) 273 1232

## New South Wales

### Office of Energy

The New South Wales Office of Energy produces and maintains publications with information and statistics on various aspects of energy and energy use. Among them is *Energy Focus*, a bimonthly publication containing interesting and informative articles on energy use and technological developments. Other publications include *Energy Efficient Housing* and *Electricity Tariffs*.

For further information, contact:

Public Relations Officer
Promotion and Public Affairs
NSW Office of Energy
29–57 Christie Street
St Leonards NSW 2065

Tel: (02) 9901 8888
Fax: (02) 9901 8777

### Environment Protection Authority

The New South Wales Environment Protection Authority provides information and advice related to waste minimisation, recycling and reuse.

For further information, contact:

Waste Management Branch
Environment Protection Authority
799 Pacific Highway
PO Box 1135
Chatswood NSW 2067

Tel: (02) 9795 5000
Fax: (02) 9325 5678

### Pacific Power Energy Services

Pacific Power Energy Services provides expert advice on energy saving to businesses in New South Wales and runs a statewide technology transfer program.

For further information, contact:

Pacific Power Energy Services
172 Silverwater Road
Silverwater NSW 2141

Tel: (02) 9748 6363
Toll free: 1 800 224 033
Fax: (02) 9748 1635

### Remote Area Power Supply Rebate Scheme

The Remote Area Power Supply Rebate Scheme provides a rebate of up to $8 000 for connections quoted to cost more than $30 000. Depending on how far away the grid is and whether a transformer is needed, it is not uncommon for a quote to connect to exceed $30 000. Guidelines encourage the use of predominantly renewable energy technologies rather than diesel generating sets in Remote Area Power Supply systems.

For further information, contact the NSW Office of Energy at the address given above.

## Victoria

### Cleaner Production and Waste Minimisation Program

The Cleaner Production and Waste Minimisation Program is designed to assist Victorian industry improve its environmental performance. It provides subsidies for engaging environmental consultants to identify opportunities for waste minimisation and to develop an environmental/waste management plan.

Subsidies for specialist consultants' fees are provided in conjunction with the NIES Enterprise Improvement Scheme to approved Victorian businesses.

For further information, contact:

Section Manager, Trade and Services
Business Victoria
228 Victoria Parade
East Melbourne Vic 3002

Tel: (03) 9412 8468
Fax: (03) 9419 9139

### Cleaner Production Grants Program

The Cleaner Production Grants Program assists Victorian industry to reduce the amount and level of hazardous waste generated. It promotes clean technology and encourages small and medium firms to invest in low waste, no waste or clean technologies to reduce pollution and conserve resources.

For further information, contact:

Managing Director
Australian Centre for Cleaner Production
PO Box 60
Mill Park Vic 3082

Tel: (03) 9407 6060
Fax: (03) 9407 6061

### Energy Information Centre

The Energy Information Centre provides independent information on domestic renewable energy technologies, energy conservation measures, energy efficient appliances, and transport fuel efficiency. Basic information is provided free to the Victorian public via telephone, fax, mail and at the Information Centre Showroom and on fee-for-service basis elsewhere. Detailed advisory services and products are also available on a fee-for-service basis. The centre sells the *Energy Efficient Housing Manual* and other publications on energy-efficient commercial building design and the *House Energy Rating* computer program.

For further information, contact:

Energy Information Centre
115 Victoria Parade
Fitzroy Vic 3065

Tel: (03) 9412 6886
Toll free: 1 800 136 322
Fax: (03) 9412 6887

### Energy Smart Companies Program

The Energy Smart Companies Program is a voluntary scheme in which companies agree to establish a cost-effective energy efficiency program, with information and advisory support from Energy Victoria and energy utilities.

For further information, contact:
Energy Victoria
Level 5
115 Victoria Parade
Fitzroy Vic 3065

Tel: (03) 9412 5666
Fax: (03) 9412 5677

### Environment Protection Authority

The Victorian Environment Protection Authority provides advice on cleaner production, waste minimisation and recycling. It has produced a series of books on reducing greenhouse gas emissions, including the Work Greenhouse Saver.

For further information, contact:

Environment Protection Authority
477 Collins Street
PO Box 4395QQ
Melbourne VIC 3000

Tel: (03) 9628 5533
Fax: (03) 9628 5699

### Recycling and Resource Recovery Council

The Recycling and Resource Recovery Council provides advice and information on waste minimisation. It also provides grants for innovative projects on waste minimisation.

For further information, contact:

Recycling and Resource Recovery Council
Suite 6
355 Exhibition Street
Melbourne Vic 3000

Tel: (03) 9639 0922
Fax: (03) 9639 3087

### Renewable Energy Assistance Program

The Renewable Energy Assistance Program (REAP) encourages the wider use of renewable energy technologies. Financial assistance is offered for the cost of buying the renewable energy components of remote area power systems.

Rural domestic (and possibly commercial) customers, are eligible for a REAP payment if installing a new remote area power supply system or upgrading an existing remote area power supply system.

For further information contact the Energy Information Centre at the address given above.

## Queensland

### Best Practice Environmental Management (BPEM) Demonstration Program

This program provides a subsidy to small to medium sized enterprises for linking an environmental assessment with the preparation of an environmental management plan. Grants of 50 per cent of the total cost of services provided by private sector consultants, up to a maximum of $12 000, are available under this program. Consultants must be approved by State Government departmental officers responsible for the administration of the program.

For further information, contact:

NIES Branch
Department of Business, Industry and Regional Development
Level 25, 111 George Street
Brisbane QLD 4001

Tel: (07) 3224 7190
Fax: (07) 3224 3660

### Energy Wise Advisory Centre

The Energy Wise Advisory Centre offers information on all aspects of renewable energy and suppliers.

For further information, contact:

Home and Building Display Centre
Cnr Pacific Highway and Old Chatswood Road
Springwood QLD 4127

Tel: (07) 3808 8864
Toll free 1 800 175 518
Fax: (07) 3808 3228

Energy Wise Advisory Centres are to be established in Townsville and southeast Queensland.

### Department of Environment and Heritage

The Department of Environment and Heritage provides information and advice on waste minimisation and recycling.

For further information, contact:

Waste Management Branch
Department of Environment and Heritage
160 Ann Street
Brisbane QLD 4000

Tel: (07) 3227 6640
Fax: (07) 3227 8341

## Western Australia

### Office of Energy

The Office of Energy provides information and advice on energy efficiency, renewable energy and other energy issues.

For further information, contact:

Office of Energy
5th Floor
170 St Georges Terrace
Perth WA 6000

Tel: (09) 321 1477
Fax: (09) 321 1474

### Environment Protection Authority

For further information contact:

Environment Protection Authority
8th Floor
Westralia Square
38 Mounts Bay Road
Perth WA 6000

Tel: (09) 222 7000
Fax: (09) 322 1598

### Office of Waste Management

The Office of Waste Management provides information and advice to industry and the general public on a wide range of waste minimisation and recycling issues.

For further information, contact:

Office of Waste Management
32 St Georges Terrace
Perth WA 6000

Tel: (09) 222 0422
Fax: (09) 222 0455



## South Australia

### Cleaner Industries Demonstration Scheme

The Cleaner Industries Demonstration Scheme is run by the Environment Protection Authority and provides interest-free loans to industry to fund installation of new plant, equipment or processes which minimise pollution or waste. Grants are also available for consultants to prepare proposals and review production processes and work practices.

Grants are available for reduction of industrial pollutants and waste, with preference to small to medium sized industries. Priority is given to proposals which concentrate on reducing waste at its source. Recycling and commercial waste minimisation projects are also eligible.

For further information, contact

Environment Protection Authority
GPO Box 2607
Adelaide SA 5001

Tel: (08) 204 2024
Fax (08) 204 2025

### Energy Information Centre

The Energy Information Centre provides information on all aspects of renewable energy. It has a reference library, can provide guest speakers and has technical officers who can offer advice.

For further information, contact:

Energy Information Centre
77 Grenfell Street
Adelaide SA 5000

Tel: (08) 204 1888
Fax: (08) 204 1880

### Department of Environment and Natural Resources (Environment Protection Authority)

The Environment Protection Authority provides information and advice on waste minimisation and recycling.

For further information, contact:

Environment Protection Authority
GPO Box 2607
Adelaide SA 5001

Tel: (08) 204 2000
Fax: (08) 204 2025

### Resource Recovery and Recycling Scheme

For further information, contact:

Environment Protection Authority
GPO Box 2607
Adelaide SA 5001

Tel: (08) 204 2000
Fax: (08) 204 2025

### South Australian Tourism Commission

The South Australian Tourism Commission has published a series of guidelines for ecotourism operations. The report, *Ecotourism: A South Australian Design Guide for Sustainable Development* covers all ecotourism-related issues including site selection, development, management and operation and includes a checklist for those undertaking an ecotourism development.

For a copy of the publication or further information, contact:

South Australian Tourism Commission
178 North Terrace
Adelaide SA 5000

Tel: (08) 303 2338
Fax: (08) 303 2296

## Tasmania

### Integrated Energy Management Centre

The Integrated Energy Management Centre provides information on energy management, including efficient buildings and appliances and the role of renewables, to all sectors of the community.

For further information, contact:

Intergrated Energy Management Centre
163–169 Main Road
Moonah TAS 7009

Tel: (002) 71 6460
Fax: (002) 73 3420

## Northern Territory

### Department of Lands, Planning and Environment

The Department of Lands, Planning and Environment provides information and advice on waste minimisation, recycling and reuse.

For further information, contact:

Department of Lands, Planning and Environment
GPO Box 1680
Darwin NT 0801

Tel: (089) 99 4468
Fax: (089) 99 4657

### Department of Mines and Energy

The Energy Division of the Department of Mines and Energy offers general advice on renewable energy technologies and companies, technical information, and leaflets.

For further information, contact:

Director
Energy Management
Department of Mines and Energy
GPO Box 2901
Darwin NT 0801

Tel: (089) 99 5440
Fax: (089) 99 5289

## Australian Capital Territory

### ACT Electricity and Water

ACT Electricity and Water provides energy, water and sewerage services to the Australian Capital Territory and advice on energy, water and effluent management strategies.

For further information, contact:

ACT Electricty and Water
Electricity House
221–223 London Circuit
Canberra ACT 2600

Tel: (06) 248 3360
Fax: (06) 248 3287

### Department of Urban Services

The Department of Urban Services provides advice and information on waste minimisation and recycling.

For further information, contact:

Manager
Waste Reduction Unit
Department of Urban Services
PO Box 352
Civic Square ACT 2608

Tel: (06) 207 6323
Fax: (06) 207 6341

Office of the Environment
PO Box 1119
Tuggeranong ACT 2901

Tel: (06) 207 2155
Fax: (06) 207 6084

# Non-Government

Many non-government bodies can offer advice and/or services in minimising waste and energy.

## Industry Associations

### Australian Solid Fuel and Wood Heating Association

The Australian Solid Fuel and Wood Heating Association can advise on the efficient use of wood and solid fuel-fired heaters and stoves as well as manufacturers and suppliers.

For further information, contact:

Australian Solid Fuel and Wood Heating Association
7 South Road
Brighton Vic 3186

Tel: (03) 9592 2522
Fax: (03) 9592 8080

### Environment Management Industry Association of Australia

The Environment Management Industry Association of Australia is an association of organisations with a commitment to sustainable development, providing technology and associated skills and services in cleaner production, waste and pollution control, and sustainable energy. Its national secretariat is in Brisbane, and it has an active State-based networks. It publishes a quarterly newsletter.

For further information, contact:

Environment Management Industry Association of Australia
Unit 1, Level 6
Anzac Square Building
202 Adelaide Street
PO Box 2231
Brisbane QLD 4000

Tel: (07) 3229 8522
Fax: (07) 3229 8577



### Plastics and Chemicals Industry Association

The Plastics and Chemicals Industry Association is the umbrella organisation for medium to large chemicals and plastics companies. It has published the *Plastics Recycling Register*, which provides information on products made from recycled plastics, and a brochure, *Disposing of Household Chemicals*, which deals with reducing chemical wastes from kitchens, bathrooms, workshops, gardens and garages.

For further information, contact:

Plastics and Chemicals Industry Association
4th Floor
380 St Kilda Road
GPO Box 16010M
Melbourne Vic 3004

Tel: (03) 9699 6299
Fax: (03) 9699 6717

### Solar Energy Industries Association of Australia

The Solar Energy Industries Association of Australia is the trade association of solar energy equipment suppliers and installers. It runs training courses, certifies installers and can provide lists of members.

For further information, contact:

Solar Energy Industries Association of Australia
1st Floor
505 St Kilda Road
Melbourne Vic 3004

Tel: (03) 9866 8977
Fax: (03) 9866 8922

### Sustainable Energy Industries Council of Australia

The Sustainable Energy Industries Council of Australia is the umbrella industry group for promoting energy efficiency and renewable energy. Members include suppliers of energy-efficient and renewable energy products and services. It publishes a quarterly newsletter.

For further information, contact:

Sustainable Energy Industries Council of Australia
PO Box 411
Dickson ACT 2602

Tel: (06) 241 9260
Fax: (06) 241 9266

## Special Interest Groups

### Alternative Technology Association

The Alternative Technology Association promotes solar housing, energy efficiency and the use of renewable energy technologies in urban and rural applications. It publishes the quarterly magazine *Soft Technology*, which has a classified advertising section used by many renewable energy businesses, and operates the '*Energymobile*' which tours Australia. It has local branches in major cities.

For further information, contact:

Alternative Technology Association
247 Flinders Lane
Melbourne Vic 3000

Tel: (03) 9650 7883
Fax: (03) 9650 8574

### Appropriate Technology for Community and Environment

Appropriate Technology for Community and Environment promotes and provides information on appropriate technologies, particularly for application in developing countries, including simple and robust renewable energy technologies.

For further information, contact:

Appropriate Technology for Community and Environment
PO Box 123
Broadway NSW 2007

Tel: (02) 330 2554
Fax: (02) 330 2611

### Appropriate Technology Development Group

Appropriate Technology Development Group provides information and advice on alternative sustainable technologies for energy and waste management. They have a library and produce a newsletter four times a year.

Appropriate Technology Development Group
1 Johannah St
North Fremantle WA 6159

Tel: (09) 336 1262
Fax: (09) 430 5729

## Australian Conservation Foundation

The Australian Conservation Foundation maintains a database of ecotourism operators, relevant experts and service providers. It provides information and campaigns on environmental issues and practices and publishes *Habitat* magazine. It has offices in Melbourne, Sydney, Canberra and Adelaide, and local groups in many areas.

For further information, contact:

Australian Conservation Foundation
340 Gore Street
Fitzroy VIC 3065

Tel: (03) 9416 1166
Fax: (03) 9416 0767

## Australian Electric Vehicle Association

The Australian Electric Vehicle Association promote research, development and the use of electric vehicles, from do-it-yourself to commercial products. It organises competitions and meetings and publishes *Electric Vehicle News*. Electric vehicles (particularly those using batteries charged from renewable energy sources) can provide on-site or short distance travel where low environmental impact at point of use is important.

For further information, contact:

Australian Electric Vehicle Association
PO Box 164
Turramurra NSW 2074

Tel and fax: (02) 9488 8423

## Australian Institute of Energy

The Australian Institute of Energy is a professional association which promotes energy efficiency in both traditional and renewable energy. It organises seminars, technical visits and demonstrations, and publishes *Energy News Journal* (national) and local newsletters for its groups in Adelaide, Brisbane, Canberra, Gippsland, Newcastle, Perth and Sydney.

For further information, contact:

Australian Institute of Energy
PO Box 230
Wahroonga NSW 2076

Tel: (02) 9449 1800

## Australian and New Zealand Solar Energy Society

The Australian and New Zealand Solar Energy Society promotes research, development and the use of solar energy and other renewable energy technologies. It holds an annual national conference and publishes *Solar Progress* magazine. Local groups run meetings.

For further information, contact:

Australian and New Zealand Solar Energy Society
PO Box 124
Caulfield East VIC 3145

Tel and fax: (03) 9570 7900

## Ecodesign Foundation Incorporated

The Ecodesign Foundation is a non-profit association which undertakes a number of activities including: applied research, educational activities, demonstration projects, displays and exhibitions, publishing, information services, consultancy services and product or project innovation.

For further information, contact:

Ecodesign Foundation Incorporated
PO Box 369
Rozelle NSW 2039

Tel: (02) 555 9412
Fax: (02) 555 9564

## Key Centre for Design

The Key Centre for Design is a national centre undertaking research and collaborative projects with industry, focusing on environmentally oriented design and sustainable product development. The Centre is producing an EcoReDesign information kit which will document case studies of ecodesign with high profile Australian companies. The information kit will include an introductory video on environmentally oriented design, and also detailed resource publications. The kit is scheduled for release toward the end of 1996.

For more information, contact:

Key Centre for Design
Royal Melbourne Institute of Technology
GPO Box 2476V
Melbourne VIC 3001

Tel: (03) 9660 2362
Fax: (03) 9639 3412

## Waste Management Association of Australia

The Waste Management Association of Australia promotes improved waste management practices. It has active branches in most States, holds public meetings and seminars, and forms working groups on issues of interest. It publishes the bi-monthly *WMAA News* and runs a major national solid and hazardous waste convention every two years in association with the Australian Water and Wastewater Association.

For further information, contact:

Waste Management Association of Australia
PO Box 146
Chatswood NSW 2057

Tel: (02) 281 7655
Fax: (02) 313 8442

# References


Department of Primary Industries and Energy 1994, *Financial Evaluation of Energy Management Measures*, Canberra.

Department of Primary Industries and Energy 1994, *Fuel Consumption Guide* (annual), Canberra.

Energy Policy and Planning Bureau and Greenhouse Coordination Council, Western Australia 1994, *Energy-Efficient, Environment-Friendly Office Equipment*.

Energy Victoria 1994, *Energy Efficient Housing Manual: Design Guidelines and Case Studies*.

Environment Protection Authority (Victoria) 1992, *Work Greenhouse Saver*, Melbourne.

Plastics and Chemicals Industry Association 1995, *Disposing of Household Chemicals*.

Plastics Industry Association 1993, *Plastics Recycling Register*.

South Australian Tourism Commission 1994, *Ecotourism: A South Australian Design Guide for Sustainable Development*.

Standards Australia 1990, AS 1680.1 *Interior Lighting Part 1: General Principles and Recommendations* .

Standards Australia 1992, AS 4012 *Domestic Solid Fuel Burning Appliances: Method for Determination of Power Output and Efficiency*, Sydney.

Standards Australia 1993, AS 2627.1 *Thermal Insulation of Dwellings, Part 1: Thermal Insulation of Roof/Ceilings and Walls in Dwellings*, Sydney.