

# The low-carb calculator

Want to know how to get ready for a carbon price? Let Alan Pears AM show you how. His knowledge as an energy efficiency expert has been ‘bottled’ in an online tool to measure and reduce household energy use. Alan explains how it works so you can get online and give it a go.

Most of the debate on climate change in Australia has been based on assumptions that no-one will act to cut their emissions and that we will all be victims of this ‘great big new tax’. Even the government’s calculator that tells you if you’ll be better or worse off assumes you won’t change, as well as assuming the higher your income the more extravagant your lifestyle.

The carbon price, or Clean Energy Futures Package, as the government describes it, is actually a belated effort to make polluters pay for their impact on the global commons known as the atmosphere. More importantly, it is intended to encourage action to change, not to victimise people or businesses.

The new EPA Victoria Australian Greenhouse Calculator is a tool that can help people to estimate their carbon footprints, then explore ways of reducing them. It’s probably the world’s most sophisticated free access household level carbon footprinting tool. It covers greenhouse gas emissions from all motorised travel (road, rail and air), household energy-using activities, shopping (for food and goods), lifestyle (dining out, movies etc) and waste.

## Quick or detailed

The calculator offers two modes: quick and detailed. You can skim through all the activities in quick mode, answering a few questions on each activity. This gives a rough idea of which activities contribute most to your carbon footprint. You can switch to detailed mode



Modern homes can use a lot of energy. Measure your energy use with ease with online calculators.

for one or more activities, to explore ways of cutting emissions. A wide range of options for behaviour change and replacing equipment can be considered.

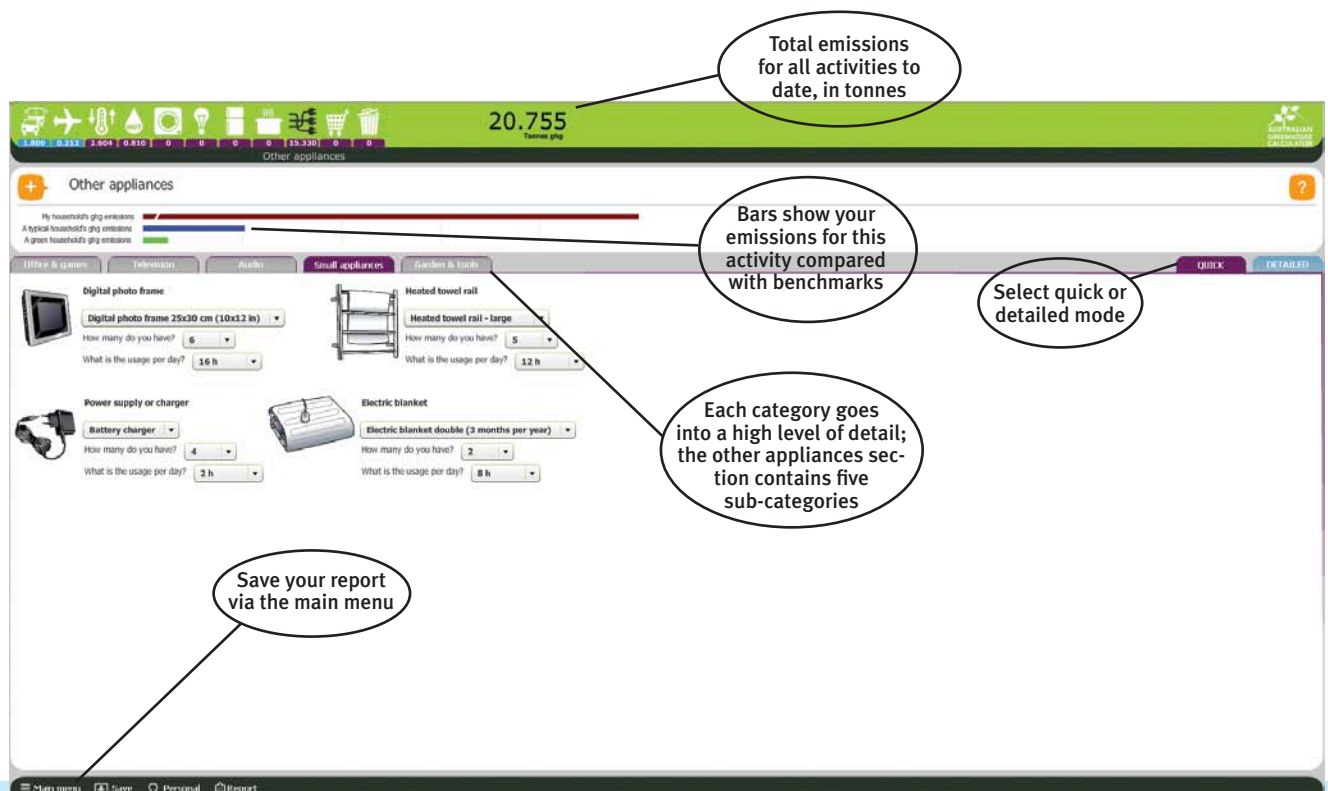
Detailed mode allows any number of each type of item or activity to be calculated separately. So you can look at your car’s annual emissions, or break it down into trip by trip or different driving conditions, or however you like. If you use your dishwasher three times a week on eco-wash and twice on normal wash, you can just enter it as two separate dishwashers being used in those ways. You can enter every light in your house and its usage, or you can make a rough overall estimate. Your choice.

You can answer as many or as few questions as you want: smart default values are applied to all questions you don’t answer, based on the best data found for your circumstances (e.g.

matching your location, number of people, typical appliance ownership and usage).

## Unprecedented detail

What’s different about this calculator? For most of the activities, models have been developed based on the physics underlying the ways they work. So when a user selects different modes of behaviour or technologies, the models are adjusted appropriately. This means a combination of factors, which often have complex interactive effects, can be more realistically modelled. For example, the vehicle model considers aerodynamics, rolling resistance and inertia (effect of mass on energy required to accelerate). So you can explore a range of measures from towing a trailer or aggressive driving styles, to not pumping your tyres up or driving on gravel roads.



## How it works

In each activity screen, the calculator provides feedback in a number of ways. For each line of input, an individual value in kilograms of greenhouse gas is given. Under the activity icon at the top of the screen, the total for that activity is shown in tonnes. A running total for all activities in tonnes is given next to the activity icons. This section of the EPA Australian Greenhouse Calculator looks at small appliances in the home. The horizontal bar shows emissions for the activity relative to two

benchmark carbon footprints, which in this example is off the radar (note the high ownership of digital photo frames). The default benchmarks are a 'typical' Australian household and a 'green' one. In the 'report' section another footprint file can be used as a benchmark. This means you can enter and save, for example, your existing footprint, and make it one of the benchmarks. Then you can open and rename that footprint and make changes (or start a completely new footprint) to explore your options and see how much difference each change makes.

On the home page there is a link to an 80-page 'Assumptions' document. This outlines how the nuts and bolts of the calculator work and includes selected data and data sources used to create the calculation engine.

The launch of this calculator is really just a beginning. The core engine can be relatively easily adapted for many different uses. An early version has already been used as the basis for the Australian government's Green Loans Calculator, part of the ill-fated Green Loans scheme. It could be adapted to build community emission profiles or to allow one household to benchmark itself against others, or its past performance. Parts of the calculator could be used for new tools: for example, the air

travel and land transport module could be linked to a suitable interface for use by businesses to track their travel greenhouse gas emissions.

And there's plenty of scope to improve it. In many cases, data on which to base values in the calculator was very scarce, so measurement and monitoring would help to improve its accuracy. Users could compare the bottom-up estimates from the calculator against actual billing data; this would help to identify faulty appliances or hidden problems. Some of the sub-models are still fairly basic and could be enhanced. And the present calculator doesn't include on-site renewable energy (apart from a basic treatment of solar hot water) or low emission generation. \*

**Australian Greenhouse Calculator**  
[www.epa.vic.gov.au/AGC/](http://www.epa.vic.gov.au/AGC/)

**Alan Pears has worked in the energy efficiency field for over 20 years. His regular *ReNew* column is on page 68. Read about Alan's path to today's calculator at [www.renew.org.au](http://www.renew.org.au)**

## Educational use

The calculator is designed for educational use, too. It includes a number of animated information segments explaining issues related to climate change, research and teaching resources, and teacher support resources that make use of the calculator. Explanations of how these activities can fit into the Australian Curriculum are also provided.

## The path to today's greenhouse calculator; the pain of previous projects has dulled with time

**A**lan Pears, supported by a range of other specialists, has developed a series of greenhouse calculators for EPA Victoria and other organisations. Alan developed Australia's first personal computer-based home energy auditing software in 1983. This was used for over 90,000 home assessments carried out by the Victorian Government's Home Energy Advisory Service from 1983 to 1993, when it was shut down by the incoming Kennett government.

In the mid-1980s he developed a simplified home audit using a mark-sense sheet (like a bigger version of the Tattsлото tickets you mark with a pencil). People simply chose the options for each activity and fed it through the reading machine. An Apple 2e computer processed their data and prepared a personalised report.

In the early 1990s Alan adapted his earlier approach to run on a computer, before the advent of the graphical user interface. In 1996, with funding from EPA Victoria, he, with leading edge programmer Mike Hogan, developed a new graphics-based calculator that operated on an early version of the Windows platform. This was sold to schools but, unfortunately, did not make Alan his first million dollars.

By the late 1990s Alan was ready to take advantage of the advances of dial-up internet and CDs. And the pain of the previous projects had dulled with time. EPA Victoria again stepped forward to fund it. This time, the package included animations, extensive educational resources and two modes of operation. The simpler mode ran on

the EPA's website for many years. The full version released in 2000 was too big to work with dial-up internet, so it was sold through CSIRO Publishing. The team that produced all these resources was project managed by the Curriculum Corporation (now Education Services Australia). A spin-off of the detailed version of the transport component of the calculator was adapted for RACV, and ran on their website for many years; it still runs on the EPA Victoria website, too.

Alan then focused on developing a number of smaller calculators. He worked with the programmers and web designers who had worked on the latest greenhouse calculator, Nectarine, to produce GreenFleet's TreeTotaler calculator, which estimated emissions from car and air travel as well as household emissions from energy bills. This still operates. He also adapted the household energy component of the EPA calculator to produce the predecessor to the NABERS Home Energy Explorer for the NSW Government.

He also worked on the infamous ABC Science on-line PlanetSlayer calculator, again with Nectarine, and with ABC personality Bernie Hobbs. The PlanetSlayer website included games (see how easily you can destroy the Earth), animations, and a calculator, developed by Alan using data from the University of Sydney's Institute for Sustainability Assessment. After answering 12 questions, users would get feedback on how long they could live their lifestyle and not exceed the lifetime greenhouse gas emissions of an average human. This meant many Australians found they had short lives in the calculation. On the other hand, if you cut your emissions below net zero (by storing carbon and investing your money in activities that cut other people's emissions) you could 'live forever' and you became a cute little piglet with wings that flew off to a wonderful future!



**Alan Pears AM with Professor Kate Auty, Victoria's Commissioner for Environmental Sustainability, at the launch.**

After running very successfully on the ABC Science website for some years, it was discovered by a conservative parliamentarian, who accused the ABC of encouraging young children to commit suicide. The publicity led to an enormous increase in the numbers visiting the calculator. By then, the calculator was somewhat dated, and with the tight budgets of the Howard government era, funding for an update could not be found. So the PlanetSlayer was slain.

In 2007, Alan was approached to develop an updated version of the Greenhouse Calculator, to run on-line and take onboard the many developments in household activities. He was convinced it was time to create 'the mother of all calculators'! Little did he realise the agony this naive goal would lead to for him, and just about everyone who worked on the project: they all contributed far more than they were paid. EPA Victoria again led with funding, which was topped up by Sustainability Victoria and Education Services Australia, who also project managed the team. And here it is! A bit late but, through the serendipity of life, launched just at the right time to help people respond constructively to the introduction of a carbon price!