

VICTORIA'S ECOLOGICAL FOOTPRINT



Victoria's Ecological Footprint

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About this report

EPA Victoria and the Commissioner for Environmental Sustainability present the Ecological Footprint of Victoria.

Victoria's first comprehensive State of the Environment (SoE) Report includes Ecological Footprint as a key indicator of the environmental impacts of consumption.

SoE reports have traditionally focused on the state of the natural environment but have not given much attention to the factors that lead to environmental degradation or the opportunities to reduce those impacts.

This Ecological Footprint report provides information that is used in the SoE report, which is prepared by the Commissioner for Environmental Sustainability. In particular, it is used in the chapter 'Production, Consumption and Waste', which identifies the pressures placed on the environment from human activities.

This document is based on a technical report provided by the Stockholm Environment Institute at the University of York (Thomas Wiedmann, John Barrett, and Richard Clay) and the Centre for Integrated Sustainability Analysis at the University of Sydney (Richard Wood and Manfred Lenzen).

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Calculate your own Ecological Footprint at
www.epa.vic.gov.au/ecologicalfootprint



Foreword

EPA Victoria and Commissioner for Environmental Sustainability

We are pleased to bring you this report on Victoria's Ecological Footprint.

Ecological Footprint offers a way both to measure the Earth's capacity to regenerate and to encourage innovation towards one-planet living – a necessity of sustainability. The report highlights that our current use of resources is not sustainable by reminding us just how much it takes to provide what we use every day – fuel for transport, orange juice for breakfast, cotton for clothes or lights for a footy match.

The challenges of climate change and overuse of our precious resources require new, creative ways of thinking by all. To protect our environment and our future we all need to change how we think and act.

In changing our thinking, we often focus on the potential loss and hardship of the change needed, and ignore the vast array of opportunities that living sustainably can present us. However there is evidence that the Victorian community is already responding to the challenges presented. We are already finding ways to lighten our burden on the planet - we are replacing inefficient light bulbs in homes and workplaces, implementing water saving initiatives within homes and industry, and improving bicycle infrastructure to support sustainable transport. While this is encouraging, we are not making change at the speed and scale required.

The Victorian Government is committed to helping Victorians embrace a more sustainable lifestyle and develop new and innovative ways of tackling emissions and reducing our resource consumption. In order to do this, it is critical that we understand ecological limits and consider these when making everyday decisions.

We encourage everyone from the community and business to find out what your Ecological Footprint is, work with your community, within your business and household to help minimise our environmental impact and create a sustainable Victoria.

Mick Bourke
Chairman
EPA Victoria

Ian McPhail
Commissioner for Environmental Sustainability

Executive summary

Victoria's consumption pattern is unsustainable and shows that, if everyone in the world lived like Victorians, we would need four planets.

The average Victorian requires 6.8 productive hectares to support their lifestyle. However, there are only 1.8 productive hectares available per person. This equates to a total Ecological Footprint of 33 million productive hectares, or 147 per cent of Victoria's biocapacity. Victoria's Footprint is more than three times higher than the world average of 2.2 productive hectares per person.

This level of consumption is unsustainable and places significant pressure on the natural environment. This Ecological Footprint assessment helps to identify what activities are having the biggest demand on nature and opens up possibilities to reduce our impact and live within the means of one planet.

Food and services make up the biggest part of Victoria's Ecological Footprint, with residential energy use the biggest contributor to Victoria's carbon Footprint. This is largely due to Victoria's reliance on emission-intensive brown coal for electricity generation.



What is an Ecological Footprint?

Ecological Footprint encourages innovation toward *one-planet living*.

Ecological Footprint is a tool for measuring how much nature is available, and how much is being used by society. Society's activities consume resources from the environment and produce waste that the environment must then deal with. Ecological Footprint shows how much biologically productive land and water (known as biocapacity) is required to support current levels of consumption and waste production for any given activity – in this case, the consumption by Victoria's population.

Ecological Footprint measures biocapacity in global hectares (gha), which represent the average yield of all biologically productive areas on Earth. There are currently 1.8 gha available per person. This area needs to be shared with other species.

There are many factors that contribute to a sustainable society. Using less than the Earth's regenerative capacity is one prerequisite for sustainability, but there are other aspects that need to be considered. Ecological Footprint does not measure all environmental impacts, such as pollution and degradation of soils through erosion or salination. However, if degradation results in a loss of bioproductivity, this will be captured in future Footprint accounts.

Victoria's Footprint is a measure of the land and water area used to provide all the goods and services consumed by the Victorian population. This includes the land required for activities such as building cities, growing fruit and vegetables, grazing cows to provide dairy and beef products, growing trees for paper and wood products, absorbing carbon dioxide produced from using electric appliances, driving cars and operating machinery. This does not include exports, because this is an assessment of Victoria's consumption, not production.

This Ecological Footprint assessment is based on input-output analysis of the interdependencies and material flows between Australian industries, and on Victorian household expenditure data collected by the Australian Bureau of Statistics.

The results of this analysis cover the financial year 2003–04 (the most recent ABS statistics at the time of calculation in 2007).

For detailed information on how the Footprint was calculated see the full technical report available from www.epa.vic.gov.au/ecologicalfootprint

Why should we calculate a Footprint?

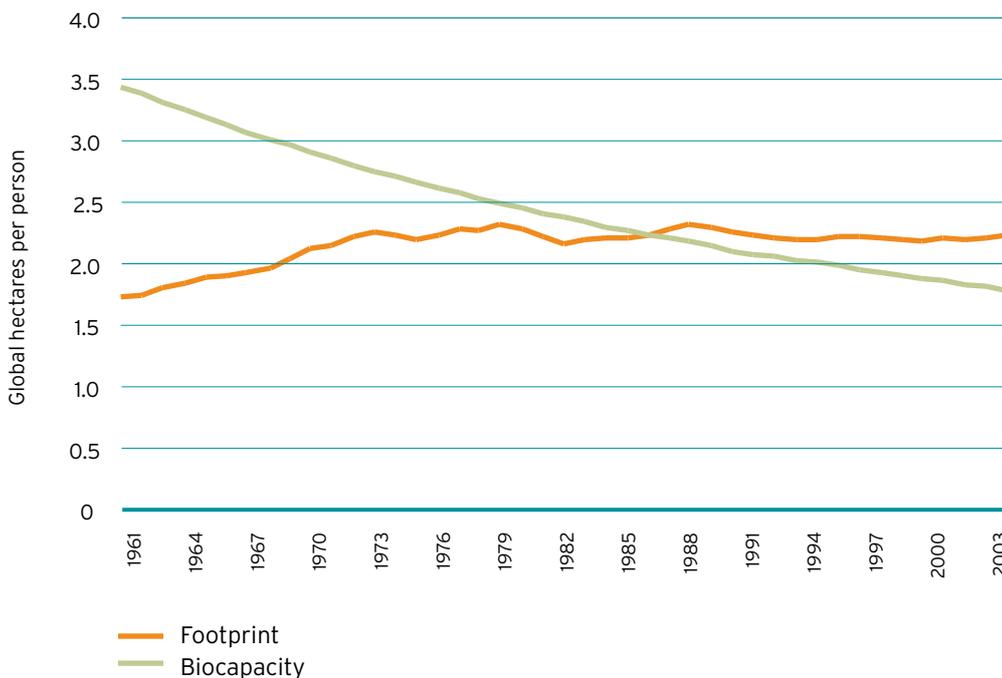
Every human activity consumes resources from the planet and produces waste that the planet must then deal with. However, we only have one planet Earth. As our demand for resources has grown we have exceeded the rate at which the Earth can regenerate resources and absorb our wastes, with a current global overshoot of 30 per cent. Put another way, it now takes about one year and four months for the Earth to regenerate what humanity uses in a single year. We maintain this overshoot by liquidating the planet's natural resources. For example, we can cut down trees faster than they regrow, and catch fish at a rate faster than they repopulate.

While this can continue for a short while, unless overshoot is addressed, it will ultimately lead to the depletion of the resources on which our economy depends.

Measuring the Ecological Footprint of a population (an individual, a city, a nation or all of humanity) allows us to assess our overshoot, which helps us to better manage our natural assets and ensure consumption is sustainable.

People often get disillusioned by sustainability, saying it is too complicated to understand. Measuring our Ecological Footprint can help shed light on this issue by identifying what activities are having the biggest impact on the environment and inspiring people to take personal and collective actions to reduce our impact and live within the means of one planet.

Humanity's accumulating ecological debt



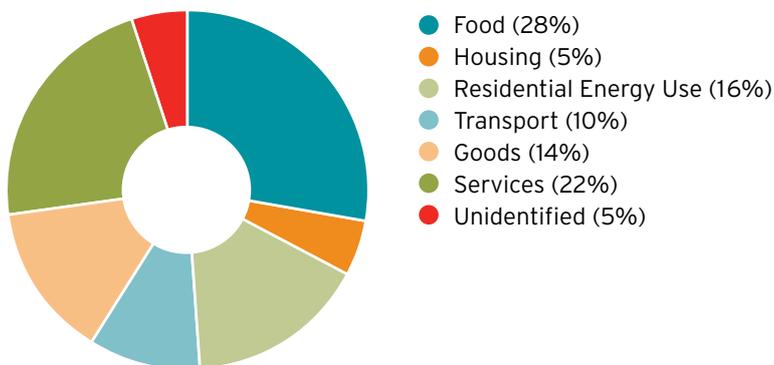
There is no doubt climate change is one of the greatest social, economic and environmental challenges of our time. Every time you use electricity generated from fossil fuels, you produce greenhouse gases, which contribute to climate change. This impact is reflected in the carbon Footprint. If we can reduce these areas of our Footprint, we will be reducing our impact on climate change.

Victoria's Ecological Footprint

The average Victorian is using 6.8 global hectares to support their lifestyle for one year; however, there are only 1.8 gha available per person. If everyone in the world lived like Victorians, *four* planets would be needed.

This report organises Victoria's Ecological Footprint into *consumption categories*, such as the food we eat, the energy we consume and the services we use. This helps provide a focus on where to take action to achieve maximum reduction in environmental impact. The following pages break these consumption categories down to show how these activities contribute to the Footprint.

Victoria's Ecological Footprint by consumption category



Food

28% of Footprint

We have to eat, but we often don't realise that the food so readily available to us in supermarkets comes at a cost to the environment.

Consumption of food has a significant Ecological Footprint. This is because the production, processing, packaging, storage and transport of food require large amounts of land and energy. In general, processed foods have high Ecological Footprints, since large amounts of resources are required to process food. While packaging has its place in helping to protect food, it also requires the use of resources and energy to produce and, when thrown away, puts a demand on the environment.

Food wastage is a common occurrence. For example, it has been estimated that in 2004 Victorians threw away a total of \$2.5 billion worth of food³. However, this wasted food costs more than just the money we paid for it; it also wastes all the water, energy and other resources that went into producing the food. In addition, when food waste breaks down in landfill, it produces greenhouse gases. In fact, for every kilogram of food waste sent to landfill, about one kilogram of greenhouse gases is produced⁴.

Moving towards a sustainable Victoria will involve difficult choices. Meat and dairy industries are significant contributors to Victoria's economy and a key part of Australian society, with 'the great Aussie barbeque' a regular weekend activity for many Australians. However the Food Footprint shows us that meat and dairy industries are the most resource-intensive. For example, in Australia, a single serve of meat is estimated to create five kilograms of greenhouse gases¹ and it takes about 1600 litres of water to produce a kilogram of wheat, but about 17,000 litres to produce one kilogram of beef².

This does not mean we should necessarily eat less beef and dairy products, especially as Australian beef and dairy producers are amongst the most efficient in the world in their sectors. People will continue to make food purchases based on a variety of factors: taste preferences, dietary needs, prices, environmental factors and so on. It does, however, indicate that we need to continue to support efforts by farmers in these sectors as they strive to find ways to reduce water, energy and other resource use.



What can you do?

- + Buy food that is in season and shop at farmers markets when possible.
- + Buy less processed food.
- + Don't waste food – buy only what you will eat.
- + Choose food that has less packaging.
- + Look at the *Australian Guide to Healthy Eating* to see how much meat, dairy, fruit and veggies are good for you!



Services

22% of Footprint

This category includes a large range of commonly used services such as government, telecommunication, financial, retail and medical services, as well as clubs, accommodation, libraries, museums and art galleries.

Such industries are often seen as having a minimal on-site environmental impact, but they often have significant off-site environmental impacts from the goods and services they require to operate. For example, they may require air-conditioning, aeroplane travel, maintenance, electricity, transport and staff in order to deliver their services. All of these things require the use of energy and resources, which contribute to the services Footprint.

Since our lifestyles increasingly depend on services, this category makes up a significant piece of Victoria's overall Footprint.



What can you do?

- + Choose your service providers wisely. Research their environmental credentials and values.
- + Refer to a green directory when looking for a service provider.
- + Ask service providers if they work under an accredited environmental management system.

Residential energy use

16% of Footprint

Energy production and use is the largest contributor to Victoria's greenhouse pollution.

Energy is central to our way of life, from lighting our buildings to powering our appliances. However, as Victoria relies heavily on non-renewable fossil fuels that increase the concentration of greenhouse gases in the atmosphere, our use of energy is directly contributing to climate change.

Most of Victoria's residential energy use is met through brown coal-fired power stations. Brown coal produces the highest levels of carbon dioxide emissions of all forms of electricity generation, thereby contributing significantly to climate change and the Ecological Footprint. Fourteen per cent (0.96 gha) of each Victorian's Ecological Footprint is from electricity use alone.

With the current trend toward bigger house sizes and decreasing occupancy rates, the energy intensity of the residential sector is increasing, with the average household responsible for over 12 tonnes of carbon dioxide every year⁶. Residential energy use accounts for 17 per cent of Victoria's total energy use⁷. Therefore, reducing residential energy use will go a long way to reducing Victoria's greenhouse gas emissions.



What can you do?

- + Switch to energy-saving light globes and turn off lights when leaving a room.
- + Switch off appliances at the wall and minimise the number of appliances in your household.
- + Wash your clothes in cold water.
- + Set your thermostat to 20 °C in winter and 26 °C in summer.
- + Switch to GreenPower.



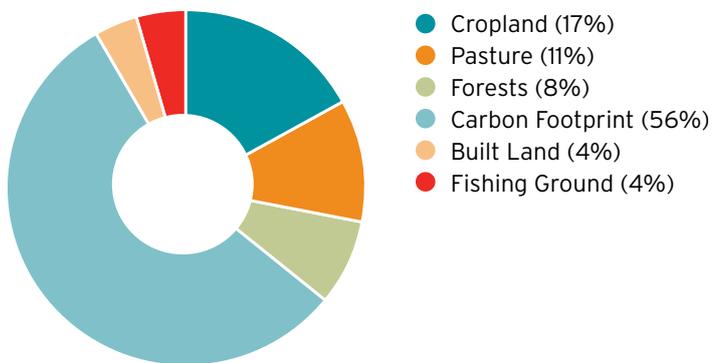
The *real* impact of energy – the carbon Footprint

The impact of energy is far-reaching and better represented in the *carbon Footprint*. There are two ways of viewing the impact energy has on the Ecological Footprint.

Residential energy use only includes non-mobile electricity and fossil fuels. It does not include the energy embedded in goods and services that Victorians buy. For this reason the carbon Footprint is much higher than the category of residential energy use alone.

The carbon Footprint is by far the most significant part of Victoria's total Footprint (56 per cent) but is still an underestimate of Victoria's greenhouse pollution, as only carbon dioxide emissions are included, not methane or other greenhouse gases.

Victoria's Ecological Footprint by land type



Land type

In addition to consumption categories, Ecological Footprint distinguishes different types of bioproductive areas that provide renewable resources for human consumption.

Cropland is the land type used for growing crops for food, animal feed, fibre, oils and biofuels.

Pasture is used for raising animals for meat, milk, wool and hides.

Forest area is natural or plantation forest used for harvesting timber products and fuel wood.

Built land is used for infrastructure for housing, transportation and industrial production.

Fishing grounds include both freshwater and marine areas where fish can be harvested.

Energy land is the theoretical area that is required to sequester carbon dioxide emissions from human activity.

Goods

14% of Footprint

All products we consume have an impact on the environment.

All consumer products, such as clothes, appliances, furniture and electronics require energy, water and materials to produce. One-third of the natural resources ever consumed by humanity were consumed in the last 30 years⁸. In supplying these natural resources to manufacture the products we consume, large amounts of greenhouse gases are released. For example, making a kilogram of aluminium generates more than 15 kilograms of greenhouse gas⁹.

It has been estimated that Victorians spend close to \$1.3 billion on items they purchase but don't use¹⁰.

Australian households own approximately nine million computers, five million printers and two million scanners¹¹. In addition, at least 72 per cent of Australian households have access to a mobile phone¹². However, in today's society the drive to have the latest products results in the wastage of the old products being replaced. This type of waste, termed, 'e-waste', is one of the fastest growing waste types.

Victorians are generating increasing amounts of waste each year. Recyclable products can reduce the amount of waste going to landfill and have the added benefit of providing manufacturers with recycled material, which has a lower environmental impact. For example, recycling aluminium products only emits five per cent of the greenhouse gas emitted in primary aluminium production¹³.



What can you do?

- + Reduce, reuse, recycle.
- + Next time you go shopping ask yourself: 'do I really need to buy this?', 'can I borrow it?' and 'can I hire it?'
- + Buy recycled products when available.
- + Insist on products with minimal packaging.

Want to know more about how the goods you buy impact the environment?

Check out ACF's Consumption Atlas at www.acfonline.org.au and watch 'The Story of Stuff' at www.storyofstuff.com



Transport

10% of Footprint

Transport of people makes up 10 per cent of Victoria's total Ecological Footprint. Over half of this is made up of the use of passenger cars and trucks, largely due to petrol and diesel consumption, which releases carbon dioxide into the atmosphere.

Transport is the second largest producer of greenhouse gases in Victoria, after electricity generation, emitting over 20 million tonnes of carbon dioxide every year¹⁴. The average Australian household generates about six tonnes of greenhouse gas every year from transport alone¹⁵.

A large proportion of the transport Footprint is the result of travel in private cars. Seventy-three per cent of Victorians use a private car as their main form of transport to work or study¹⁶ and such high car usage results in traffic congestion. As a result of higher fuel consumption, driving in such conditions can double the output of greenhouse gases compared to free-flowing traffic¹⁷.

The impact of transporting goods is calculated as part of Goods and is reflected in the carbon Footprint.

As well as emitting greenhouse gases, cars and trucks release dangerous chemicals and particles that reduce air quality and have serious health implications. Studies indicate that current levels of air pollution contribute to approximately 300 deaths and 1000 hospital admissions per year in Melbourne¹⁸. In addition it is estimated that particle pollution from motor vehicles costs the Victorian economy up to \$1 billion per year in premature deaths and direct medical costs¹⁹.



What can you do?

- + Choose public transport where available.
- + Walk or cycle rather than driving.
- + Reduce air travel – consider local holidays.
- + Consider carpooling.
- + Switch to a low-emissions vehicle.

Housing

5% of Footprint

New house construction is the biggest contributor to the overall housing footprint.

More than 35,000 new houses are built in Victoria every year²⁰. Building each house requires 27 global hectares. This represents the land area required to produce all the construction materials, provide the energy and deliver the services needed to build a new house. Of all the materials needed, timber is the biggest contributor, with two-thirds of a new house's Footprint attributable to the forest area required to supply timber (43 per cent), followed by 16 per cent for use of electricity during construction.



What can you do?

- + Design a new house that uses natural light and is thermally insulated.
- + Check the environmental credentials of your builder.
- + Use recycled materials when building or renovating.
- + Choose energy-efficient appliances and lighting.
- + Retrofit existing homes, taking advantage of available government rebates.

Aurora – a case study of sustainable design towards one-planet living⁸

Building sustainable design into the construction of new housing at Aurora, VicUrban's residential community in Epping North, means that residents will not only have less impact on the environment, but will also save on the costs of running their homes. An Ecological Footprint study of the development showed the following:

- + The housing Footprint of Aurora is 53 per cent less than in conventional developments.
- + Aurora homes use 60 per cent less household energy compared to a conventional five-star development. This is a result of the six-star energy-efficient house design, which includes evaporative cooling, gas heating and 100 per cent solar hot water.
- + Aurora homes use 45 per cent less water due to the use of AAA-efficient water fixtures and a third pipe which provides recycled water for flushing toilets, watering gardens and washing cars.
- + Aurora homes reduced the transport component of the Ecological Footprint by 11 per cent, due to the pedestrian and bike-friendly design, combined with greater housing densities.



Footprint snapshot

The footprint of a household fridge

Purchasing goods and using services contribute significantly to Victoria's total Ecological Footprint.

The use of energy and water are the most visible areas of a person's impact on the environment. However, while many Victorians are increasingly aware of the need to conserve water and reduce energy use, information about the hidden environmental impacts of many products and services is much harder to come by.

The Ecological Footprint analysis of a refrigerator shows that manufacturing this everyday household item requires 0.021 global hectares, for one fridge over one year.

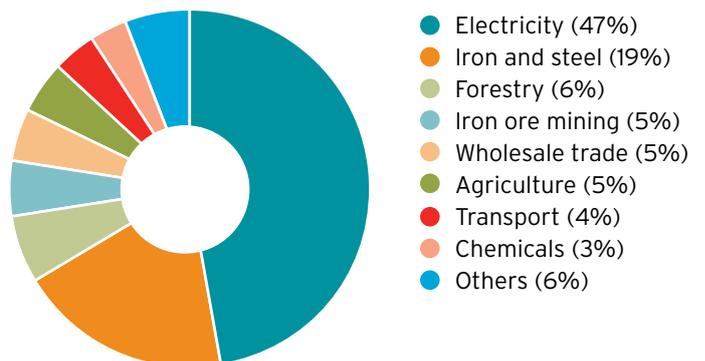
The electricity consumption required for manufacture accounts for up to 47 per cent of the fridge's Footprint; production of steel accounts for 19 per cent, with forestry accounting for 6 per cent, largely due to the cardboard packaging used for shipping the fridge. Wholesale trade and road transport each account for four to five per cent of the total fridge Footprint.

Once the fridge has been manufactured, there are significant environmental costs associated with running it. Annual electricity consumption of a fridge makes up about 12 per cent of total residential electricity consumption²¹ and contributes 0.16 global hectares to the Ecological Footprint of each Victorian household each year. This is because of the greenhouse gas emissions from using fossil fuel-based electricity.

To reduce the Ecological Footprint of a fridge, the carbon intensity of electricity used in both the production and use phase would need to be reduced. This can be achieved by using more efficient appliances and switching to alternative energy sources.



The Ecological Footprint of an average household fridge



How does Victoria compare with Australia?

Victoria's Ecological Footprint is large and Australia's is similar (6.6 gha per person).

The main pattern of consumption in Victoria is similar to the national average, except for a notable difference in the area of residential energy use, where Victorian residents have an Ecological Footprint 36 per cent larger than the average Australian. This is mainly due to Victoria's reliance on electricity from carbon dioxide-intensive, brown coal-fired power stations, the most polluting energy source in Australia.



Loy Yang Power Station, Victoria

Comparing the contribution of the consumption activities of Victorians with the averages for Australia





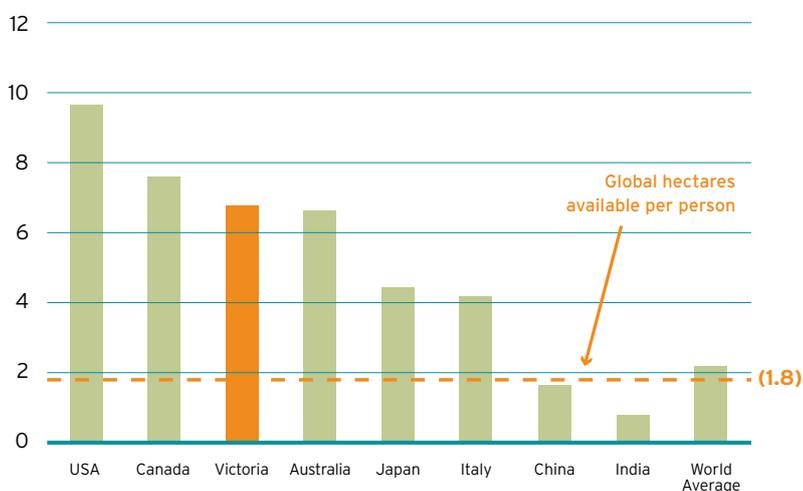
The global context

With a Footprint of 6.8 gha per person, Victoria is well above the average global Footprint of 2.2 gha.

Whilst it is clear that Victoria's Ecological Footprint is unsustainable, on a global scale it is important to note that it is mostly low-income nations whose Footprint is within the global average biocapacity of 1.8 gha. A small number of high-income nations are consuming well in excess of global and even local biocapacity. The average Footprint of high-income countries is 6.4 gha, for middle income it's 1.9 gha, and low-income countries have an average Footprint of 0.8 gha²².

However, living sustainably does not necessarily require a reduction in quality of life, nor do all countries with a high standard of living have a large Ecological Footprint. For example, Italy, a high-income country with a high quality of life, currently has an Ecological Footprint of 4.2 global hectares per person. Whilst not within global average biocapacity, Italy's Footprint is considerably smaller than Victoria's and most other high-income countries. The design of Italian cities is very compact, with a high reliance on public transport, and Italians enjoy eating locally produced food. This shows us that we can make real progress toward sustainability without compromising our standard of living or quality of life.

Ecological Footprint of nations





What does it mean?

The Ecological Footprint is a powerful tool for advancing sustainability, yet some people misinterpret it as a threat to human wellbeing that will lead to a lower standard of living. The intent of the Footprint is actually the opposite. Footprint seeks to help secure quality of life within the reality of one planet. It shows us that ignoring ecological limits is a major threat to human wellbeing and opens up the possibility of sustainable, prosperous lives for all.

This Ecological Footprint analysis demonstrates that there is a need for Victorians to be smarter in the way we consume resources. While it is important to use technologies to reduce Victoria's Ecological Footprint, gains in energy and resource efficiency are often outdone by increased consumption. Even drastic measures to reduce water and energy use may not have the desired effects unless they are complemented by strong action to reduce the environmental impacts associated with consumption and purchase of goods and services.

It is clear that Victorians need to move to a more sustainable lifestyle if our Ecological Footprint is to be reduced. To reduce our impact on the environment Victorians must live smarter by using less electricity, switching to GreenPower, and choosing goods and services that have a small Footprint. This will not only have positive environmental effects but also lead to healthier, more sustainable communities and a better quality of life.

In the Victorian Government's Green Light Report – Victorians and the Environment in 2008 – 90 per cent of survey respondents felt that they can do something about the environment as individuals. Also, 25 per cent of respondents nominated environmental issues as the most important matter for the Victorian Government to attend to.

Learn more about how you can reduce your personal Footprint at www.epa.vic.gov.au/ecologicalfootprint/calculators/personal/completed.asp

Victoria's last Ecological Footprint assessment showed that the average Victorian was consuming 8.1 gha each year to sustain their lifestyle, compared to 6.8 gha in this study. As the science of Footprint has progressed since the previous study, there are methodological differences between the two studies. The apparent reduction is probably due to the change in method rather than a genuine Footprint reduction.

*At the time of publication, WWF released the **2008 Living Planet Report**, including the Ecological Footprint Atlas 2008 by Global Footprint Network, presenting the Ecological Footprint and biocapacity results for 201 countries, including 150 whose populations exceed 1 million.*

For information about uncertainties and data sources, see the full technical report available from www.epa.vic.gov.au/ecologicalfootprint



Calculate your own Footprint

If you would like to find out how much bioproductive area it takes to sustain your lifestyle and how many planets we would need if everyone on Earth shared your way of life, log on to www.epa.vic.gov.au/ecologicalfootprint and explore EPA's Ecological Footprint calculators.

Here you will find a variety of information, including what Australia's Footprint looks like in comparison to the rest of the world, and how you can calculate your own Ecological Footprint. You can also learn more about the origins of the Ecological Footprint, and the Ecological Footprint community around the world.

Calculating the Ecological Footprint for yourself, school, shop or event will help you to identify the environmental impacts of everyday activities. The results of your Ecological Footprint may even motivate you to make a few changes to your lifestyle and take steps towards a more sustainable Ecological Footprint.

For answers to questions about Ecological Footprint, see Global Footprint Network's FAQ page at www.footprintnetwork.org



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