

Environmental benefits of cycling



This Fact Sheet outlines the environmental benefits of cycling compared to Australia's most common mode of transport - the car. It shows that cycling can improve our environment by replacing some car trips.

Greenhouse pollution: direct emissions

About half of the greenhouse gas emissions produced by an average Australian household each year are from transport - see Figure 1.¹ Cycling is one way a household can significantly reduce its contribution to the pollution that causes climate change.

Cars produce an average² of 0.3 kg of CO₂ per km travelled.³ A cyclist emits negligible greenhouse or other pollution.⁴ **So for each kilometre you ride your bike instead of driving, you are saving approximately 0.3 kg of CO₂.** This is equivalent to the energy from running a 60 watt incandescent light globe for close to 5 hours.⁵

Using bicycles to replace short car trips and city driving gives the greatest savings in emissions. Stop-start driving and short trips (where engines do not properly warm-up), result in fuel being burnt less efficiently and a higher level of emissions.^{6,7}

In our capital cities, most trips involve stop-start driving or short trips: 53% of trips in Melbourne are less than 5 km,⁸ with similar figures in Sydney,⁹ Brisbane¹⁰ and Perth,^{11,12} - see Table 1. Many of these trips could easily be ridden by bicycle.

Table 1 - Proportion of car trips below 3 and 5 km in three Australia cities

City	Car trips less than 3 km	5 km
Brisbane	29%	45%
Melbourne	37%	53%
Perth	32%	48%
Sydney	25%	42%

Air pollution

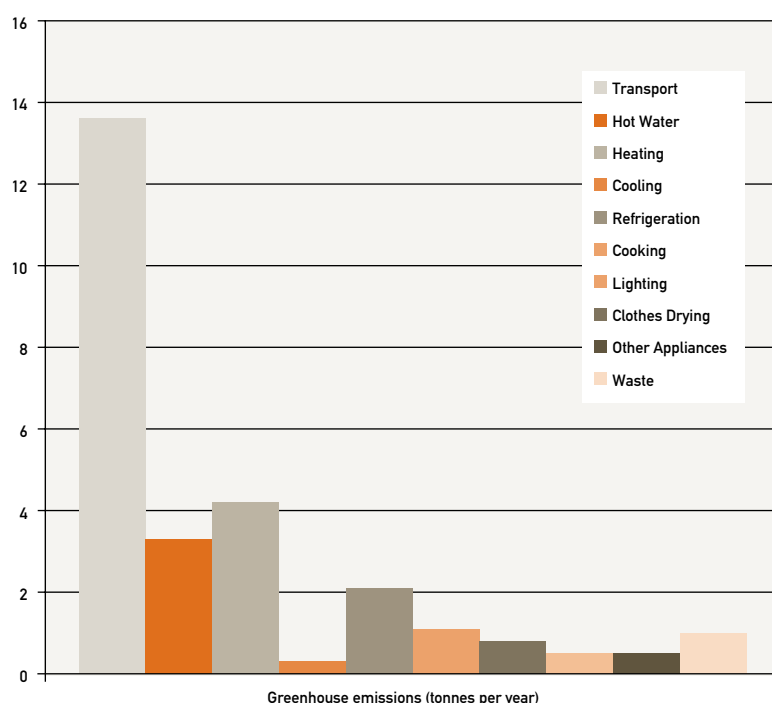
Passenger cars are our cities' biggest producers of carbon monoxide, oxides of nitrogen, sulphur oxides, ozone-forming substances, hydrocarbons and fine particulates. The interiors of new cars give off formaldehyde and other contaminants¹³ linked to cancer, birth defects, brain and nerve damage, and long term injury to the lungs and breathing passages.¹⁴

In Australia it is estimated that in a single year, air pollution from motor vehicles causes between 900 and 2,000 early deaths and between 900 and 4,500 cases of bronchitis, cardiovascular and respiratory disease, costing between \$1.5 and \$3.8 billion.¹⁵ Air pollution also harms the environment by restricting plant photosynthesis, damaging leaves and adversely affecting the yield of some crops.^{16,17}

Motor vehicles also produce *other pollutants* like oil and petrol residues,¹⁸ which enter the storm-water system and are a major source of waterway and ocean pollution.

Every time you cycle instead of driving, you significantly reduce emissions of pollutants and toxins into our environment. There is also evidence that as a cyclist, you breathe in less, not more pollution - see our Fact Sheet on the *Health Benefits of Cycling*.

Figure 1: Greenhouse emissions per household application





Indirect greenhouse and other pollution: 'embodied energy' and the 'chain of impact'

'Embodied energy' is all the energy that goes into the manufacture and delivery of a product. This includes energy for mining, refining and transport of materials and manufacture of the goods. At each stage the energy used produces greenhouse and other pollution.

A typical \$30,000 car embodies 475 gigajoules of energy, or 41 tonnes of CO2 equivalents and over one million litres of water. In contrast, a typical \$500 bike would embody just 8.8 gigajoules of energy, 0.75 tonnes of CO2 equivalents and 19,000 litres of water.¹⁹

The 'chain of impact' includes the energy required for the infrastructure and services associated with car and bicycle use such as the energy used to build roads, paths, car parks etc. It also includes a share of the materials and energy used for emergency services and hospital wards (that service the victims of both traffic accidents and illnesses related to pollution), and the energy and materials for repairs, maintenance, spray painting, and providing new car parts. **German research shows that each car produces**

26.5 tonnes of rubbish.¹⁸

The bicycle is much smaller, has slower speeds and lower maintenance and infrastructure needs than the car. Car-free city centres, or a shift to more bicycle-centred urban design can make great savings in our transport systems' chain of impact. For example, **up to 10 bikes can fit into one car parking space.**^{20,21} Energy use and greenhouse emissions associated with the provision of infrastructure and services for bicycles are considerably less than the requirements for cars.

Noise pollution

A 1989/90 study found that, based on OECD criteria, 9% of the Australian population was exposed to excessively high levels of noise, of 68 decibels or more,²² while a 1993 study in NSW identified that 73% of individuals exposed to environmental noise were affected by road noise alone.²³ **The main noise arising from cycling is the ringing of bells.**

Urban design and amenity

A city designed for much higher levels of cycling would be a cleaner, less polluting, more pleasant and liveable environment in which to

live. In regions with high vehicle ownership rates 10-20% of urban land is typically devoted to roads and parking space. In commercial centres, this figure can be greater than 50%.²⁴ High density cities can devote less of their space to roads.

Urban sprawl has resulted in car-dependent suburbs, and increased greenhouse emissions and air pollution. Less than 7% of Australian urban trips are made by public transport, bicycle or walking.²⁵ High increases in fuel prices have had negative economic impacts, especially on residents of outer suburbs who tend to rely more on cars.



Bicycle Federation of Australia	www.bfa.asn.au	02 6249 1181
Bicycle NSW	www.bicyclensw.org.au	02 9218 5400
Bicycle Queensland	www.bq.org.au	07 3844 1144
Bicycle SA	www.bikesa.asn.au	08 8232 2644
Bicycle Tasmania	www.biketas.org.au	
Bicycle Transportation Alliance	www.multiline.com.au/~bta/	08 9420 7210
Bicycle Victoria	www.bv.com.au	03 8636 8888
Cycling Australia	www.nsw.cycling.org.au/	02 9644 3002
Cycling Promotion Fund	www.cyclingpromotion.com.au	03 9818 5400
Pedal Power ACT	www.pedalpower.org.au	02 6248 7995

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- ¹ Australian Greenhouse Office / CSIRO, *National Kilowatt Count of Household Energy Use*, 2002
- ² *The Green Vehicle Guide* (1) and the Australian Greenhouse Office (2) indicate that actual average fuel consumption (and therefore CO₂ emissions) would vary from test condition fuel consumption because of: the use of added extras such as air conditioning; age of car (old cars are less efficient but it is greenhouse gas intensive to replace them); maintenance and tuning; optimal tyre inflation; road and traffic conditions; and driving speed (at 110 km/h your car uses up to 25% more fuel than it would cruising at 90 km/h).
 - (1) Department of Transport and Regional Services, *Green Vehicle Guide – Tips for Greener Motoring*, 2006, <http://www.greenvehicleguide.gov.au/gvgpublicui/StaticContent/greener.aspx>, accessed 10/01/07
 - (2) Department of Environment and Water Resources, Australian Greenhouse Office, *10 Top Tips for Fuel Efficient Driving*, <http://www.greenhouse.gov.au/fuelguide/tips.html>, accessed 14/01/07
- ³ For petrol driven passenger vehicles, the average fuel consumption for the year ended 31 October 2005 is estimated at 11.4 litres per 100km (1). A petrol driven passenger vehicle with average CO₂-equivalents emissions of 2.8 kg per litre of fuel (2) will produce 0.3 kg of CO₂ per kilometre travelled.
 - (1) Australian Bureau of Statistics, *9208.0 - Survey of Motor Vehicle Use, Australia, 01/11/04 to 31/10/05*, Table 5, <http://www.abs.gov.au/Ausstats/abs@.nsf/39433889d406eb9ca2570610019e9a5f63af63dccc1078f4ca2571e1001f0ff6?OpenDocument>, access 11/03/07
 - (2) Department of the Environment and Water Resources, Australian Greenhouse Office, *Transport – How can I save?* Web page, <http://www.greenhouse.gov.au/gwci/transport.html>, accessed 12/03/07
- ⁴ While it is true that the cyclist, due to increased respiration, will breathe out slightly more CO₂ than the motorist, this is considered negligible.
- ⁵ For every kilowatt-hour (kWh) of energy used in NSW/ACT, 1.068 kg CO₂-e is produced (1). Time in hours to produce 0.3 kg of CO₂-e = (0.3 kg of CO₂ from 60 W light bulb) / ((1.068 kg of CO₂/kWh) X (60/1000 kWh)) = 4.68 hours
 - (1) Department of the Environment and Heritage, *AGO Factors and Methods Workbook*, December 2006 Table 5, p.13, <http://www.greenhouse.gov.au/workbook/pubs/workbook2006.pdf>, accessed 12/04/07
- ⁶ For modern engines, the warm up time for the engine cooling system is very short and the richer Air Fuel Ratio for this short period is unlikely to have a significant impact on carbon dioxide emissions. The main significance of the warm up time for modern engines is for non-greenhouse pollutants e.g. NO_x, as the exhaust catalyst has a longer warm up time than the engine for the oxidation/reduction reactions to occur effectively. However, with the average age of the Australian motor vehicle fleet being 10.4 years old (1) there would still be many vehicles on the road whose engines do produce elevated greenhouse gas pollution during a significant warm up period, estimated by Chevron to be in the range of 5 – 10 miles of urban driving (2) and still noted by transport ministers, for example, New Zealand's the Hon Judith Tizard (3).
 - (1) Australian Bureau of Statistics, *1301.0 - Year Book Australia, 2005 - Australia's automotive industry*, web page, <http://www.abs.gov.au/AUSSTATS/ABS@.NSF/Previousproducts/1301.0Feature%20Article252005?opendocument&tabname=Summary&prodno=1301.0&issu e=2005&num=&view=>, accessed 13/03/07
 - (2) Chevron, *The Real World*, undated web page, <http://www.chevron.com/products/prodserv/fuels/bulletin/oxy-fuel/realwrl.shtml>, accessed 13/03/07
 - (3) Judith Tizard, New Zealand Associate Minister of Transport, 2007, 'Low carb' diet will cut vehicle emissions, press release, 4 March 2007, <http://www.scoop.co.nz/stories/PA0703/S00064.htm>, accessed 13/03/07
- ⁷ Department of the Environment and Water Resources, Australian Greenhouse Office, 2006, *Global Warming – Cool It!, Transport – How Can I Save?* <http://www.greenhouse.gov.au/gwci/transport.html>, accessed 13/03/07
- ⁸ Transport Research Centre, *Victorian Activity and Travel Survey, 1994 – 1999*, RMIT University, Melbourne
- ⁹ Transport and Population Data Centre, 2002 Household Travel Survey, Sydney NSW, cited in Australian Bicycle Council, 2006, *Benefits of Cycling – Savings to Individuals*, <http://www.austroads.com.au/abc/index.php?type=sep&id=33>, accessed 13/03/07
- ¹⁰ Queensland Transport, *South East Queensland Travel Survey, 2003-04*. For information, see: http://www.transport.qld.gov.au/Home/Projects_and_initiatives/Projects/South_east_queensland_travel_survey/, accessed 27/02/07
- ¹¹ Socialdata Australia, 2000, *Potential Analysis "Perth"*, Department of Transport, Western Australia, http://www.dpi.wa.gov.au/mediaFiles/tsmart_Report.pdf, accessed 27/04/07
- ¹² Austroads, 2005, *The Australian National Cycling Strategy 2005-2010*, Sydney, <http://www.austroads.com.au/documents/TheAustralianNationalCyclingStrategy2005-2010.pdf>, accessed 17/02/07
- ¹³ Air Quality Sciences, 2006, *Indoor Air Quality Hazards of New Cars*, Air Quality Sciences Inc., United States, <http://www.aeris.org/uploads/Indoor%20Air%20Quality%20Hazards%20of%20New%20Cars.pdf>, accessed 14/01/07
- ¹⁴ Department of Environment and Water Resources, Australian Greenhouse Office, *About TravelSmart* web page, <http://www.travelsmart.gov.au/about.html>, accessed 11/03/07
- ¹⁵ Bureau of Transport and Regional Economics, *Health impacts of transport emissions in Australia: economic costs*, 2005, Department of Transport and Regional Services, Canberra, p. 147, <http://www.btre.gov.au/docs/workingpapers/wp63/wp63.pdf>, accessed 11/03/07
- ¹⁶ Department of Environment and Water Resources, Australian Greenhouse Office, *About TravelSmart* web page, <http://www.travelsmart.gov.au/about.html>, accessed 11/03/07
- ¹⁷ Environment News Service, January 15 2003, *EU Cuts Smog Forming Compounds in Paints, Varnishes*, web article, <http://www.ens-newswire.com/ens/jan2003/2003-01-15-03.asp>, accessed 27/02/07
- ¹⁸ Whitelegg, J., undated, *Dirty From Cradle to Grave*, <http://www.ecologica.co.uk/DirtyfromCradletoGrave.pdf>
- ¹⁹ Personal communication, Dr Graham Treloar, Associate Professor: Property and Construction, University of Melbourne. The life cycle energy implications of car use have been known for some time e.g. see Treloar, G., et al, 2000, *Analysing the life-cycle energy of an Australian residential building and its householders*, Building Research & Information, Vol 28(3), pp.184–195. The life cycle energy consumption total includes not just the energy embodied in the car, but also the energy embodied in maintenance, part replacement, other goods and services, car replacement and energy embodied in finance.
- ²⁰ SPOKES, The Lothian Cycle Campaign, undated, *Get Cycle Friendly - a guide for employers*, <http://www.spokes.org.uk/oldsite/bugs.htm>, accessed 14/01/07
- ²¹ Bicycle Victoria, 2004, *The Bicycle Parking Handbook*, <http://www.bv.com.au/file/File/The%20bicycle%20parking%20handbook.pdf>, accessed 10/01/07
- ²² Road Traffic Noise Taskforce, 1994, *Final Report of the Road traffic Noise taskforce: Options for controlling road traffic noise*, Sydney, NSW cited in Lansdell, H., and Cameron, C., 1998, Night-time noise levels: a state-of-the-art review, Research report ARR 323, ARRB, Melbourne, p.9
- ²³ NSW Environmental Protection Authority, 1993, *NSW State of the Environment – Noise Report*, Sydney, NSW cited in Lansdell, H., and Cameron, C., 1998, Night-time noise levels: a state-of-the-art review, Research report ARR 323, ARRB, Melbourne, p.9
- ²⁴ Herbert Levinson, *Transportation and Traffic Engineering Handbook*, Prentice Hall (Englewood Cliffs), 1982, p. 256; Kenneth Button, *Transport Economics*, 2nd Ed, Edward Elgar (Aldershot), 1994, p. 117, both cited in Victoria Transport Policy Institute, undated, *Transportation Cost and Benefit Analysis – Roadway Land Value*, p.5-7-2, <http://www.vtpi.org/tca/tca0507.pdf>, accessed 14/01/07
- ²⁵ Australian Department of Transport and Regional Services, 2004, *AusLink White Paper*, p.4 ISSN 1440-9707, <http://www.auslink.gov.au/publications/policies/pdf/whitepaper.pdf>, accessed 13/03/07