# Climate Change - Re-examining the data from a Vegan Perspective

**by Bruce Poon, March 2007**

## The Problem

The leading climate scientists in the world agree that the Earth is warming, and that the majority of this warming is due to human activity. Fundamentally, the emissions of greenhouse gases, including Carbon Dioxide, have changed the balance of the atmosphere in a way that additional sunlight is 'trapped' by our planet.

This will lead to changes in the overall average temperature for the planet, and could lead to wildly different weather in various regions. Melting of the world's glaciers and ice-caps could lead to changes in the oceans and significantly higher sea levels. A number of potential 'run away' environmental catastrophes are possible, but the science is still determining how close we are to these events.

In a foreword to Tim Flannery's excellent book, 'The Weather Makers', which outlines the problem, Robert Purves, the President of WWF Australia states “Quite simply, climate change is a threat to civilisation as we know it”.[1]

Most of the world has agreed on a framework for tackling the problem, called the Kyoto Protocol. It limits the amount of greenhouse gas that each country can emit without penalty, and makes a market to trade 'carbon credits'.

Australia has to date refused to ratify the Kyoto Protocol, even though we had a special exemption that allowed us to have an increase of 8% p.a. over 1990 levels for Australia during the Kyoto period of 2008-2012.

Australia's emissions from energy use have increased by 46% since 1990. We will only come close to our Kyoto targets because of one-off reductions in land clearing have effectively given us large carbon credits. These credits will be rapidly swallowed up by our rapidly rising energy emissions.

## Examining the Accounts - First Glance

The Australian Government has published a report called the National Greenhouse Gas Inventory, based on 2004 data, which is a summary of our 'accounting' for greenhouse gases.[2]

It is broken up by sources of emission, and a straightforward presentation of the data shows that Australia produced 564.7 Mt of $CO_2$-e (Megatonnes of Carbon Dioxide or equivalent other gases). Stationary Energy (Coal and Gas fired power stations) and fugitive emissions associated with the fuels, contribute a whopping 310.9 Mt or 55% of these numbers.

Other contributors are listed as Transport (13%), Industrial Processes (5%), Agriculture (16%), Land Use (6%) and Waste (3%).

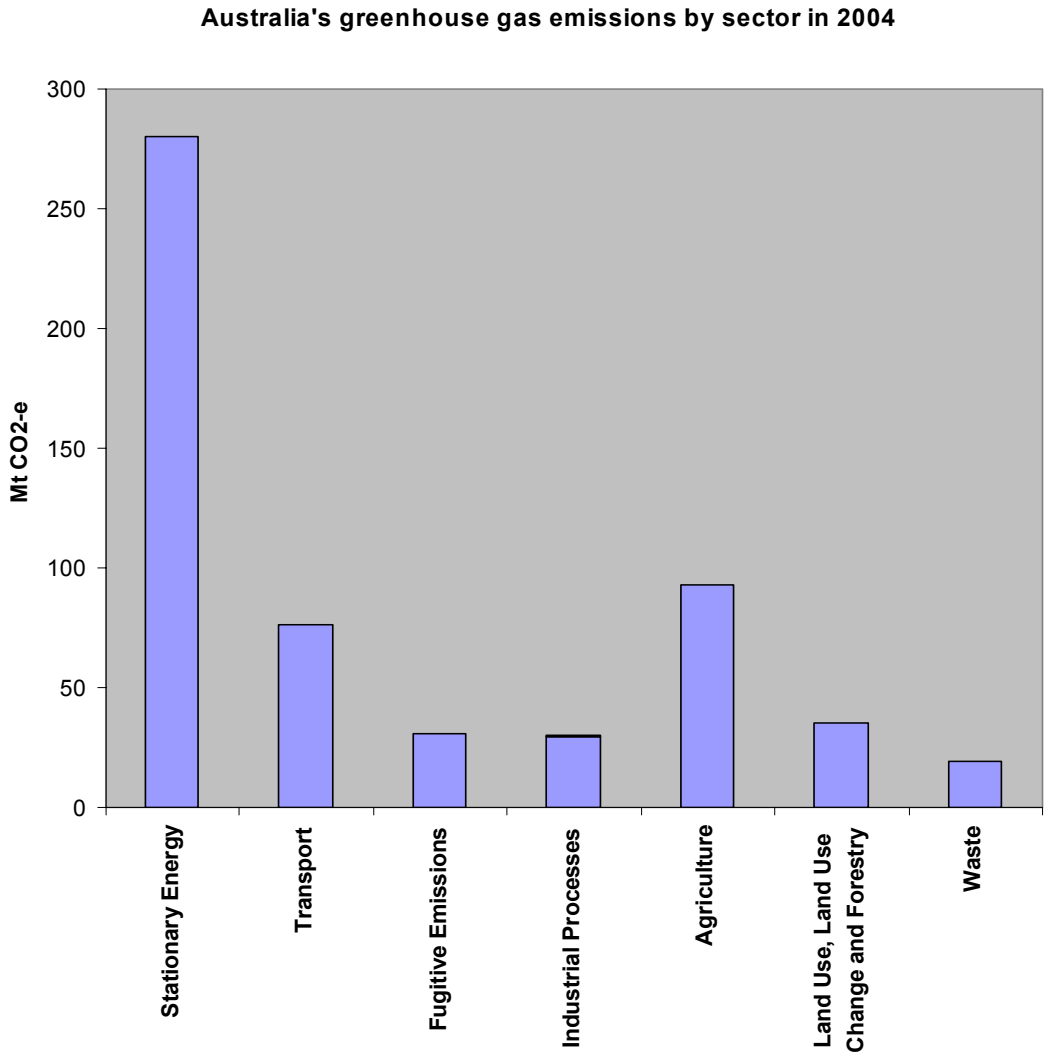


*Figure 1 - Conventional view of Greenhouse accounts*

This explains why there is such focus on changing the mechanisms for the production of Electricity. Surely, the conventional logic goes, since 55% of the total is to do with stationary energy generation, we should tackle that problem first. Perhaps we can find ways to generate 'clean coal' or we could gradually change to wind, wave and solar technologies.

There is merit in examining cleaner technologies for energy generation, but they all come at considerable cost. There is also another way to look at the problem.

**Examining the Accounts - A deeper look**

What do we do with all that Energy? We use it in industry throughout Australia, in agriculture and in domestic homes. In order to properly break out the use of energy within Australia, and which industries use how much, when all their inputs and outputs

are taken into account, another kind of economic report is required.

There is both an 'end-use' report associated with the greenhouse accounts, but more thoroughly, there is a report called 'Balancing Act', a Triple Bottom Line analysis of 135 sectors of the Australian economy. This report was produced by CSIRO and the University of Sydney, and included statistics of greenhouse gases produced by each industrial sector.[3]

When we look at these accounts, we see that the animal industries are significant causes of Greenhouse gases, both through the specific activities involved in the industry, but also through their significant use of energy. Additionally and importantly, they are responsible for significant land degradation.

The following table shows the amount of Carbon Dioxide (or equivalent) released by each industry sector within the animal industries.

| **Industry Sector** | **Mt $CO_2$-e** | **Percent of Total** |
|---|---|---|
| Beef Cattle | 122.5 | 23.6 |
| Sheep and Shorn Wool | 23.9 | 4.61 |
| Dairy Cattle and Milk | 8.8 | 1.7 |
| Pigs | 1.3 | 0.25 |
| Commercial Fishing | 0.68 | 0.13 |
| Meat Products | 0.68 | 0.13 |
| Dairy Products | 0.59 | 0.11 |
| Poultry and Eggs | 0.58 | 0.11 |
| Leather Products | 0.016 | 0.003 |
| **Totals** | **159.03** | **30.64** |

*Table 1 - Carbon emissions by industry sector, animal industries in Australia*

The 'Balancing Act' numbers are based on mid 90's data, compared to the 2004 data used in the National Greenhouse Gas accounts. So while the total numbers of greenhouse gases emitted have increased over that time by about 8.5%, the relative percentages are unlikely to have changed markedly.

This re-analysis shows a substantial total of nearly 31% of the total greenhouse gases that Australia produces, all caused by animal industries. This is a number hidden by the conventional view of the accounts.

The greenhouse accounts also show a figure of 10% of our greenhouse emissions caused by "Land Use, Land Use Change" which is offset in the top level graph (see Figure 1) by 4% Credit through Forestry, that is, growing of new forests to lock up carbon.

Of that 10%, fully 93% of this figure is clearing land for cattle grazing! [4]

31% reduction in emissions is possible by eliminating the animal industries. This is without considering ANY change to our energy generation mix, or other reductions in fuel use in transport or domestic use. Of course, we can and should also look at those other mechanisms for reducing greenhouse gas emissions, but they are secondary to the

cheapest and easiest way to reduce emissions now.

**Forestry**

Eliminating the need for cattle grazing and dairy herds would free up land for other uses. Quite a lot of land actually. About 110 million hectares, roughly the area of NSW and Victoria combined! [5]

If even a fraction of this area was replanted with native forests (or softwoods if desired), then we would start to take carbon from the atmosphere and lock it up in these forests. Even if they were subsequently logged for timber, the bulk of the carbon would remain locked up and out of the atmosphere.

The science and accounting for carbon locked up by forestry is still in its infancy. The numbers are still in flux, and any business case for forestry must take that into account.

As an example though, based on re-planting of 1 Million Hectares per year (less than 1% of the land freed up), we would take 10 Mt of $CO_2$ from the atmosphere each year[6]. In the second year, with another million hectares planted, 20 Mt, 3rd year, 30 Mt, etc.

Somewhere between 3 and 5 decades of planting would see Australia reach carbon neutrality in total. Again, this is completely without any change in Energy Generation, Household Use, Transport Efficiency, etc. With innovations in these areas, it could happen much quicker.

Incidentally, under Kyoto accounting rules, these carbon credits are worth tens of billions of dollars each year. Hugely more than the profits from our current exports of animal products.

**Kyoto Targets**

How would this affect our Kyoto targets? We would easily exceed our Kyoto targets, and go well beyond them. Australia's targets under the Kyoto protocol are modest indeed. It has to be understood that the Kyoto targets are just the start. Beyond Kyoto, the science is calling for reductions in the order of 60-90% from current emissions, just to stabilise the atmosphere at current levels and achieve an equitable emissions regime across the world.

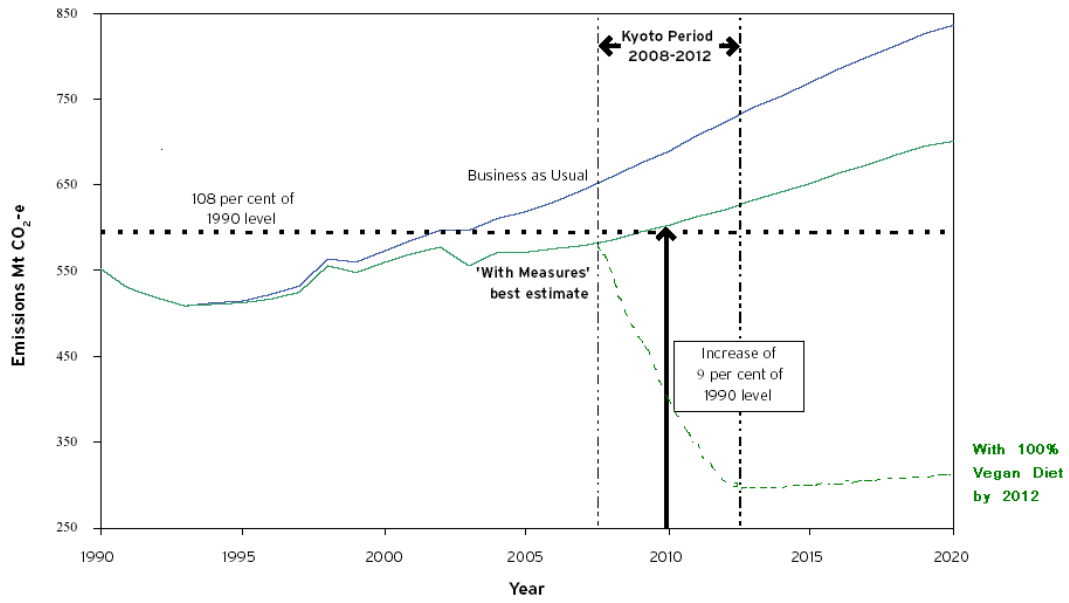


*Figure 2 - Australia's Kyoto Targets, Current Projections and 'with vegetarian diet' projection, not including the further benefits of forestry*

Note that Figure 2 above shows the reduction in emissions over the Kyoto period, with a 5 year change to complete veganism. Any lesser result will have correspondingly lower but proportional results. That is, even a reduction in meat eaten by all people, or a conversion of a smaller proportion of the population to an animal free diet will have a good impact on our emissions profile.

It does NOT show the figures including forestry credits. With this included, the line would dive beneath the current X axis shown on the graph, and hit zero in 3 to 5 decades.

**The rebound effect: wouldn't we need to replace the animal products with other food?**

Yes and No. Firstly, we already eat too many calories! Secondly, we already produce many times the food calories we need to eat healthily. Some of these are then fed to animals, from which we get a substantially smaller return of calories in animal products.

In any case, non-animal food products require vastly less resources to produce. They require less land, less water, less fuel and importantly, produce substantially smaller greenhouse gases.

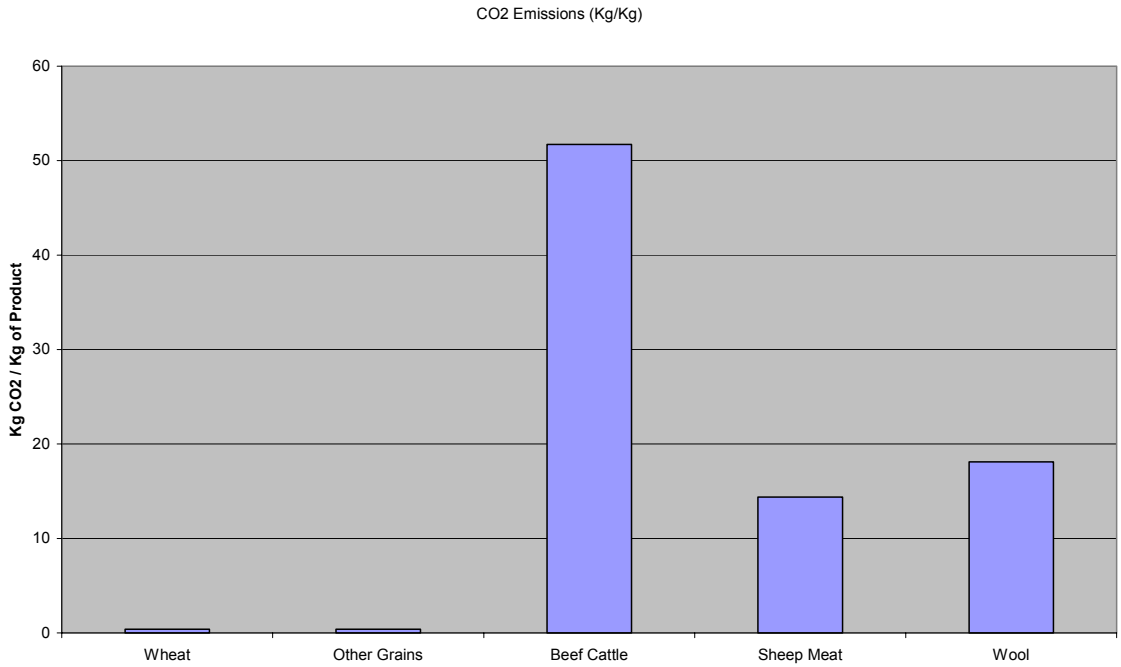


*Figure 3 - Greenhouse Gas Emissions of Fruits, Vegetables and Grains are all substantially less than those of animal products. While Beef is shown here as 52 (1999 End Use Report), new estimations of Methane importance could triple this value!*

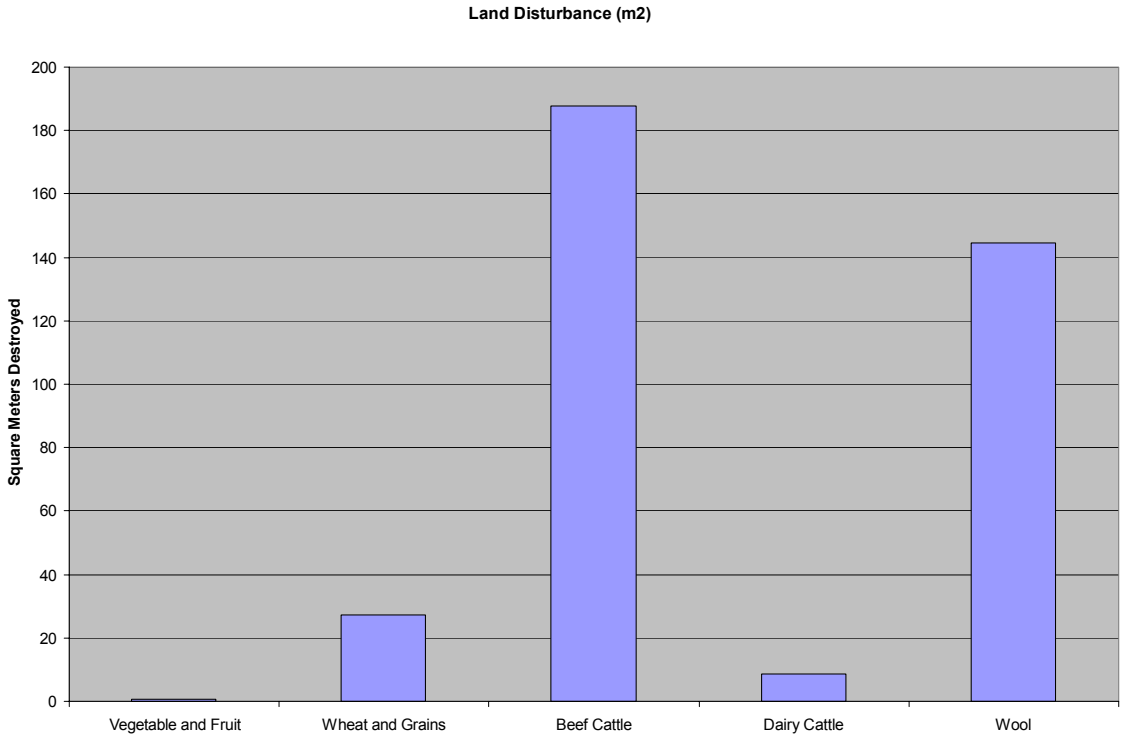


*Figure 4 - Land Disturbance of Fruits and Vegetables, and to a lesser extent, wheat and grains, are vastly less than those of animal products, particularly beef and wool. Note that the measurement is in metres squared damage "per dollar of product". It is also the*

*case that for example, a dollar of grain has more calories and food value than a dollar of beef. If we were therefore to compare the results on a 'per calorie' basis, the comparison would be even more stark.*

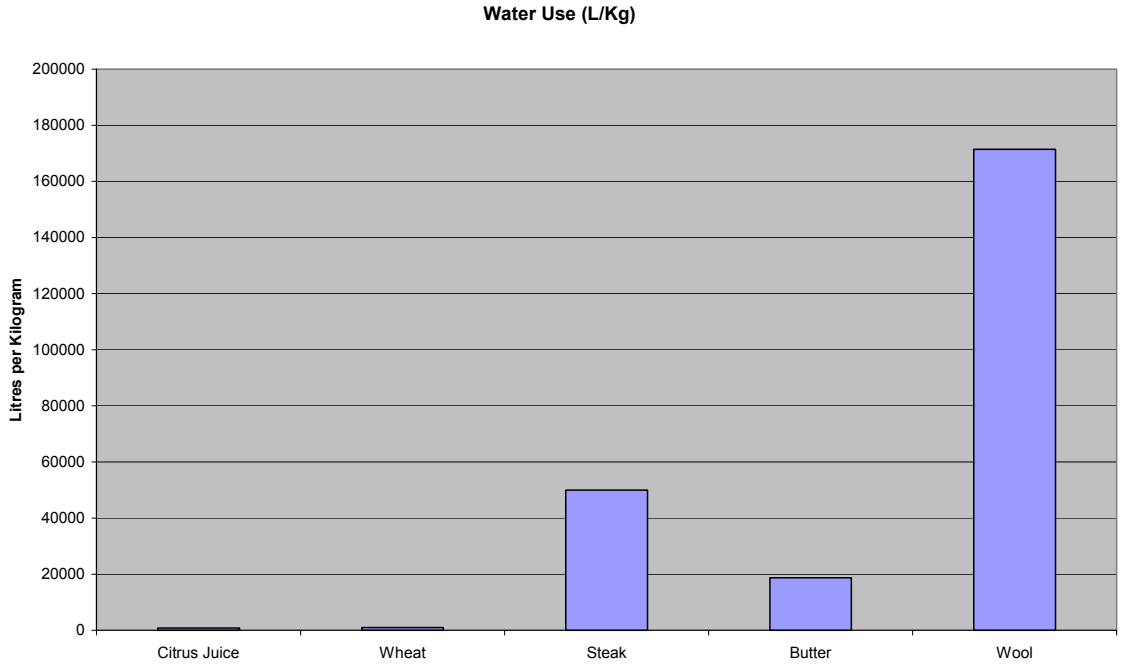


*Figure 5 - Water Use of vegetarian foods is substantially less than animal products. From hundreds of litres to produce 1 Litre of Fruit Juice, to 50,000 litres for a Kilo of Beef, and even more for wool.* [7]

**What about the costs?**

What costs? It costs most people nothing financially to become vegetarian or vegan. This is in stark contrast to the substantial capital costs of changing generation plant, or even end-use efficiencies such as energy saving bulbs or hybrid cars.

Of course, there will be winners and losers. People involved in beef farming will make less money, but people growing vegetables will make more. There would be no net loss to the economy. It would be no more change than the introduction of ATMs (displacing bank tellers) or other changes in employment patterns that Australia has undergone in recent decades. Many farmers are close to retirement age in any case, with natural attrition a useful mechanism to reduce the size of the industry.

On the contrary, a move to lower (or nil) meat consumption would have huge positive benefits to the economy, in terms of substantially lower health costs, reduction in government expenditure and subsidies to prop up animal industries, improved availability of fresh water, improved land, improved tourism potential, additional forestry potential and less imports of fuel.

Carbon credits alone could produce substantially more revenue than currently obtained from animal industries.

The majority of Australians would be substantially better off financially with this change. Of course, some of these savings could be diverted to assist those affected by the necessary structural reform.

**Unpacking the $CO_2$-e mechanism - From Economics to Science**

It is also important, in looking at the figures, to understand what has been lost in converting from the science of the atmosphere, into the accounting of Kyoto. The atmosphere could care less about politics, or bad accounting.

The atmosphere is complex, and the science is still developing. Although we have under Kyoto a 'normalised' set of accounts which are shown in units of $CO_2$-e (Carbon Dioxide or Equivalent) where every other greenhouse gas has been 'converted' into an 'equivalent' figure for accounting purposes.

**Figure 2:** Contribution to total net $CO_2$-e emissions by gas, 2004

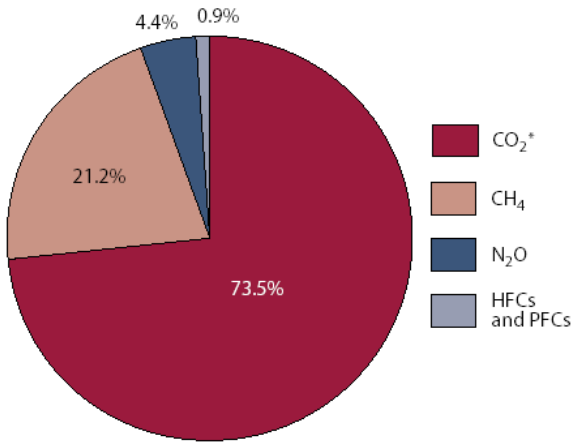


*Figure 6 - Labelled as Figure 2 from the National Greenhouse Gas Accounts, this graph shows Australia's total emissions in $CO_2$-e, where every gas other than carbon has been 'converted'.*

Figure 6 shows that Australia's emissions consist of 73.5% $CO_2$, and an effective $CO_2$ equivalent of 21.2% for Methane. Correspondingly less for Nitrous Oxide and other gases. This does not mean that 21.2% of our emissions are methane, but the much smaller amount has been 'converted' to $CO_2$-e (carbon dioxide equivalent) based on the fact that Methane is a much more potent Greenhouse gas than carbon dioxide.

Current science is indicating that gases other than Carbon Dioxide are responsible for much of the current warming[8]. This is not at all to say that control of $CO_2$ is not important, for it will impact on future warming.

**Methane**

Methane is often said to be 21 times more potent as a greenhouse gas than CO2.

This isn't quite accurate. The inaccuracy is absolutely critical both globally and particularly for a country like Australia with 28 million cattle and 110 million sheep.

If you pump a tonne of methane into the air it breaks down in 10 to 15 years, whereas $CO_2$ stays around for a hundred or more. During that decade or so the methane has a massive impact on climate. The IPCC calculate that the relative potency of methane to $CO_2$ is 62 over a 20 year period. The usual figure of 21, as used by the AGO1, is for a 100 year period. Here is the relevant table from the IPCC[10]:



*Table 6.7: Direct Global Warming Potentials (mass basis) relative to carbon dioxide (for gases for which the lifetimes have been adequately characterised).*

| Gas | | Radiative efficiency ($Wm^{-2}ppb^{-1}$) (from (b) unless indicated) | Lifetime (years) (from Chapter 4 unless indicated) | Global Warming Potential Time horizon 20 years | 100 years | 500 years |
|---|---|---|---|---|---|---|
| Carbon dioxide | $CO_2$ | See Section 6.12.2 | See Section 6.12.2 | 1 | 1 | 1 |
| Methane | $CH_4$ | $3.7x10^{-4}$ Σ | 12.0* | 62 | 23 | 7 |
| Nitrous oxide | $N_2O$ | $3.1x10^{-3}$ Σ | 114* | 275 | 296 | 156 |

*Table 2 - Methane has 62 times more global warming potential over a 20 year time horizon.*

While atmospheric concentrations of $CO_2$ have risen by about 31% since pre-industrial times, methane concentrations have more than doubled.

Whereas human sources of $CO_2$ amount to just 3% of natural emissions, human sources produce 150% as much methane as all natural sources. In fact, the effect of our methane emissions may be compounded as methane-induced warming in turn stimulates microbial decay of organic matter in wetlands—the primary natural source of methane.

Methane is produced by a number of sources, including coal mining and landfills—but the number one source worldwide is animal agriculture. In Australia, animal agriculture is responsible for at least 55% of our Methane emissions. Each 'Dairy Cow' emits even more methane than a 'Beef cow'.

Australia's cattle and sheep produce about 3 megatonnes of methane per annum. 3 megatonnes times 62 is 186. Hence the 3 megatonnes of methane is equivalent to 186 megatonnes of carbon dioxide which shows that our cattle and sheep will have a bigger impact on climate during the next 20 years than all our coal fired power stations which together produce only about 180 megatonnes of carbon dioxide.

Cutting $CO_2$ emissions will have no effect on climate for a very long time --- the oceans act like a huge flywheel and warming increases are already "in the system". The only way to stabilise climate in the short term is to reduce methane. This will have an immediate effect.

None of which means we don't have to worry about $CO_2$, we must reduce $CO_2$ emissions, but while this is happening we must reduce methane to stabilise temperature while we wait for the effects of any reductions to kick in.

**Time is of the essence**

A shift away from Carbon and Methane emitting food sources is relatively simple and cheap compared to alternative mechanisms of reducing the impact of climate change. Even 100% reduction will have little or no negative impact on the economy, and will provide other savings, whereas alternative strategies for cuts in carbon are much more expensive.

Moreover, shifts in diet lower emissions much more quickly than we can move away from fossil fuels. There is a one to two year 'turnover time' for ruminant animals rather than the decades long lifetime for power plants and automobiles.

Changing diet is easy and can be done by a person every day, unlike major changes such as buying a new efficient car or better electrical appliances.

**The Bottom Line – Atmospheric Gases, Climate Change and You**

Australia could reduce its total emissions of greenhouse gases by 31% through the simple expedient of eliminating animal products. Moreover, it could reduce its anthropogenic methane emissions by over 55% the same way. Restoration of the environment on reclaimed land could reduce our emissions to zero over time.

While global climate change is an impending environmental catastrophe, its worst effects could be reduced or stopped by a simple change in diet, without any financial cost (in fact, with overall economic benefit).

For an individual that wishes to minimise their greenhouse gas footprint, and prevent global climate change, the most important, urgent and first step should be to reduce their consumption of animal products, preferably adopting a vegetarian or vegan diet.

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