Why New Zealand must rapidly halve its greenhouse gas emissions

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Abstract

New Zealand must commit to substantial decreases in its greenhouse gas emissions, to avoid the worst impacts of climate change on human health, both here and internationally.

We have the fourth highest per capita greenhouse gas emissions in the developed world. Based on the need to limit warming to 2°C by 2100, our cumulative emissions, and our capability to mitigate, New Zealand should at least halve its greenhouse gas emissions by 2020 (i.e. a target of at least 40% less than 1990 levels). This target has a strong scientific basis, and if anything may be too lenient; reducing the risk of catastrophic climate change may require deeper cuts.

Short-term economic costs of mitigation have been widely overstated in public debate. They must also be balanced by the far greater costs caused by inertia and the substantial health and social benefits that can be achieved by a low emissions society. Large emissions reductions are achievable if we mobilise New Zealand society and let technology follow the signal of a responsible target.

The New Zealand Government has announced a 2020 greenhouse gas emission target of 10–20% below 1990 levels, leading into international climate change negotiations culminating in Copenhagen on 7-18 December. This target range has strict conditions attached and, unlike many developed nations, New Zealand has not offered an alternative emissions target if these conditions are not met.

We consider New Zealand needs to do much more to adequately respond to the climate change threat. We summarise why health professionals should care about this problem, and why it is our duty (to our patients and the wider public health) to act now, before it is too late.

Why health professionals?

Climate change has been described as the biggest global health threat of the 21st Century. Doctors have a professional duty to work to tackle it, and health benefits should be fully included in decision-making, as should the harms of inaction.
A recent high profile review in *The Lancet* noted major threats—both direct and indirect—to global health from climate change. These effects occur through water and food insecurity, threats to shelter and human settlements, population displacement and migration, extreme climatic events, changing patterns of disease, risks to security (e.g. war), and loss of economic potential.

Direct threats to health are powerful motivators for action—often more powerful than discussions about distant threats to rainfall, ocean currents, and fish stocks. Hence those who manage health effects, such as health professionals, are in a strong position to advocate responses to this global threat, for three reasons.

First of all, health professionals are citizens. Secondly, they are privileged by their education, access to power, and a professionally compassionate role in society. Thirdly, they have the ability to assimilate complex evidence and a role in advocacy for health, making them potential leaders.

Sir Muir Gray in *The Times* has compared climate change to cholera in 19th Century England as needing an all-encompassing response, saying the medical profession must be in the vanguard of this new revolution in public health for “the health threat that will come to define our age.” We have ethical obligations and professional duties to use our best efforts to mitigate climate change in whatever way we can.

**Impact and equity: by how much should we reduce?**

The latest Intergovernmental Panel on Climate Change (IPCC) assessment from 2007 reports that a reduction of at least 25–40% of 1990 greenhouse gas emissions levels by 2020 (leading to 80–95% by 2050) is required by the developed world to be confident that the world will avoid 2°C warming. This level of warming was proposed by the IPCC as the climate change ‘guard rail’; beyond 2°C the risks of tipping points with dangerous (and potentially unstoppable) climate change increase steeply.

According to Sir Peter Gluckman, the Prime Minister’s Chief Science Advisor, we risk the consequences of a changing global climate becoming another ‘tragedy of the commons’—where if collective action is not taken then everyone will suffer. The German Advisory Council on Climate Change (WBGU) has commented that relaxing the trajectory of one country results in other countries picking up the bill, as “there is no carbon offset for Planet Earth as such” (see endnote *). New Zealand has the fourth highest per capita greenhouse gas emissions in the developed world and one of the biggest increases in gross emissions since 1990 (see endnote †). Calls for a 40% reduction target on 1990 levels by 2020 for New Zealand, as with the developed world overall, have been based on climate science (the upper end of the 2007 IPCC 25–40% range for developed countries) and equity.

Approaches to determining countries’ individual emissions targets are described internationally, often based on defined global emissions budgets (the global amount of tolerable emissions over a period of time) after which the available emission rights can be divided among countries according to different rules (see endnote ‡).
The 40% reduction target for New Zealand is based on the Responsibility and Capability Index (RCI) approach, instigated in Europe, and which has been adapted by Oxfam International. This explicit, principle-based framework is one of many that incorporates both science and fairness—how much countries have emitted already, and what they can afford; the RCI combines (1) the emission reductions needed globally to limit warming to 2°C with (2) countries’ responsibilities (i.e. their cumulative emissions) and (3) their capability to mitigate (using wealth as a proxy for the capability for action) (see following table and later endnotes §, **, and ††).

In Table 1, New Zealand’s RCI is 0.34% of UNFCCC Annex I (§) countries’ overall target, and is ranked fourth for total greenhouse gas emissions per capita, requiring in fairness a 40.6% reduction by 2020 on 1990 levels (with 40.0% for Annex I countries overall).

Table 1. Mitigation targets—Oxfam International calculations (2009): Fair shares of overall Annex I(§) mitigation target (40% below 1990 levels by 2020)

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**Metrics**: fair share of emissions reductions for each Annex I country (endnote §), calculated using both countries’ partial history of past emissions (cumulative emissions for 1990–200538 for responsibility, see endnote **), and their current levels of income (total income above a ‘development threshold’ for capability, endnote ††).

**Key**: *Column 1* shows fair shares of any aggregate Annex I mitigation target for individual Annex I countries, based on a responsibility-capability index (RCI); New Zealand’s RCI is 0.34% (its fair share of the Annex I target). *Column 2* is per capita emissions in greenhouse gases (GHG) in 2005.
New Zealanders emitted on average 18.7 tonnes CO2-equivalent GHGs for each person that year, ranking it fourth highest.

*Column 3* is 2020 emissions-reductions targets for individual Annex I countries (based on respective fair shares of the total combined minimum reductions target of 40% below 1990 levels for Annex I as a whole), presented in terms of per capita reductions relative to 2005 levels;

New Zealand’s target is a 9.8 tonne CO2-equivalent reduction for each person by 2020 compared with 2005.

*Column 4* is total reductions relative to each country’s own 1990 emissions;

New Zealand’s target is a 40.6% reduction in CO2-equivalents for each person by 2020 compared with 1990. This ranks eighth out of the 17 countries listed in terms of percentage emission reductions necessary.

*Column 5* is total reductions relative to each country’s 2005 emissions;

New Zealand’s reduction by 2020 therefore translates to 52.3% compared with 2005 (ranked seventh).

*LUC* is Land Use Change.


In terms of gross emissions, a 40% reduction below 1990 levels for New Zealand means halving our current emissions (51%) (see endnote †). Our previous inaction[^9] (since 1990) has led to this scale of emissions and the need to reduce them so substantially—we cannot afford to delay again.

Future adaptation to catastrophic climate change will be much less achievable and affordable. Furthermore, transferring these costs and consequences to future generations would be irresponsible.[^5]

Using the latest assessments, even halving New Zealand’s current emissions may be insufficient. The latest IPCC assessment is now more than 2 years old, and the science in this area is fast-moving.[^33] According to more recent reviews[^16,24,33,40-43] (including the UN Environment Programme’s 2009 compendium on climate change science[^13]), climate change is proceeding at or beyond the upper projections of the 2007 IPCC assessment, with the chair of the IPCC recently quoted as saying “things are going to get substantially worse than what we had anticipated.”[^44]

A synthesis released in March 2009[^24] concluded that atmospheric CO₂ concentrations are already at levels predicted to lead to global warming of 2.0–2.4°C, and to meet the targets proposed by the IPCC, global emissions need to reduce by 60–80% immediately.[^24] Calls are mounting for more stringent levels of atmospheric greenhouse gases at 350 parts per million (ppm) CO₂ or CO₂-equivalents or even less[^33,40-42,44-46] (CO₂ levels are currently 387.81 ppm CO₂[^47]; the current CO₂-equivalent level will be higher[^48]).

**Action is necessary, but too expensive?**

Comprehensive international analyses such as the United Kingdom (UK)’s 2007 Stern review[^49] and Australia’s Garnaut review[^50] point to probable economic gains by moving quickly on emissions reductions. Conversely they indicate the greater economic damage long-term from inaction.

To protect New Zealand’s economy, including its agricultural advantage, we need to move quickly to reduce emissions.[^51]
As described by Lord Stern, the costs of taking action to stabilise the climate will be high but much less than the costs of inaction. The recent analysis suggests that past important costings of adapting to climate change, used to drive global policy, have been at least 2–3 times too low. Delay will be dangerous, and action is needed now. The Stern review also exposed the economic cause of climate change: market failure on the greatest scale the world has ever seen. In short, we have had too cheap a ride.

The World Bank, which in the past has tended to down-play the seriousness of long-term environmental risks, warns that even the current international financial crisis is no justification for inertia over climate change; “while financial crises may cause serious hardship and reduce growth over the short- to medium-term, … the threat of a warming climate is far more severe and long-lasting.”

At the time New Zealand’s conditional 10–20% target was announced, much publicity had been given to the NZIER/Infometrics report to Government. This report was used by the Government to help decide on the target. However, its macroeconomic modelling approach had been criticised as being the wrong tool for the job and a poor basis for major public policy.

The report’s key flaws included:

- **Ignoring the effects of climate change itself.** The business-as-usual modelling looked only at the cost to New Zealand of reducing emissions; it completely overlooked the greater costs (including health impacts) of climate change if we fail to reduce emissions in time. For the world as a whole, and most individual countries, the long-term future costs of catastrophic climate change greatly exceed the costs of reducing greenhouse gas emissions to avoid this.

- **Using the wrong baseline.** The report ignored New Zealand’s established legal commitment under the Kyoto protocol to meet its net emissions target—when it is highly unlikely New Zealand would renege on this commitment. Recalibrating the NZIER/Infometrics results to exclude these sunk costs gives positive improvements in the economy under many assumptions—e.g. pushing technical change in agriculture/land use (see endnote §§) would yield significant gains in emission reductions at low cost.

- **Assuming no advances in technology or changes in behaviour despite market signals.** Yet the whole purpose of placing a real price on emissions is to stimulate technological change and influence consumer behaviour, making this assumption implausible.

- **Assuming that New Zealand is an expensive place to reduce emissions.** On the contrary, many agricultural emissions will be cheap to abate, and some will actually profit farmers (see endnote §§). We have abundant renewable energy sources yet can still make substantial gains (endnote ***)—forestry has economic potential as a carbon sink (§§). So the 40% target may well be easier to meet in New Zealand than many OECD countries.
• Ignoring possible international sanctions. The report did not count the potential economic consequences for exports and tourism of New Zealand appearing inactive and failing to do its fair share.\textsuperscript{26}

In essence, the NZIER/Infometrics report was a partial analysis that greatly overestimated abatement costs and ignored the profoundly changing world around us.\textsuperscript{55} Compared with unabated climate change, perceived economic ‘hardship’ is a luxury problem.\textsuperscript{37}

Less publicised was the report’s conclusion that, if the rest of the world moves to similar regimes, then economic effects on New Zealand may be minimised.\textsuperscript{54} A responsible target by New Zealand\textsuperscript{26} will help that move.

Such econometric projections inherently cannot and do not indicate the feasibility or engineering involved in reducing our dependence on fossil carbon. However, any lack of current technology (not itself a given—see below) is no reason for inaction, and for the technology to advance needs an acceptance of the reality and urgency of climate collapse.\textsuperscript{24,33,60,61}

We must not confine our target setting to what current technology we think is cost-effective; rather, setting the necessary targets can spur the development of the changes we need. Recall the turnaround of US industry in 1942–43 to meet military needs, where President Roosevelt set production targets (for tanks, for example) based on need, not existing capacity.

NZIER/Infometrics reported that a 15\% emissions reduction target would mean average disposable incomes in 2020 will increase from $38,500 currently to $47,650, rather than $49,000.\textsuperscript{62} Thus, if we cut emissions 15\%, by 2020 people would still be much richer than today; just marginally less rich than if we took no action. And even this estimated projected shortfall, of about $1500, is overstated, for the reasons stated earlier.\textsuperscript{56}

We think discussion of this issue can and should be more balanced.\textsuperscript{26} During public consultation, figures of $3200 per capita income loss and doubling of energy costs\textsuperscript{63} were widely quoted. These figures were alarmist, selectively reporting only the most extreme of scenarios analysed (a very high carbon price of $500/Ct), and came from work funded by specific interest groups\textsuperscript{65} rather than any of the formal advice to Government.\textsuperscript{54} Such soundbites should be tempered with health warnings.\textsuperscript{56}

The World Bank says that a climate-smart world is within reach if we work together now to overcome inertia; the costs for getting there will be high but still manageable. “There are real opportunities to shape our climate future for an inclusive and sustainable globalisation, but we need a new momentum for concerted action on climate issues before it is too late.”\textsuperscript{53}

**Action is affordable, but not our responsibility?**

The Kyoto Protocol concentrates on countries’ recent emissions alone. This downplays the importance of historic emissions—their cumulative emissions over time. In this respect, per capita, New Zealand has made disproportionately large historic contributions to the atmospheric greenhouse gas load.\textsuperscript{51}
Developing countries are disproportionately affected by climate change.\textsuperscript{6,53} As the World Bank notes, this is a crisis that is not of their making and for which they are the least prepared.\textsuperscript{53}

While the Oxfam International RCI calculations, described above, allocate equitable shares across Annex I countries, they do not say that a 40\% reduction below 1990 levels by 2020 equates to rich countries’ full capabilities and overall responsibilities to the world. Indeed, there are good reasons to think that the fair share of Annex I countries involves much more.\textsuperscript{16}

Applying measures of responsibility and capability globally, the Greenhouse Development Rights (GDR) framework\textsuperscript{32} has assigned more than three-quarters of the total required global effort to developed countries in 2010. Assuming a 2°C pathway, this means significantly stronger obligations\textsuperscript{34} for developed countries than the above IPCC 25–40\% range for rich-country reductions by 2020.\textsuperscript{22}

According to Lord Stern\textsuperscript{64} and others\textsuperscript{16} there are powerful equity arguments for rich countries paying for all actual greenhouse gases emitted. Viewed from this perspective, even a 40\% target for New Zealand may be too weak. We may not want to pay more than we should, but we must still pay our fair share.\textsuperscript{65}

A fair deal\textsuperscript{32,34} means both keeping global warming as far below a 2°C increase as possible and delivering sufficient resources, so that poor people—who will bear the brunt\textsuperscript{6,34,53}—can avoid the worst impacts of already inevitable\textsuperscript{26} climate change. The World Bank notes that the poorest and most exposed countries in particular will need help in adapting to the changing climate.\textsuperscript{53}

Fairness also dictates that those countries most responsible for past emissions and most able to help, take a lead to cut emissions first and fastest. The World Bank states that advanced countries, which have produced most of the greenhouse gas emissions of the past, must act now, cutting their emissions aggressively.\textsuperscript{53} Oxfam International agrees that a fair and adequate global climate regime will require a massive effort across the board to reduce the risks to lives and livelihoods that poor people face first and most.\textsuperscript{34}

Although deep emissions reductions in rich countries are critical, Oxfam and the World Bank also say that climate security will now be won or lost depending on cooperative efforts, where rich countries finance large-scale reductions in emissions in developing countries.\textsuperscript{34,53} According to the new analysis for WWF International,\textsuperscript{37} by 2050 developed nations as a group need to reduce emissions by up to 157\% of 1990 levels (GDR methodology); given they cannot cut domestic emissions by more than 100\%, developed nations will have to finance substantial emissions reductions in other countries to keep within their share of the global carbon budget (‡).\textsuperscript{37}

The World Bank is calling for all countries to act now and act together, saying that no one nation can take on the interconnected challenges posed by climate change;\textsuperscript{53} global cooperation is needed.\textsuperscript{16,53}

As the Prime Minister’s Chief Science Advisor has stated, “This is a global challenge, and a country like ours that aspires to be respected as a leading innovative nation cannot afford to appear to be not fully involved. Indeed, such a perception would compromise our reputation and potential markets.”\textsuperscript{26}
Neither should we underestimate our country’s ability to lead the world on important issues of justice and security. New Zealand has wielded genuine influence on matters such as extending the vote, community child health, abolishing nuclear weapons, and settling colonial grievances. It is our generation’s responsibility to now rekindle this influence and lead on the matter of climate change.

**Health benefits of action?**

The threat of impending climate catastrophe demands urgent and drastic action in its own right. However, “mitigating climate change also presents unrivalled opportunities to improve public health,” especially if we can align climate change, health, and equity goals. Such health co-benefits arise because climate-change policies necessarily impact on some of the most important determinants of health, especially energy intake (nutrition) and expenditure (physical movement).

Particular health benefits should include:

- A low carbon transport system that involves more walking, cycling, or using public transport will reduce road traffic crashes, pedestrian and cyclist deaths, urban air pollution, and the impacts of obesity and cardiovascular disease (see endnote ‡‡). Such health co-benefits arise because climate-change policies necessarily impact on some of the most important determinants of health, especially energy intake (nutrition) and expenditure (physical movement).

- Reduced rates of overweight and obesity, as well as obvious health improvements, will also reduce the climate change impacts of extra fuel consumption needed for transporting extra weight and contributing extra food consumption and waste. Food itself has important implications for climate change through production, distribution, quantity, composition, and waste.

- Improvements in the efficiency of residential energy use could reduce mortality and morbidity from the extremes of heat and cold and reduce the vulnerability of the poor to fluctuations in the price of energy.

To give just one example, research in Auckland estimates that shifting 5% of short urban trips by private motor vehicle to bicycles would save each year about 22 million litres of fuel and 0.4% of transport-related greenhouse emissions. The health effects would include 116 deaths avoided annually as a result of increased physical activity, and nominal economic savings of approximately $193 million per year.

These important health co-benefits will dramatically reduce the cost to society from taking strong action to mitigate climate change, and thus failure to count these benefits could have serious consequences. Health professionals have a particular responsibility to ensure that the health benefits of environmental policies are understood by the public and by policymakers.
Our problem, but not achievable?

The potential for runaway climate collapse transcends the public health benefits from such changes as increased exercise, reduced pollution, and improved community engagement. Mitigation alone will need profound reengineering of New Zealand’s structure and function.84

We need to prioritise mitigation efforts according to effectiveness and cost effectiveness (the ability of each action/technology to effect overall emission reductions versus its cost), and negotiate tradeoffs.26 The science and fairness simply indicate the extent we need to responsibly reduce our emissions quickly, but do not say how to do this.26

However, mitigation ideas are detailed in the 4th IPCC mitigation report,21 country-specific marginal abatement cost curves,85–89 and elsewhere.33,84,90,91 This is apart from known things we can do now in agriculture that should actually profit farmers and protect our key export earning sector (endnote §§).51,58 Much of this conceptual work has already been done for Australia,86,92–94 and to a limited extent in New Zealand.51,84,87–90,95

Aside from economic instruments,16,35,36,51,91,96 which are necessary but insufficient in themselves,97 investment in education and social networking (e.g. transition towns, http://www.transitiontowns.org.nz/) to promote carbon reduction may prove cost-effective. Mitigation technology and ideas will advance with the right signals/environment, including responsible targets. We must not underestimate the technology that already exists51,58 but simply lacks planning, prioritisation, and implementing.

Agriculture is a significant source of diverse emissions—half of our greenhouse gas emissions2,98—with separate causes requiring diverse solutions.89,99,127 It is incorrect to clump these emissions together.2 Agriculture is clearly a big part of the problem, and reforming land use could be a big part of the solution. Endnote §§ lists a number of possibilities for Agriculture, as does endnote *** for Energy.

We also need to manage population growth,100–103 projected to increase 9.9% by 2020 for New Zealand,104 which will significantly increase the emissions reductions needed (see endnote †††). Our population growth rate is high compared with other OECD countries—mainly from natural increase rather than migration.105,106 The long-term effects of sub-replacement fertility will not accrue until the mid 2040s, and will be countered by a likely increase in immigration, including climate refugees from the Pacific. Education, employment, and social policies that accelerate our transition to low natural population growth will be a necessary part of any mitigation strategies.

We can design our mitigation policies to improve (rather than reduce) the quality of life of low-income families, and ensure that any financial costs are carried by those who can most afford it.30 Whether we end up with a genuine Emissions Trading Scheme (ETS) or in effect a carbon tax (see endnote ‡‡‡) policies should be progressive (particularly central government revenue recycling) to protect the wellbeing of low-income households (endnote §§§).
How will we get there?

Since political inaction has delayed progress for so long, action on both national and global scales is now extremely urgent. The next 6 years to 2015, by which time global emissions must peak, will be critical to keeping within the global carbon budget. Delaying reductions by even only 5 years could have significant consequences. For example, starting absolute global emission reductions around the year 2015 would require annual reductions of 5% (large decreases), but delay to 2020 would require 8–9% reductions (huge decreases, see endnote ****).  

Addressing climate change is one of the biggest public policy challenges of our time—complex, urgent, and having serious implications for the economy. We need a policy mix that will work effectively and equitably across all sectors and shift the economy to a low-carbon one. 

Large-scale acceptance of emission targets by the public is a political necessity. But much of the debate has focussed on potential difficulties with meeting the targets. A more positive and empowering approach would recognise the wealth of innovation and knowledge within the New Zealand population, along with an ability to adapt and get on with it. 

There is a large body of indigenous knowledge that has enabled Māori to develop sustainably in Aotearoa for centuries, with significant potential to contribute to national action on climate change. Tangata whenua have also adapted to a variety of environmental challenges and worked collectively to develop innovative solutions to social problems. New Zealand has a proud history of adapting, a ‘can-do’ approach, and working together to counter peril, for example the sacrifices made across society in the world wars. Climate change is the new challenge, calling on this capacity for action and innovation, to again save lives. 

Intensified efforts to ensure buy-in of the public are crucial. Greater public awareness is needed of the urgency of climate change and the broad consequences of inaction, which goes beyond just direct immediate economic costs. It is easier to make changes, or accept mitigation effects, if you are convinced of the impact and urgency of the situation. New Zealanders will do what is right if they know it is needed. 

In the United Kingdom, the 10:10 campaign —where individuals, businesses and organisations commit to cut their carbon emissions by 10% in 2010—shows how people and groups can take action immediately. People are measuring their own emissions and committing to real reductions over a year (not the 11 years for New Zealand). Numerous individuals and organisations have already signed up for 10:10, including the entire British Cabinet, parts of the National Health Service, and Local Authorities. Such small but immediate targets can be meaningful, are achievable with small steps, and are less daunting than long-term targets that are less tangible and more difficult to engage with. 

As in the UK, difficult choices may need to be made across all sectors of society, the economy, and government to reduce New Zealand’s emissions. Approaches will need to be both top-down and bottom-up. Mitigation will inevitably change lifestyle choices. However, many people are changing their...
attitudes, actions, and choices already—with sometimes unexpected benefits. With leadership, others too may be willing to make those changes once they know the consequences of inaction and the possibilities for action.

The challenge for New Zealand, health professionals included, is to mobilise society. The need to generate even more social resilience to respond effectively to the emerging realities of climate change.

Such mobilisation for large-scale change across human and natural systems has a strong theoretical and empirical basis;\textsuperscript{118–121} engaging the public towards a greater sense of belonging and working to make a difference,\textsuperscript{16} wider sustainable views of the economy\textsuperscript{117,122–125} with comprehensive not partial economic analyses,\textsuperscript{56} and a community of interest with affiliation, goals, norms, and using intrinsic rewards.\textsuperscript{33,117,124}

Health professionals cannot be inactive observers of this process. We have a significant role and responsibility to lead this challenge—and we must be involved wherever possible.

We have overspent our atmospheric resources\textsuperscript{16,126}—and now need smart sustainable solutions.\textsuperscript{33,117} The pace of climate change is accelerating.\textsuperscript{16,24,33,40–43} Halving the current level of emissions is urgent, responsible, just, and possible.

Inaction would be negligence and malpractice on a global scale.

What health professionals can do now

Political

- Join the international day of 350 action on Saturday 24 October [www.350.org.nz](http://www.350.org.nz), and the global day of action on Saturday 12 December [www.globalclimatecampaign.org](http://www.globalclimatecampaign.org)
- Lobby widely for other emissions reduction measures by central government.
- Monitor and promote local government initiatives to rapidly reduce emissions at [www.sustainablecities.org.nz](http://www.sustainablecities.org.nz)
- Join a group—us at [www.nzchg.webs.com](http://www.nzchg.webs.com/) or any other climate action group.
- Take the Climate and Health Council pledge at [http://www.climateandhealth.org/pledge/](http://www.climateandhealth.org/pledge/)

Professional

- Educate and encourage patients and colleagues in climate change action
• Write letters for eligible patients to get subsidised home insulation
  www.energywise.govt.nz/funding-available/insulation-and-clean-heating

• Make Green Prescriptions (www.greenprescription.org.nz) truly green—advise the health AND climate benefits of increasing transport-related physical activity and eating less meat

• Reduce your workplace footprint—see www.1010uk.org/business

Personal

• Be informed; start with www.tcktcktck.org, http://en.cop15.dk, and watch ‘The Age of Stupid’ film

• Live smart and healthy—measure and reduce your own household footprint
  www.sustainability.govt.nz/content/25-easy-steps-towards-sustainability. Start with 10% less in 2010—see www.1010uk.org

For more ideas, come to www.nzchg.webs.com/

Competing interests: This paper is authored by individual health professionals belonging to, and on behalf of, the New Zealand Climate and Health group (http://nzclimatehealth.org.nz). Professor Alistair Woodward and Dr. Simon Hales were members of the writing teams that prepared the fourth (AR4) and earlier assessment reports for the IPCC (2004–07 and before).

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**Endnotes:**

* According to the German Advisory Council on Climate Change (WBGU), even now there is discord between the industrialised countries and the emerging economies. “Governments still appear to be fixated on the task of supposedly establishing, maintaining or restoring their national economic competitiveness rather than on preserving the natural lifesupport systems which are the basic prerequisite for any form of economic activity. The situation is reminiscent of the nuclear arms race which ended just 20 years ago, when the apparently compelling logic of ‘mutually assured destruction’ (MAD) brought our civilisation to the brink of the abyss more than once. The climate issue is without doubt a different type of problem, for every country is both the cause and the victim of climate change, albeit to widely varying extents. Nonetheless, the threats to our societies are just as overwhelming and the mutual distrust which prevails today is still as paralysing as the doctrine of MAD in the past.”

WBGU notes “the ‘social dilemma’ concept in game theory aptly describes the current situation, for individual and collective rationality are tragically at odds here. In a social dilemma, players attach more weight to their short-term individual interests than to the long-term mutual benefits of a cooperative solution—thereby ultimately harming everyone, including themselves. With many countries currently inclined to scale down their own climate change mitigation efforts to the bare minimum due to a short-
sighted focus on competitiveness, the international community could well find itself locked into a non-
sustainable course for centuries to come.”

According to WWF International, “unabated climate change will cost much more socially,
economically and environmentally. It will wreak havoc on global food security and freshwater
availability, and its impacts will be disproportionately felt by poor and vulnerable communities.”

Information and Modelling Group), 2009.


Table 1.1: New Zealand Total Greenhouse Gas Emissions and Removals 1990-2007 (kt CO₂-e).

Calculations:

1990 actual (base) = 61,852 CO₂ equivalent (kt), all gases (gross); 2007 actual = 75,550.
Gross emissions therefore increased by 22.1% between 1990 and 2007 (1-[75550/61852]).
If 2020 goal = 61852 less 40%; then this goal = 37,112 kt.
Comparing 37,112 with 2007 actual, the reduction needed is 1-(37112/75550) = 1-0.49 = 51%.

Notes (source: MED): “Gross emissions do not include carbon sinks of land use, land-use change,
and forestry (LULUCF), which is included in net emission calculations. Net emissions in 1990 were
43,714 kt CO₂-e, with 51,714 kt in 2007. CO₂ equivalent emissions estimates are based on the global
warming potential (GWP) of each greenhouse gas expressed as the effect of 1 kilogram of CO₂ on
global warming over a given time horizon. Non-CO₂ emissions are multiplied by the appropriate
warming potential to convert to a CO₂ equivalent basis. The GWPs for CH₄ and N₂O are 21 and 310
respectively, which are for a 100-year time horizon; these are from the IPCC Second Assessment
Report (1995).”

‡ Global emissions budgets are totals set according to the global amount of greenhouse gases that may
be emitted between now and 2050 to keep within the 2°C guard rail, distributed among the world’s
population per capita. For example, the German Advisory Council on Climate Change (WBGU)
calculates a budget of 110 tonnes left per person between 2010 and 2050 (based on 660–750 billion
tons CO₂ globally to have a two-thirds to three-quarters chance of keeping within 2°C warming).

§ Signatories to the United Nations Framework Convention on Climate Change (UNFCCC) are split
into three groups: 1. Annex I countries (industrialised countries); 2. Annex II countries (the subgroup
of developed countries who pay for the costs of developing countries); and 3. Developing countries.

• Annex I countries agree to reduce their emissions of greenhouse gasses to targets that are
mainly set below their 1990 levels. They may do this by allocating reduced annual allowances
to the major operators within their borders. These operators can only exceed their allocations
if they buy emission allowances, or offset their excesses through a mechanism that is agreed
by all the parties to the UNFCCC.

• Annex II countries are a subgroup of the Annex I countries, comprising the member countries
of the OECD excluding those that were economies in transition in 1992.

• Developing countries (Annex III) are not expected to de-carbonise their economy unless
developed countries supply enough funding and technology.

New Zealand is included in Annex II (and hence Annex I). Annex I countries (industrialised countries)
comprise: Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark,
Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia,
Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal,
Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine,
United Kingdom, United States of America (40 countries and separately the European Union). See
http://unfccc.int/parties_and_observers/items/2704.php,

** Responsibility under the Oxfam International calculations is based on emissions of all six
greenhouse gases included in the UNFCCC, from 1990, when the first IPCC assessment report was
published, to 2005, the most recent year of internationally comparable data. The measure includes
emissions from land use change and forestry. Responsibility is measured as cumulative emissions
over the period 1990–2005.
†† Capability under the Oxfam International calculations is based on the absolute value of a country’s
gross national income (GNI) that accrues to the population living above a per capita income threshold
of $9000 per year. ³⁴

‡‡ Worldwide, road traffic crashes account for 1.2 million deaths each year and 10 times as many
serious injuries. ⁷³ Death rates for pedestrians and cyclists exhibit steep social gradients, and reducing
traffic volumes and speeds would have important equity implications. Urban air pollution—much of
which is related to transport—causes a further 800,000 premature deaths each year. ⁷² Walking, cycling,
or using public transport instead of travelling by car would reduce the use of energy from fossil fuels; it
would also reduce traffic injuries and air pollution. By increasing physical activity it would tackle the
output side of the personal energy balance equation, with positive implications for obesity and
cardiovascular disease.

§§ Agricultural and land use mitigation. ⁵¹,⁵⁸,⁷⁹,⁸⁹,⁹⁰,⁹⁹,¹²⁷ Immediate action can include diet modification
(low methane forage crops, charcoal feed, supplementary maize feed, monensin to improve rumen
fermentation); soil carbon sequestration, and nitrogen management through grass pasture and other
active land management, nutrient budgeting, no-till crop production, crop rotation, fallow periods, new
grasses, improving soil drainage, wintering barns, feed pads and standoff pads; changes in management
practices and reduced intensity e.g. lower dairy stocking rates; reduced fertiliser use, nitrification
inhibitors for crop growth and N₂O reductions; carbon sequestration though biochar; converting
marginal agricultural land back to shrubland and/or forest; measuring and monitoring (use of DNDC).
Other potential action can be subjected to accelerated research (e.g. dairy genetic selection (including
low methane stock); methane vaccine; biofilters).

Forestry has large potential as carbon sinks, both retaining or reforestation with indigenous and exotic
forests/bush.

An emerging agricultural mitigation strategy is the use of low carbon-intensive feed stocks as an
alternative to high carbon-intensive feed stocks such as palm kernel, used primarily in the dairy
industry. Over one million tonnes of palm kernel/nut oil cake were imported in 2008¹²⁸ (mainly from
Indonesia and Malaysia) at a value for duty of almost $225 million. Of note, imports may be trending
downwards, as the 2009 second quarter (Q2) imports were approximately half those of Q1 and less
than one-third of Q2 2008 imports. Palm kernel is the main byproduct of the palm oil industry, which is
a key cause of rain forest deforestation and release of greenhouse gases. ¹²⁹,¹³⁰

*** Energy mitigation. Although compared with other developed countries (e.g. UK and Australia) we
already have a high level of electricity generation from renewables (currently around 70%), we can still
make substantial gains in this area. Modelling suggests that a target of 90% electricity generation by
renewables is achievable by 2025 with the current technology, and without incurring substantial costs
or reducing the security of supply. ⁵⁹

New Zealand has the cheapest wind power in the world, because of our high wind speeds and low
population density; we are a long narrow country set at right angles to the prevailing winds that are
consistent, with suitable sites that are close to major infrastructure and the national grid (which keeps
costs down), the technology is available in New Zealand, and New Zealand companies will benefit
greatly with wind energy development—including job creation. Our trees grow faster than almost
anywhere in the world—not in remote areas but reasonably close to population centres where they can
be turned into high-value products plus energy from residues, let alone acting as carbon sinks. We have
substantial geothermal and hydro power potential. Our solar and marine energy are also world-class;
especially once the tidal/wave energy technology is honed further—and, again, there is economic
potential for New Zealand companies through innovation of this technology.

††† Under a business as usual scenario, possible total greenhouse gas emissions in 2020 are projected
to be 84.6 megatons (Mt) CO₂-equivalents. This is based on the 17.87 tonnes CO₂-equivalents per
capita emissions in 2007 (75.6 Mt CO₂-e total for New Zealand [NZ]⁹⁸), and a projected population for
NZ of 4.735 million by 2020¹⁰⁴ (where per capita gross GHG emissions derive from total gross
emissions for 2007⁹⁸ and the estimated NZ population for 2007,¹⁰⁴ and total gross emissions derive
from total net emissions and LULUCF⁹⁸). The 2020 projection is 9.1 Mt greater than the 2007 actual
(84.6 minus 75.6 Mt), a 12% increase (see Table 2).
Table 2. GHG emissions predicted for 2020, compared with target of 40% reduction from 1990 levels

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2006</th>
<th>2007</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>(total net kt CO₂-e)</td>
<td>43,714</td>
<td>53,722</td>
<td>51,714</td>
<td></td>
</tr>
<tr>
<td>(total LULUCF kt CO₂-e)</td>
<td>-18,138</td>
<td>-23,877</td>
<td>-23,836</td>
<td></td>
</tr>
<tr>
<td>total gross kt CO₂-e</td>
<td>61,853</td>
<td>77,599</td>
<td>75,550</td>
<td>84,619</td>
</tr>
<tr>
<td>% incremental change</td>
<td>22.1%</td>
<td>12.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>population (projected from 2006 base, Series 5 medium fertility medium migration)</td>
<td>4,184,600</td>
<td>4,227,900</td>
<td>4,735,400</td>
<td></td>
</tr>
<tr>
<td>% incremental change</td>
<td>25.7%</td>
<td>12.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gross tons per capita CO₂-e</td>
<td>18.54</td>
<td>17.87</td>
<td>17.87</td>
<td></td>
</tr>
<tr>
<td>target (40% reduction on gross 1990) per capita target (tons CO₂-e)</td>
<td>37.112</td>
<td>37.112</td>
<td>37.112</td>
<td></td>
</tr>
<tr>
<td>emissions reductions (gross kt CO₂-e)</td>
<td>-24,741</td>
<td>-38,438</td>
<td>-47,507</td>
<td></td>
</tr>
<tr>
<td>% reduction needed</td>
<td>-40%</td>
<td>-51%</td>
<td>-56%</td>
<td></td>
</tr>
<tr>
<td>per capita reductions (tons CO₂-e)</td>
<td>-9.09</td>
<td>-10.03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

‡‡‡ Technically, the Emissions Trading Scheme (ETS) as proposed for New Zealand would not be a genuine ETS as such, but rather an emissions tax, as there would be a cap on prices. Urgently needed is an effective all-sectors all-gases ETS with an uncapped market price on New Zealand’s emissions.

§§§ Progressive policies to moderate the financial impacts of mitigation efforts will in particular require central government revenue-recycling to programmes that moderate effects on low-income households. This is where the Government will acquire revenue out of either carbon taxation or an emissions trading scheme. Some of this revenue will be used to pay for required carbon credits, but the remaining excess could either go into Treasury’s general pool or be directed (tax hypothecation).

Such a scheme is progressive (as opposed to regressive) when taxes are directed to programmes that mitigate inequities (e.g. free insulation for low income households, or public transport subsidies). In the European Union, carbon pricing is said to have had regressive social effects, but there are also signs that the negative impacts can be softened, avoided altogether, or even reversed by revenue recycling.

Arguably, the intensity-based ETS as proposed could be a regressive (not progressive) taxation system, as it provides substantial and unlimited taxpayer subsidy of emitting industries for years to come, which is likely to affect other areas of Government spending.

**** The German Advisory Council on Climate Change (WBGU) states that the reversal of the emissions trend must start as soon as possible—for in view of the very limited CO₂ budget, any delay will result in almost unachievable reduction requirements.

"With a reversal of the trend (and the emissions peak being crossed) by 2010, global emissions would need to fall to 50–80% below the 1990 baseline by 2050, with further reductions towards zero emissions being achieved thereafter. Even a slight delay in the reversal of the trend, i.e. postponement of the peak year to 2015, would trigger annual global emissions reduction requirements of up to 5% (relative to 2008). See Figure 1 below. In other words, the world would then have to meet annual emissions reduction targets equivalent to those established by the Kyoto Protocol for a full 2 decades."

"Delaying the peak year even further to 2020 could necessitate global emissions reduction rates of up to 9% per year—i.e. reductions on an almost inconceivable scale, entailing technological feats and social sacrifices on a scale comparable to those of the Allied mobilisation during the Second World War" (see Figure 1).
Figure 1. Necessary emissions pathways—WBGU calculations (2009): Global emission pathways for the period 2010–2050 with global CO2 emissions capped at 750 Gt during this period.

Figure 3.2-1 Examples of global emission pathways for the period 2010–2050 with global CO2 emissions capped at 750 Gt during this period. At this level, there is a 67% probability of achieving compliance with the 2°C guard rail (Chapter 5). The figure shows variants of a global emissions trend with different peak years: 2011 (green), 2015 (blue) and 2020 (red). In order to achieve compliance with these curves, annual reduction rates of 3.7% (green), 5.3% (blue) or 9.0% (red) would be required in the early 2030s (relative to 2008).

Source: WBGU

Reproduced with permission of the German Advisory Council on Climate Change (WBGU).

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    http://www.bmj.com/cgi/content/full/339/sep15_1/b3672; http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)61641-X/fulltext


    http://www.sciencemag.org/cgi/reprint/162/3859/1243.pdf


Annex 1 countries in rank order of per capita total greenhouse gas emissions in 2005:

Australia (26.9 tonnes CO₂-equivalents per capita), United States of America (23.5), Canada (22.6). New Zealand (18.8), Russian Federation (13.7), Norway (11.2), Iceland (11.1), Japan (10.5), Ukraine (10.3), European Union (10.3), etc. For the European Union (27 countries), rank order is Luxembourg (27.5), Ireland (16.7), Estonia (14.4), Netherlands (13.8), Czech Republic (13.7), Belgium (13.2), Finland (13), Germany (11.9), Denmark (11.7), Austria (11.5), Greece (11.5), United Kingdom (10.6), etc.


44. The Times of India. Top UN climate scientist backs ambitious CO₂ cuts. 25 August 2009. 
   http://timesofindia.indiatimes.com/articleshow/msid-4933416,prtpage-1.cms


   http://www.sustainabilitynz.org/docs/thecarbonchallenge.pdf


Table 1.1: New Zealand Total Greenhouse Gas Emissions and Removals 1990-2007 (kt CO$_2$-e).


110. http://www.guardian.co.uk/environment/10-10


128. Statistics New Zealand. Statistics New Zealand Infoshare table builder records of imports Jan-Dec 2008 (http://www.stats.govt.nz/methods_and_services/TableBuilder.aspx), based on the New Zealand Harmonised System Classification 2007 HS code ‘2306.60.00.00 Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of palm nuts or kernels oils’ (http://www.stats.govt.nz/methods_and_services/surveys-and-methods/classifications-and-standards/classification-related-stats-standards/harmonised-system.aspx) [accessed September 2009]
