



## EVIDENCE TOWARDS METHANE SCIENCE AND TARGET REVIEW 2024

16 September 2024

Dear Methane Panel members,

We write on behalf of the [Nelson Tasman Climate Forum](#), a community body of about 150 individual and organisation members, with a 1500 email network, to express our views on the Government's methane science and target review.

We are a group of citizens deeply concerned about climate change, and about New Zealand's 'fair share' contribution to remaining as little over 1.5 degrees warming as possible. We promote a climate action campaign called [Take the Jump](#). 'Taking the Jump' means trying one or more of seven [shifts](#): one shift being moving from meat and dairy to a plant-based diet.

Based on our reading of scientific literature<sup>1</sup>, we hold the view that the science of methane emissions is well established. We accept that using GWP100 – though part of the architecture of UNFCCC reporting – does not accurately represent the warming impact of methane (nor its potential cooling effect).

Rather, we hold that at the core of the methane debate are matters of fairness, values and ethics, particularly in relation to the Paris Agreement's aim of pursuing efforts to limit the global mean temperature increase to 1.5°C, including:

- the second part of Article 2: 'This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances'

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<sup>1</sup> E.g. Chapters 6 & 7, IPCC WGI report (and not pretending to understand all their complexities).

- the beginning of item 4 in Article 4: ‘Developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets’.

We see these aspects eloquently expressed in the work of Dr Andy Resinger and colleagues<sup>2</sup>. A recently published article<sup>3</sup> featuring Dr Resinger and Professor Frame (one of the Panel members) expresses a contrast of approaches in implementing the Paris Agreement. We echo Dr Resinger: ‘Is fairness causing the same amount of climate change, or does fairness mean putting in the same effort?’

The context of the methane review is the forthcoming review of the 2050 target (including methane) in the Climate Change Response (Zero Carbon) Amendment Act 2019.

**We request Panel members lay out for the people of Aotearoa New Zealand the full implications and consequences of different methane emissions reduction targets, including the global context<sup>4</sup>.**

Our request is aimed at enabling people to participate as informed citizens in this forthcoming process. This is vital both to maintain the social licence of the agricultural sector to continue to operate (including its markets), and to promote social cohesion in Aotearoa as the climate challenges that we face continue to increase. The costs of climate adaptation will increase the societal pressure on sectors that are still warming the planet.

It’s very important to recognise – and this is a painful part of the climate challenge – that the impacts of greenhouse gas emissions are global, but the emissions decisions are local<sup>5</sup>. The emissions decisions of the people of Bangladesh and Burkina Faso are of far greater consequence to the future climate in Aotearoa than our own decisions. **We further request** that Panel members bear this audience in mind in their deliberations: indeed it is in our self-interest to do so.

We acknowledge Panel members in considering our request will need to consider Item 7a in the terms of reference:

*7. The following issues are out of scope of the review:  
a) **making any conclusions or recommendations** that go beyond performing the scientific review and providing the evidence-based advice required by these terms of reference. For example, the advice will not cover implications of any*

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<sup>2</sup> E.g. Resinger, A. & S.C. Leahy 2019. [Scientific aspects of New Zealand's 2050 emission targets](#).

<sup>3</sup> Driver, G. 2023. [Burps & bluster](#). North & South.

<sup>4</sup> E.g. United Nations Environment Programme and Climate and Clean Air Coalition 2021. [Global methane assessment: benefits and costs of mitigating methane emissions](#).

<sup>5</sup> See, G. 2024. [The social cost of carbon is now US\\$225 per tonne – what this means for Asia](#).

*new proposed target on the broader climate strategy. It will not try to make values-based judgements about the burden sharing responsibilities of different sectors or nations (our emphasis **in bold**).<sup>6</sup>*

Our request **does not ask** the Panel members to make conclusions and recommendations.

**We do request** however that you spell out how various methane targets affect targets for long-lived gases. Failure to do this will deprive the ordinary citizen of the ability to understand the consistency of various reduction pathways consistent with remaining as little as possible over 1.5°C of warming.

We offer below a selection of publications and reports that we believe would be central towards our request. Likely none of these will be new to Panel members.

**We further request** that Panel members take account of:

- the role of nitrous oxide emissions as an inextricably linked component of ruminant methane emissions
- biogenic methane emissions from organic soils drained for agricultural purposes, the potential of these soils for habitat restoration and thereby methane emissions mitigation, and the inclusion of these processes within the CCRA 2050 methane target<sup>7</sup>.

Ngā mihi nui.

9(2)(a) [redacted], Nelson Tasman Climate Forum

9(2)(a) [redacted], Nelson Tasman Climate Forum

9(2)(a) [redacted], Nelson Tasman Climate Forum

9(2)(a) [redacted] Nelson Tasman Climate Forum

(Contact: 9(2)(a) [redacted])

Cc. Dr. Andy Reisinger, 9(2)(a) [redacted]



<sup>6</sup> Ministry for the Environment 2024. [Terms of Reference: methane science and target review](#).

<sup>7</sup> Gibson, E. 2021. [Uncounted and unseen, is this the biggest planet warmer you've never heard of?](#)

Gibson, E. 2024a. [Is the heat about to go on Fonterra over farming on drained peat?](#)

Gibson, E. 2024b. [Tiny portion of New Zealand soil making twice the carbon dioxide previously totalled.](#)

### Evidence towards our request (in addition to references cited herein)

Allen, M.R. *et al.* 2022. [Indicate separate contributions of long-lived and short-lived greenhouse gases in emission targets.](#)

‘It has long been accepted that stringent mitigation of both LLCFs and SLCFs is needed to meet any ambitious temperature goal ... making progress on two fronts necessitates monitoring progress on two fronts’.

Ivanovich *et al.* 2023. [Future warming from global food consumption.](#)

‘We found that sustaining current dietary patterns worldwide throughout the rest of the century could amount to nearly 1 °C of additional warming beyond today’s level of ~1 °C above preindustrial times. Even under a range of population growth scenarios, we expect at least  $0.7 \pm 0.2$  °C and up to  $0.9 \pm 0.2$  °C of additional warming .... Either scenario would surpass the 1.5 °C temperature target from food consumption alone...

... methane emissions account for 73% of the additional temperature increase from food by the midcentury and 60% by the end of the century. Because methane emissions are relatively short lived and the ~30% of current warming attributed to methane is almost entirely from recent emissions, decreasing methane emissions can rapidly benefit the climate...

... our analysis clearly demonstrates that current dietary production and consumption patterns are incompatible with sustaining a growing population while pursuing a secure climate future. Fortunately, compelling mitigation options are available to address this challenge.’

Lynch, J. *et al.* 2021. [Agriculture's contribution to climate change and role in mitigation is distinct from predominantly fossil CO2-emitting sectors.](#)

‘Policy-makers, stakeholders, and society at large should also be reminded that the role of agriculture in climate mitigation is a much broader topic than climate science alone can inform, including considerations of economic and technical feasibility, preferences for food supply and land-use, and notions of fairness and justice.’

Reisinger, A. & S.C. Leahy 2019. [Scientific aspects of New Zealand's 2050 emission targets.](#)

**Comment:** the extent of Aotearoa’s historical emissions from landuse change (principally agriculture; Figure 1, below), is particularly pointed to the question of fair share of the global atmospheric commons.

Reisinger, A. 2021. [How necessary and feasible are reductions of methane emissions from livestock to support stringent temperature goals?](#)

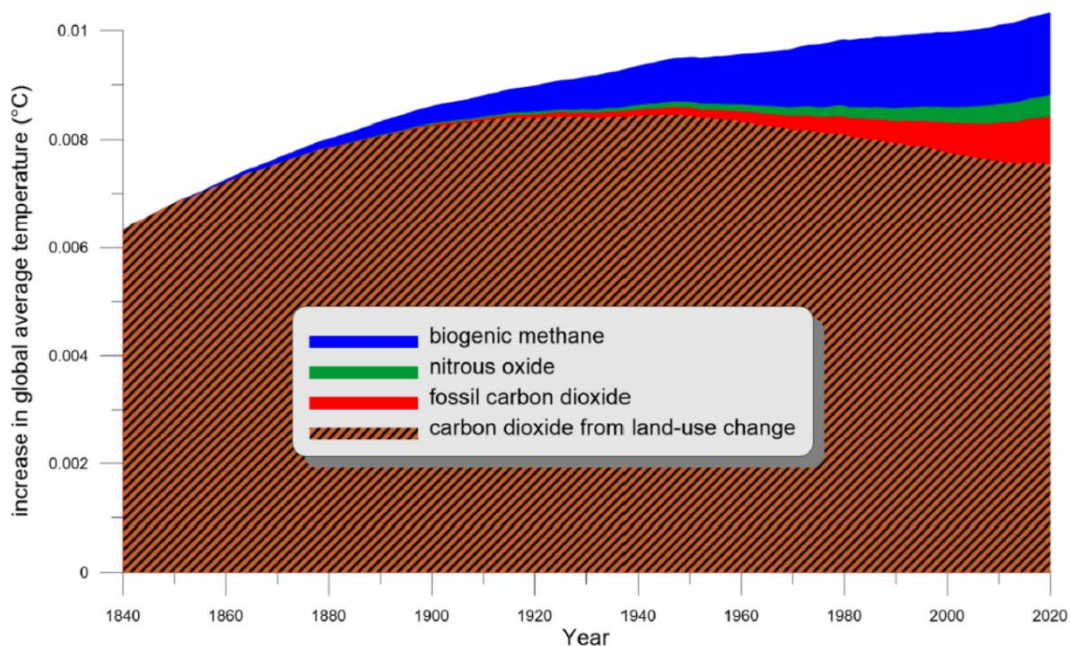


Figure 1. Calculated total contribution to global average temperature change from New Zealand's emissions to date. Emissions and associated warming of carbon dioxide from historical land-use change, fossil carbon dioxide, nitrous oxide, and biogenic methane from livestock are based on (PCE, 2019). Emissions of biogenic methane from waste were estimated using the national greenhouse gas emissions inventory and extrapolated back to 1840, and were added to methane emissions from livestock before calculating the resulting warming using the methodology in Reisinger (2018).

Reisinger, A. 2024. [Why addressing methane emissions is a non-negotiable part of effective climate policy.](#)

Shindell, D. *et al.* 2024. [The methane imperative.](#)

*Nitrous oxide and drained organic soils*

Ministry for the Environment 2024. [New Zealand's second emissions reduction plan \(2026–30\): discussion document.](#)

**Comment:** N<sub>2</sub>O is traditionally considered an inert molecule, making it difficult to remove from the atmosphere. The ERP2 discussion document makes zero provision for offsetting N<sub>2</sub>O emissions (from agricultural or other sources) in the immediate future, let alone N<sub>2</sub>O and CO<sub>2</sub> into the post-net zero 2050 future. Given finite land for ongoing CO<sub>2</sub> forest sequestration, it would be a nonsense for a methane target not to account for ongoing N<sub>2</sub>O emissions.

Nisbet, E.G. *et al.* 2021. [Atmospheric methane and nitrous oxide: challenges along the path to Net Zero.](#)

‘Discussion of this important gas is almost absent from the political debate.’

Pronger, J. *et al.* 2024. [Improving accounting of emissions from drained organic soils.](#)

**Submission to the Methane Target Review Panel – 27th September 2024**

9(2)(a)

9(2)(a)

**TO:**

The Methane Target Review Panel  
c/- Chair, Professor Nicola Shadbolt

**27th September 2024**

I am a pastoral sheep and beef-cattle farmer endeavouring to profitably produce output having good fit-for-purpose attributes that becomes transformed into food and fiber suitable for human use and consumption. The on-farm production practices are considered in the main to have a low climate, freshwater and biodiversity environmental footprint.

I am very cognisant that I am part of rural community, that the farm business is part of significantly much larger farm output pasture-to-plate value chain(s) that currently have good integrity and critical mass required to stay successful in competitive global markets. I am acutely aware of recent disruptive climate events, the need to have better resilience inside and outside the farm gate. I am also very focused upon intergenerational farm business succession and so will do my bit to ensure the opportunity for future food production is not jeopardised.

I have prepared this submission without invitation and have passed over the limitation of scope.

I am however hopeful as you deliberate upon developing a 'no additional warming' recommendation you will receive this submission without prejudice and carefully consider the several interrelated topics that this submission speaks to.

I refer particularly to the importance of absolute emission reduction vs product output intensity; the need to maintain capability for food production; the importance of sheep, beef-cattle and deer farming; ensuring the ongoing viability of rural community; and the need to correctly identify individually those agricultural subsectors whom may be contributing to current warming emissions then those same subsectors alone are given the task of reducing the warming emissions so to achieve 'no additional warming' by year-2050. And importantly any reference to historic emissions is appropriately silenced.

If we fail to set the right level of ambition in determining the 'no additional warming' reduction target and do not follow on by correctly apportioning responsibility to achieve the target, there could be grave inequitable consequences for New Zealand. We cannot afford to score an own goal...

I would very much appreciate the opportunity to discuss this submission with you in person.

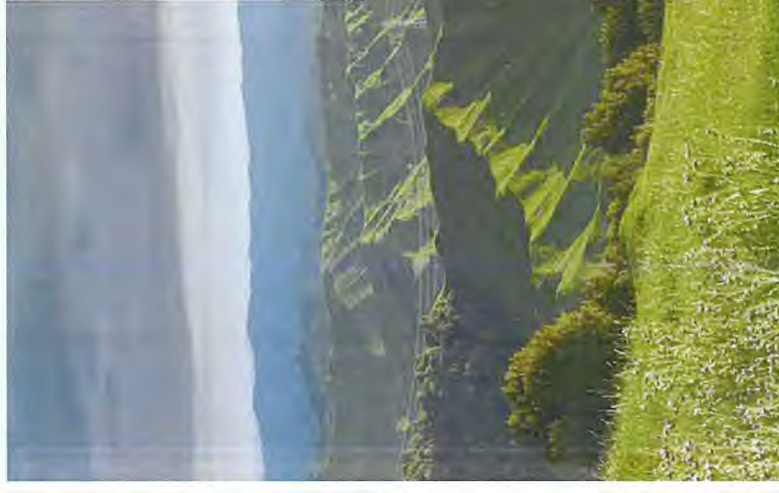
Thank you

Kind regards

9(2)(a)

**Revising the ZCA biogenic methane targets  
'No Additional Warming' from SLCP biogenic methane  
(relative to the ZCA year-2017 baseline year)  
Ruminant livestock Pastoral grass-fed**

**A perspective from a grassroots Sheep & Beef-cattle farmer**



**The background photo - North Island Heartland S&B+Deer Pastoral Hill Country**

**A bountiful landscape producing food& fibre fit-for-purpose for human use and consumption supported ably by vibrant rural communities**



**Heartland Sheep & Beef (S&B) + Deer mixed livestock farming on hill country cannot be wilfully plundered by other sectors for offsetting their GHG warming emissions and / or other externalised contaminant losses**

**S&B + Deer (mixed livestock) farmers currently have a lot on their plate!**

- **Product ↓ prices (challenging farm business profitability)**
- **Freshwater bottom lines – the Farm Plan**
- **GHG emissions – reductions required (is this for real?)**
- **Disruptive climate events, for example**
  - **prolonged dry North Canterbury**
  - **aftermath cyclone Gabrielle East Coast North Island**
- **Current land use change → afforestation**  
**(note previous land use change → dairy farming)**
  - **ETS carbon pricing distorting land value**
  - **Food production value gzumped**
  - **Rural communities disrupted**

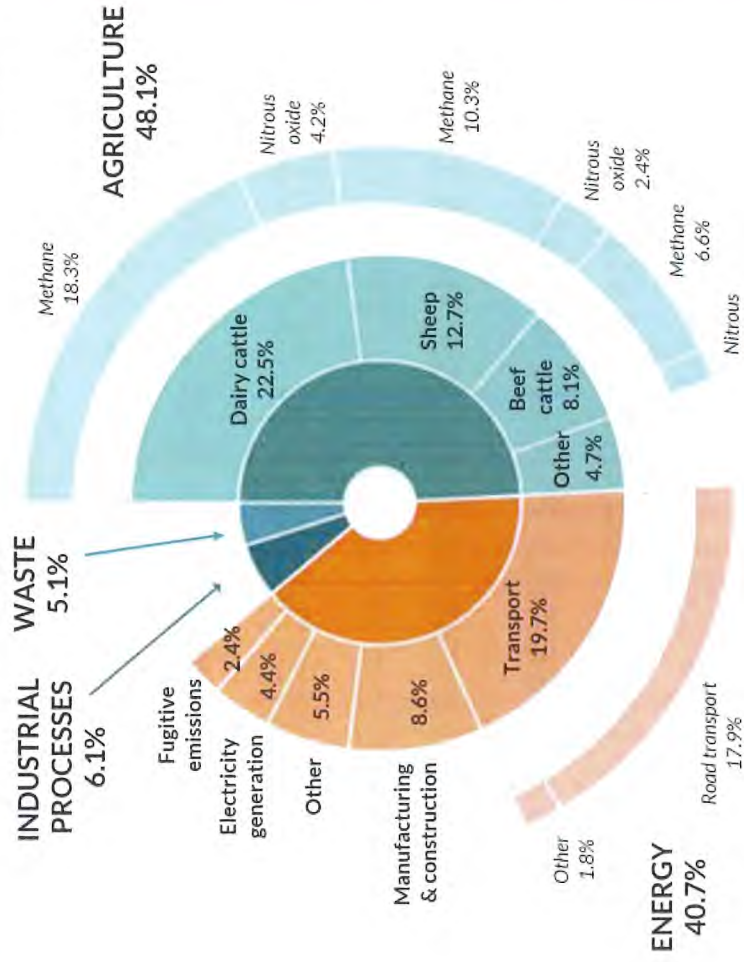
**It is pleasing the conversation about emissions regarding livestock biogenic methane is now correctly focused upon warming. It is hoped future narrative continues the focus upon warming thereby avoiding some maligned information that has characterised other past conversations about livestock emissions.**

**This submission recognises the need for absolute biogenic methane reduction (if any required) to achieve ‘No Additional Warming’ by year-2050 relative to the ZCA 2017 baseline year.**

**There has been increasing recent focus upon emission intensity per product output which may confer complimentary benefit reducing emissions, however it can also be antagonistic causing an undesirable increase of absolute emissions.**

# NEW ZEALAND'S Greenhouse Gas Emissions

Source: New Zealand's Greenhouse Gas Inventory 1990-2017, published April 2019



Note: Percentages in the graph may not add up to 100 due to rounding.

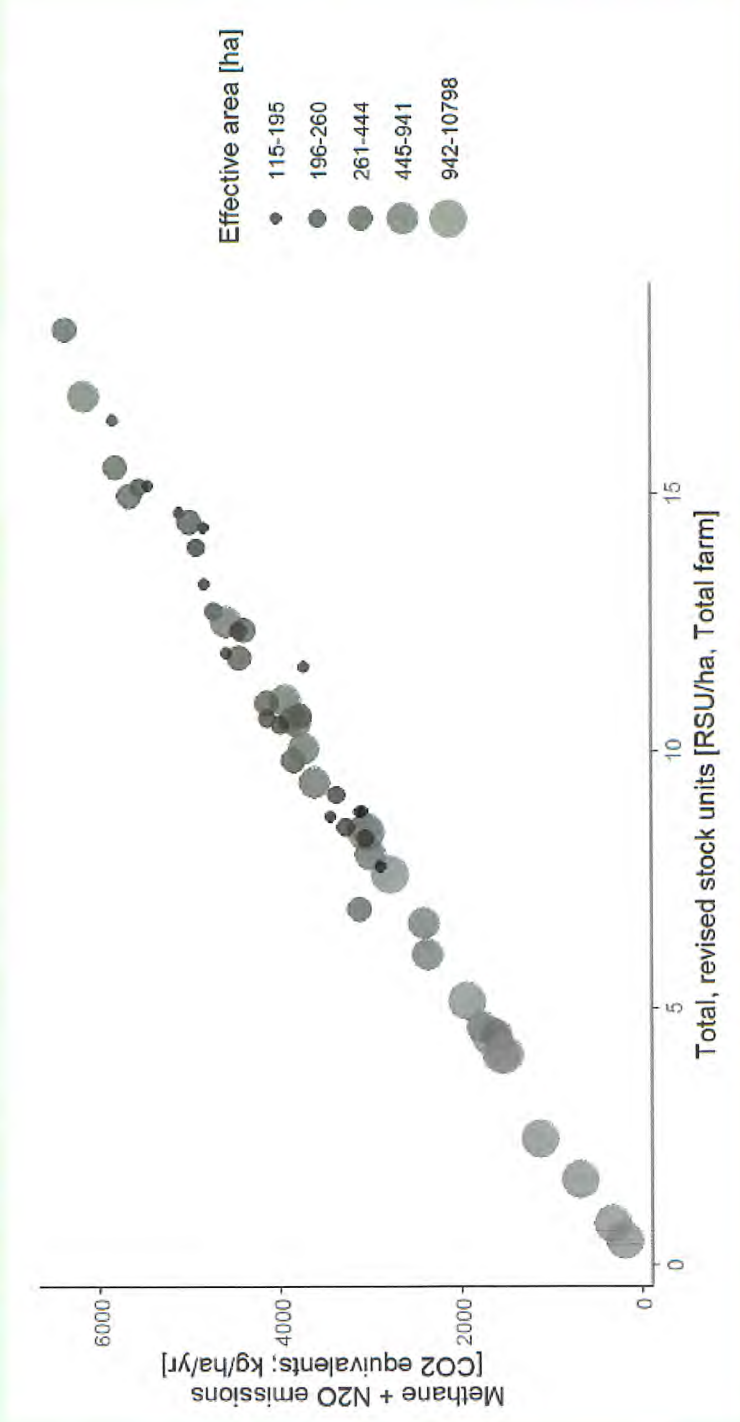
Fugitive emissions are from the leakage, burning and controlled release of gases in oil and gas operations as well as escaping gases from coal mining and geothermal operations. Agricultural methane is mainly from livestock digestive systems and nitrous oxide is mainly from manure on soil.

The agricultural GHG emission quantum commonly reported (GWP<sub>100</sub> metric) does not identify additional to climate warming. (There has been a lot of poor commentary on this topic creating widespread misunderstanding)

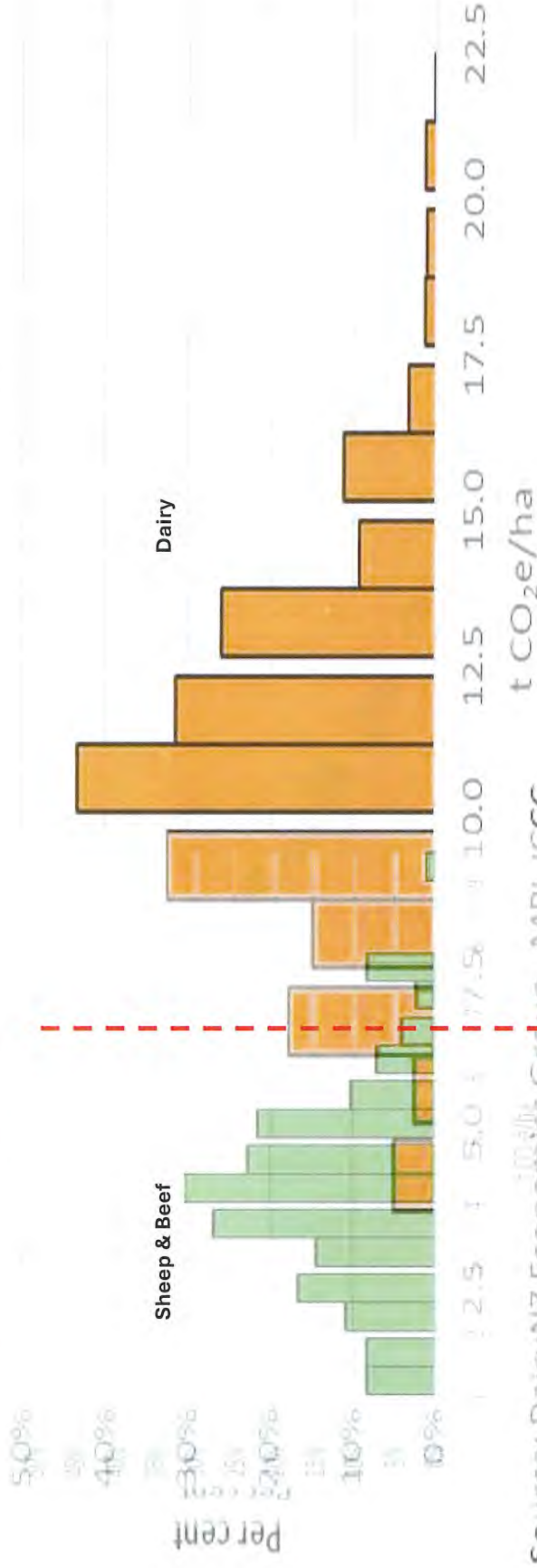
There is also distinct difference between the agricultural subsectors This needs to be unpacked to give greater clarity and understanding from which an equitable fair recommendation can be put forward

**There is a close relationship between the feed consumed by livestock and GHG emission**  
**This is particularly true when all feed consumed is pastoral grass-fed**

**Stocking rate / ha wintered (S&B+Deer farms) is a useful metric to describe this relationship**  
**This may be relatively crude however the correlation is acceptable with the**  
**relationship not changing greatly over a period of decades**



# Drystock farm emissions t CO<sub>2</sub>e/ha



Source: DairyNZ Economics Group, MPI, ICC. Source: DairyNZ Economics Service, MPI, ICC.

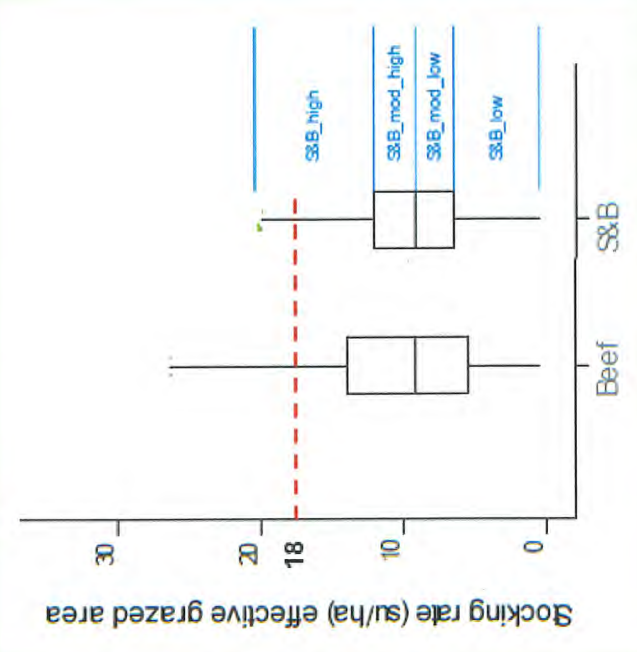
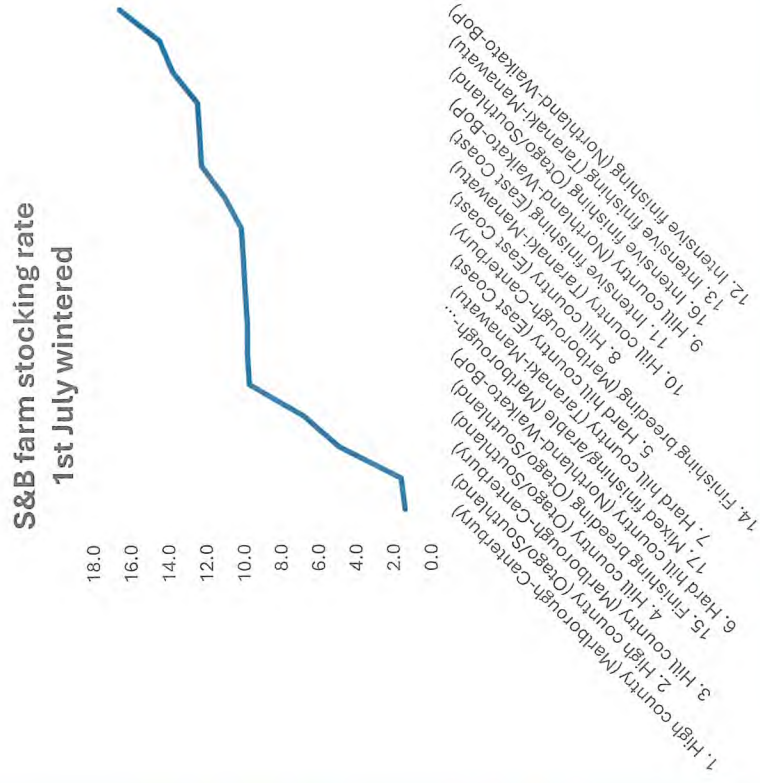
**Pastoral Grass-fed (grass growth curve)**

**Pastoral Grass-fed + N fertiliser + Import supplementary feed**

~ 18 su/ha wintered or ~ 10 tonne kgDM/ha

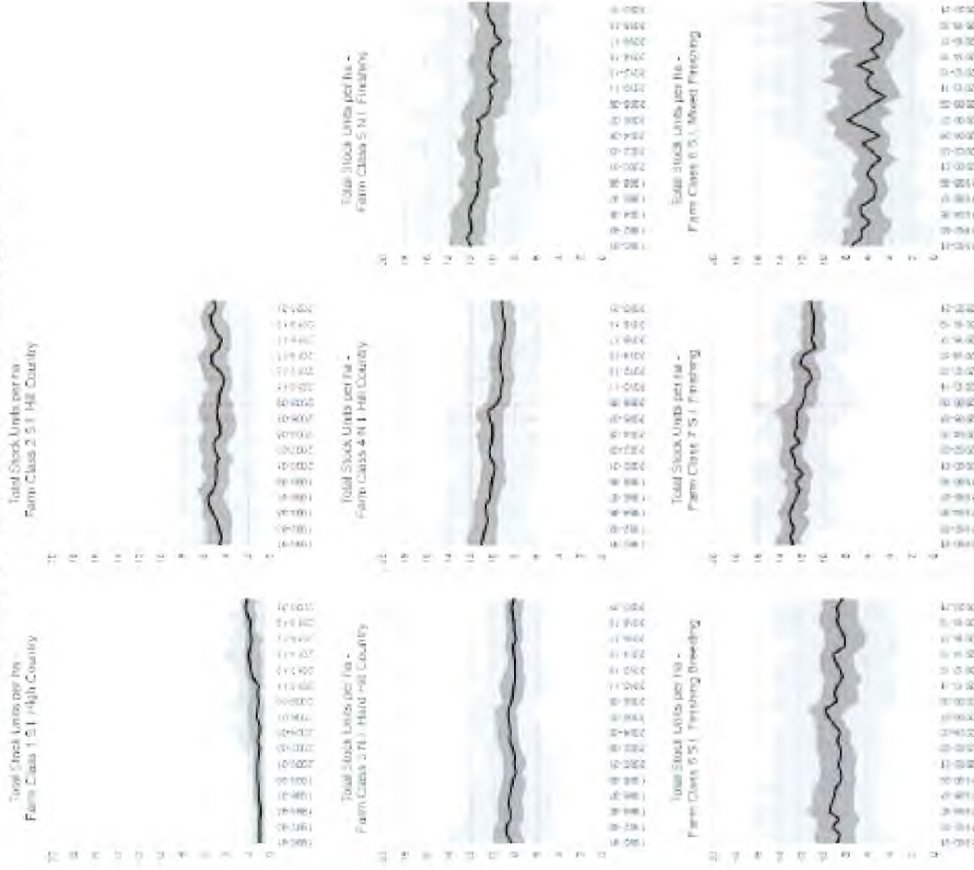
**The S&B and Dairy GHG emission profile per ha across all farms  
This reinforces the feed supply → GHG emissions linkage**

**S&B + Deer farming is closely matched to the grass growth curve  
 This is shown in linkage between farm class, livestock system and the stocking rate**



Note a farm's carrying capacity potential is generally somewhat greater than the actual stocking rate

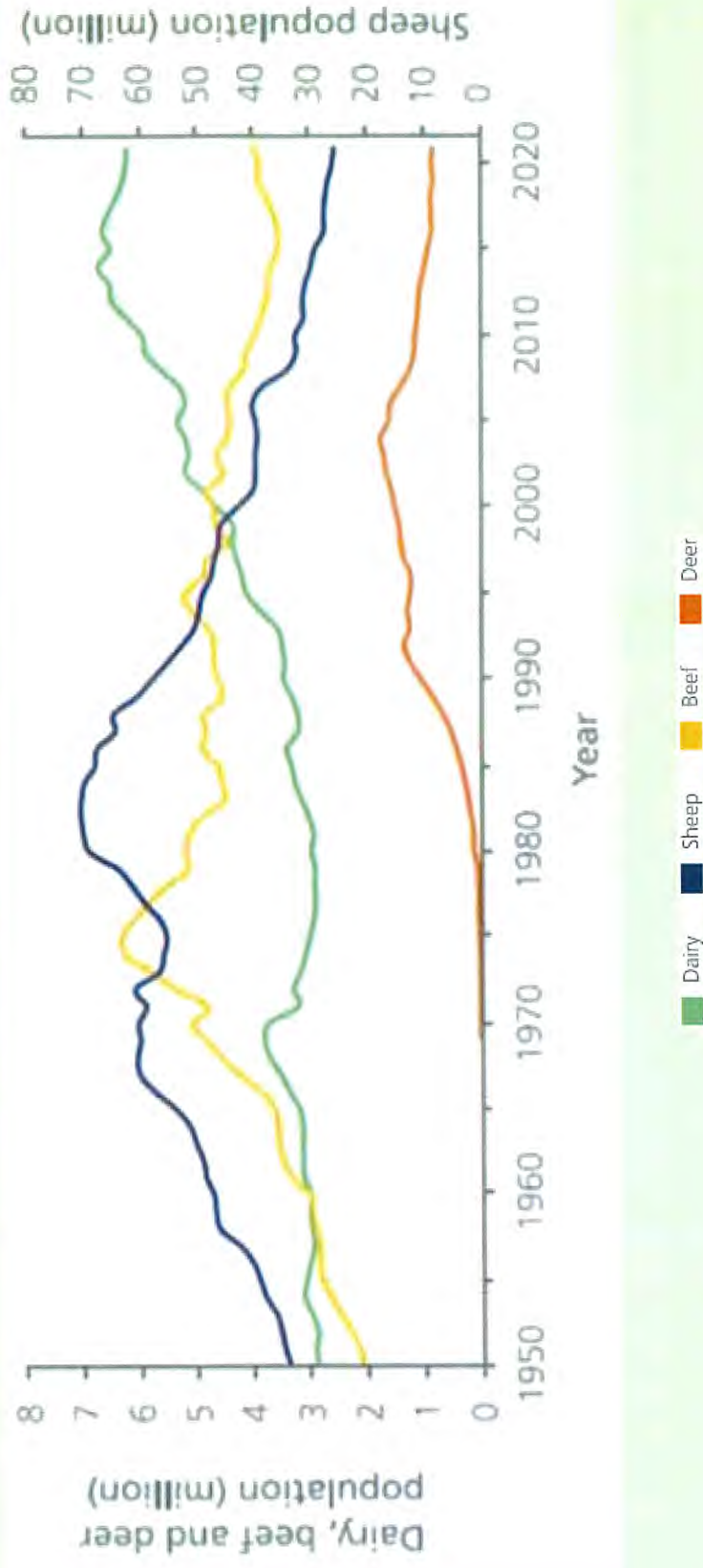
## New Zealand Sheep & Beef Farms stocking rate su/ha



- Notes:
1. Stocking rate of stock units per ha is calculated using the NZ conversion coefficients (see the Definition tab of map, stock head counts converted to equivalent) to convert head counts to stock units (multiplied by grassline area).
  2. The solid line is the mean for the range.
  3. The dark shaded area around the mean represents the range covered by half the farms that are between the 25th and 75th percentiles. This is called the interquartile range (i.e. between the lower quartile and upper quartile).
  4. The light shaded area shows the spread to the tails of the 'whiskers' in a traditional time-series plot. Outliers beyond the 'whiskers' are NOT shown in these charts.

Source: B-LIC Sheep & Beef Farm Survey

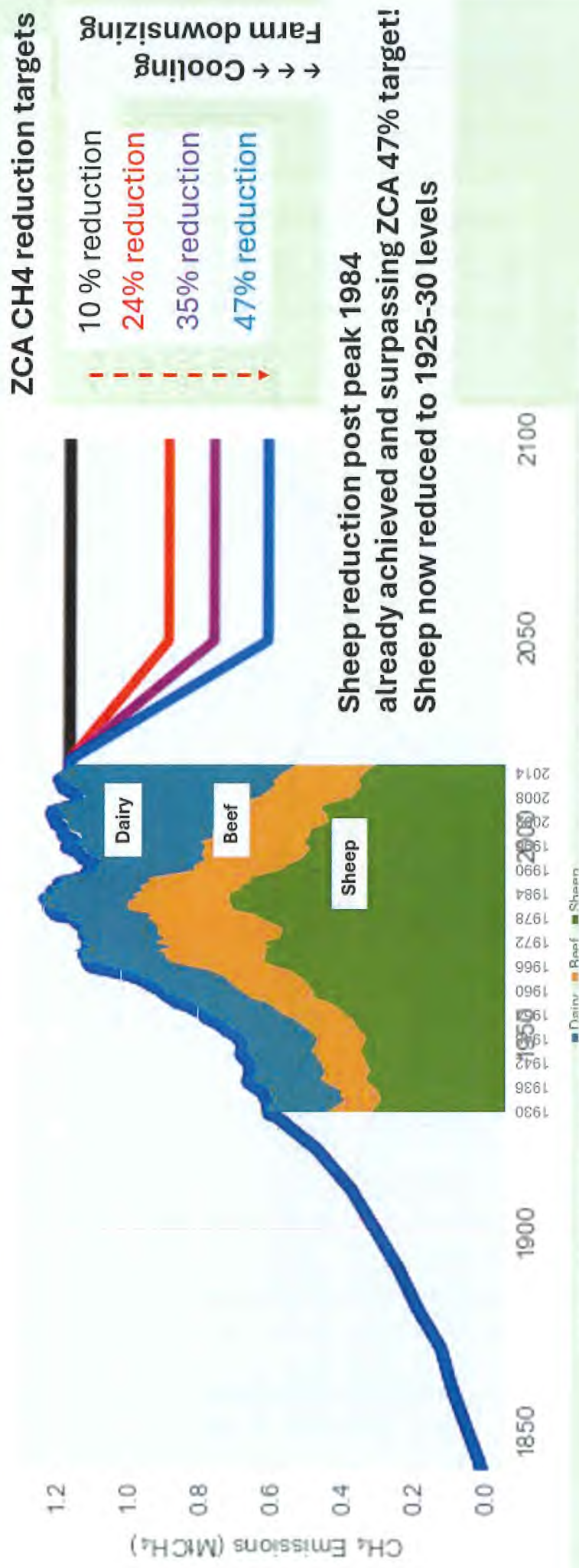
**S&B + Deer farm stocking rate (su/ha) has been relatively stabilised over many years noting the importance to have a close match with the grass growth curve**



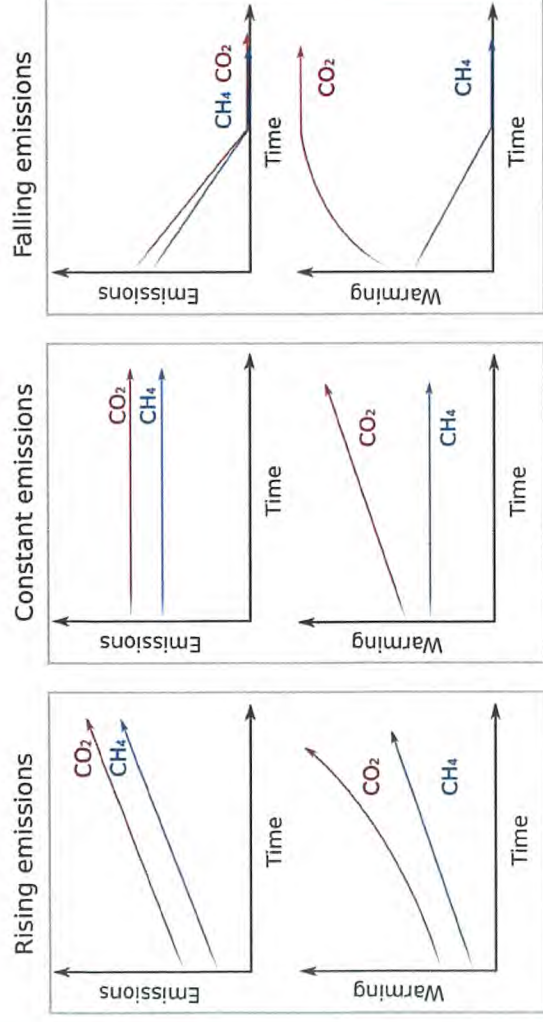
**The trend of Livestock type and numbers is well identified**

# Realigning the Zero Carbon Act biogenic methane reduction target 'No Additional Warming' relative to the ZCA year-2017 baseline

Identify where and by whom current warming arises to enable reduction effort is undertaken in an equitable fair manner



New Zealand S&B and Dairy Biogenic Methane Emission Timeline Profile



**The advancement of climate science notably GWP\* has enabled better understanding about how biogenic methane emissions contribute to warming**

**GHG emission rate and timing vs warming**

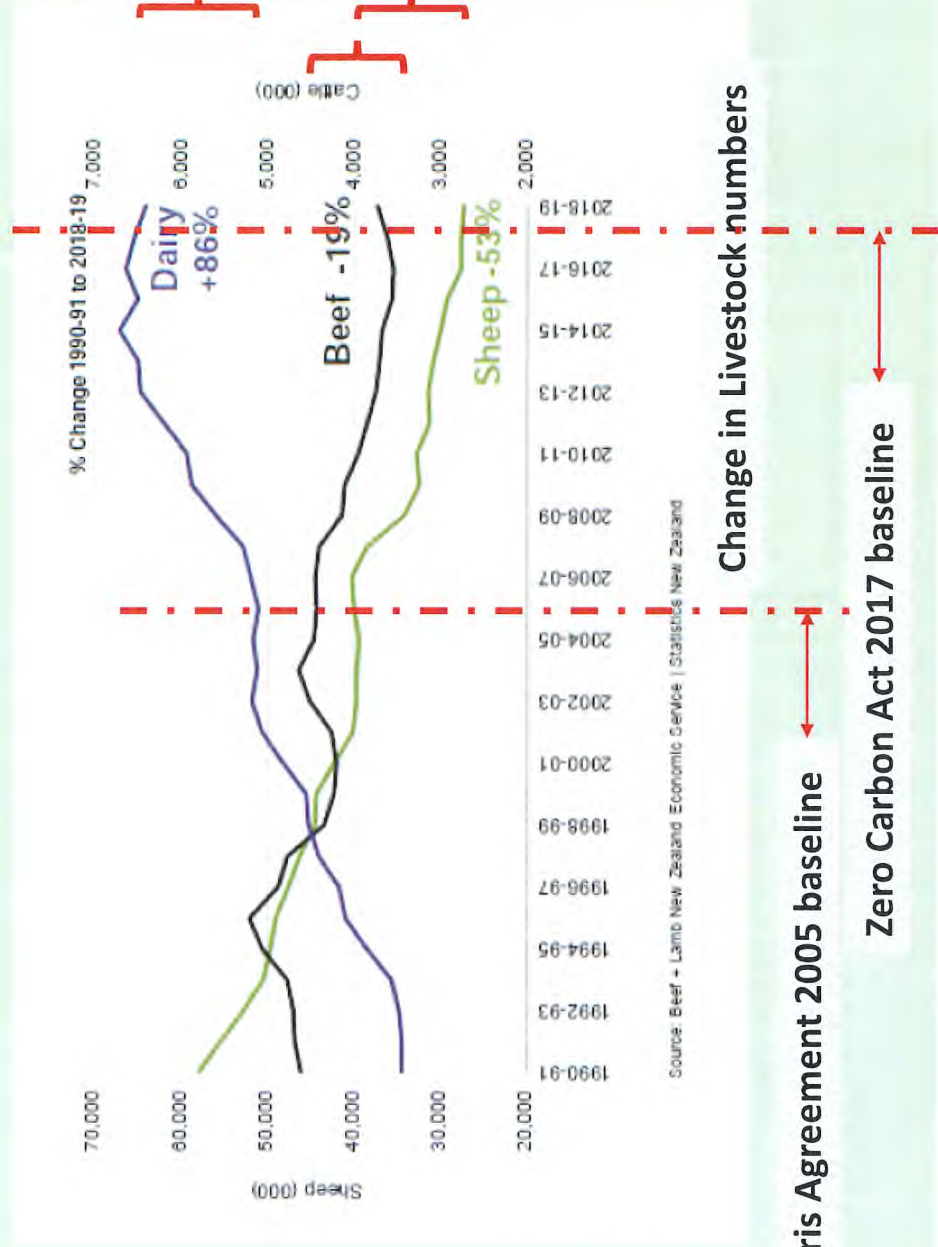
**Agricultural sector ambition = Warming neutral ('No Additional Warming') by 2050**

**ZCA 2017 Baseline year**

**Recognise importance of food production & rural community**

**Each agricultural subsector should have ownership of their warming emissions (if any) and the obligation to achieve the reduction target in an absolute manner**

# The livestock type and trend of number is indicative of different emission quantum and warming effect



Baseline year comparison

Dairy cow number notably increase from year-1990  
Additional methane emission  
→ climate warming

Sheep & Beef numbers are decreasing  
On-farm stocking rate stabilised  
Reducing methane emission  
→ climate cooling

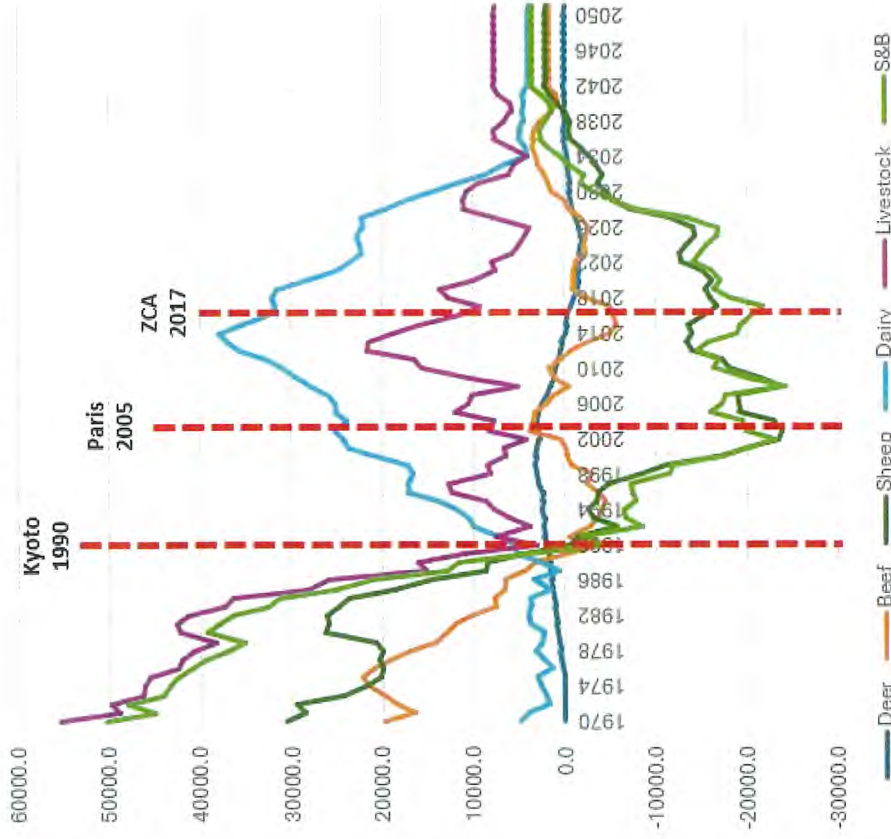
Paris Agreement 2005 baseline

Zero Carbon Act 2017 baseline

Change in Livestock numbers

Source: Beef + Lamb New Zealand Economic Service | Statistics New Zealand

Livestock GWP\* Methane Warming Emissions  
CO2-we extended graph



**‘No Additional Warming’  
Relative to a baseline year**

**Looking under the hood**

**Using GWP\* and subsector  
emissions (historic and  
projected) to better identify  
where warming arises (if any)  
and therefore the reductions  
that need to be undertaken to  
achieve warming neutral**

## **‘No Additional Warming’**

**The reduction targets should be set such that future methane emissions do not create additional warming above current levels. There has been endeavour previously to answer this:**

***“If New Zealand wishes to ensure that its livestock methane emissions cause no additional future warming relative to the warming caused by those emissions to date, it will have to reduce those methane emissions by about 10-22% below current levels by the year 2050, and 20-27% by 2100”***

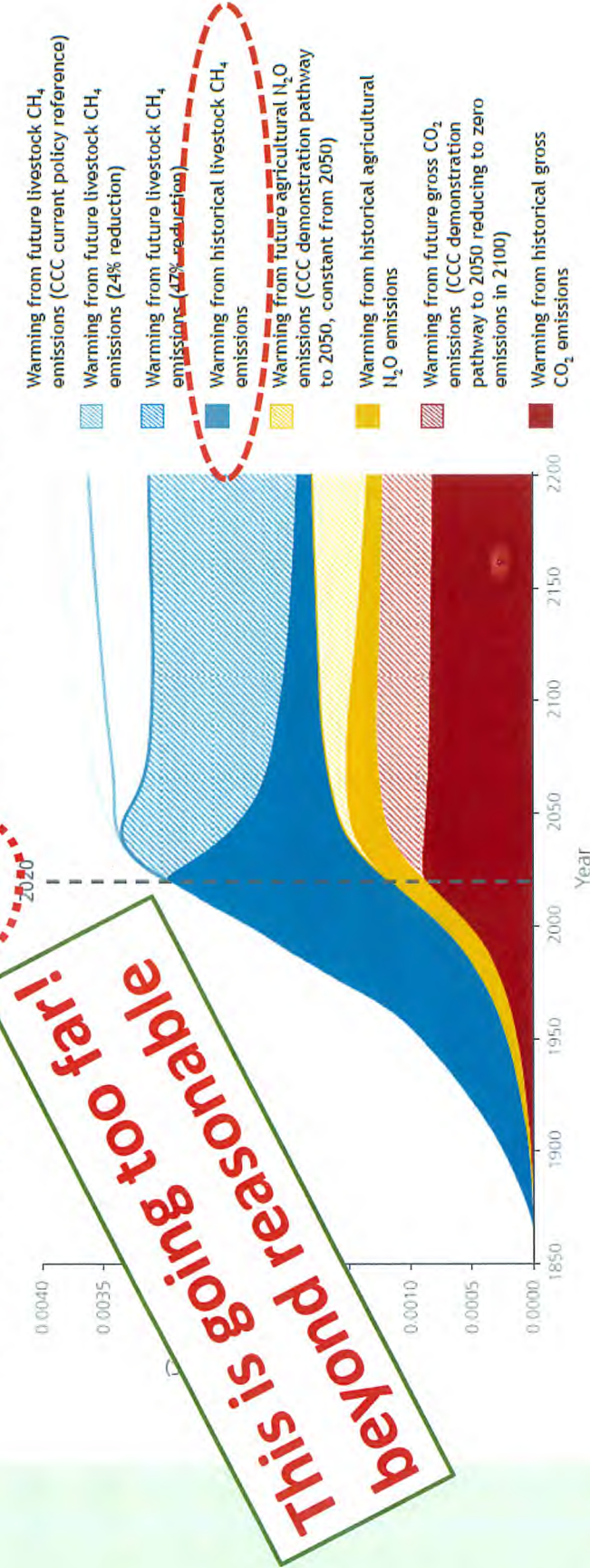
Reisinger, A. 2018. The contribution of methane emissions from New Zealand livestock to global warming. Report to the Parliamentary Commissioner for the Environment

**Warming neutral ~ 22% CH4 reduction by year-2050**

Acknowledging the existence of climate carbon cycle feedbacks

**Is this level of ‘No Additional Warming’ reduction on the mark?**

# Warming from past and future emissions



Excludes fossil CH<sub>4</sub>, biogenic CH<sub>4</sub> from waste, non-agricultural N<sub>2</sub>O and fluorinated gases.  
Source: PCE, 2022. How much forestry would be needed to offset warming from agricultural methane?

 Parliamentary Commissioner for the Environment  
Te Kaitiaki Taiao a Te Whare Pāremata

**Agriculture cannot be accountable for warming from historic emissions**

**The agricultural sector ‘no additional warming’ emission reduction target needs to be divvied up according to subsector livestock type**

**‘We are all in this together’ to share a singular target would be inappropriate because this could create serious inequality...**

**With respect to the S&B + Deer sector there must be acknowledgement about:**

- **The sector level GHG emissions trend and reductions already achieved to date**
- **The current S&B + Deer farms have a long period of stabilised GHG emissions**

**This ensures there is adequate nuance to assist inform setting appropriate ‘No Additional Warming’ reductions targets, and to get clearer focus and clarity where current warming emissions arise if they do which then infers who should be directly responsible to reduce.**

## **Per Capita Metrics is a flawed approach**

**New Zealand is a food producing nation where a very large percentage of output is exported**

- Plus noting NZ's food export has attributes of low emission intensity, food safety and high-density nutrition**
- If food production was to be offshored, it is highly unlikely to have the same positive high value attributes**

**Use of per capita metrics in an endeavour to identify global equitable fairness are distortive therefore out of place from a New Zealand food production perspective**



**Afforestation is a travesty when good productive hill country is lost forever  
No longer having capability of producing food and fibre**



**Afforestation of good productive pastoral land ideally suitable for food production is not a successful outcome**

**Anxiously awaiting a 'No Additional Warming' recommendation to direct the way forward**



## Expression of opinion to the Methane Review Panel – September 2024

Chair Nicola Shadbolt and panel members

My name 9(2)(a) I am a sheep breeder in Southern Hawkes Bay

I appreciate the opportunity to convey my thoughts to the panel and would like to speak in person to my submission if possible.

I do not propose to provide any more science to the discussion as there are other well qualified people doing that, but I do wish to raise some very obvious and perplexing anomalies in the present narrative that is used by the government, media and even our own farming advocacy groups, which makes a mockery of the climate change action.

- 1) I accept and agree with the position that all parties are promoting as the key objective of any policy, which is to ensure the planet does not 'overheat' as a result of anthropogenic action.
- 2) With regard methane emissions from ruminant animals, surely we must first and foremost establish what warming they (the emissions) are creating now before we consider what needs doing to curtail them.
- 3) That figure has been made clear by your panel member Dr David Frame as being modelled at 4 millionths of a degree C / yr, other prominent scientist's have estimated it at even less, regardless, it is unmeasurable.

Today I had the opportunity to personally suggest to minister McLay that if Ruminant methane was the main contributor to NZ's GHG problem then surely someone official would have filled him in on precisely what the warming effect was from that, and also, what instrument did he expect to use to measure it?

You might not be surprised that he dodged the answer by saying "that was exactly what the methane review panel were charged with finding out and reporting back by November". I contend that you all know the answer and I trust you have the intestinal fortitude to say so.

The minister was asked if soil carbon could ever be accounted for, and value created for farmers who followed practises that enabled it's build up. The minister replied that "if you could prove it and measure it then yes, you could probably account for it"... ironically the warming from ruminant methane cannot be measured (only modelled) due to it's infinitesimally small quantum, so it most certainly should not be the scapegoat for \$ billions of mitigation expenditure or worse still taxation.

The minister also said the free market would price soil carbon if anyone perceived it held value.

The irony of that statement is of course that if carbon itself was perceived as a problem by the free market then there would be no need for government manipulation and interference in the market to artificially force the price of carbon up.

- 4) We are continually fobbed off with the statement 'the science is settled' which is of course a totally unscientific thing to say. Your panel member David Frame disagrees with the GWP100 model, in favour of his own GWP\* theory, the IPCC have long since retracted their original beliefs around the warming from ruminant methane, so clearly when there is new unrefuted

science that supports the objective of not overheating the planet and is beneficial to our sovereign nations future prosperity then we are morally obligated to embrace it, not mock it.

- 5) When asked at a recent public meeting, when the 'no additional warming' applied from, a B+L advocacy member stated that it was from pre industrial times! Another example of the poor support farmers are getting from those that are charged with protecting our best interest.

I find it somewhat incredulous that I even need to raise these points but our levy paid advocates are so out of touch with their members that they have made up policy which supports the ridiculous situation we now have where \$billions is being ploughed into mitigation technologies for what? To reduce the atmospheric temperature by how much?

When challenged, our B+L people say 'they are not scientists' and 'the science is settled' etc which is completely patronising to the critical thinking people who are trying to give them advice and support to advocate for farmers benefit.

As an indication that B+L have realised their poor judgement in creating policy without input from members, they are only now ( early October) going out and having 'climate change workshops' to give their members the opportunity for input into that policy! Better late than never perhaps.

Farmers are tired, they are self harming at terrible rates, they live in nature, they know right from wrong, they know that blaming climate change on the perfection of the carbon cycle and the miracle of the rumen function is utter rubbish, they know they are a political minority and don't get listened to so they just close up and hope for the best. Your panel has the mandate to put this right.

New Zealand has the most unique story to tell, grass fed ruminants are part of creation, the meat they produce is second to none in terms of health attributes, why do we insist on self flagellating over 4 millionths (modelled) of a degree of warming per year, we are wasting so much energy, time and money the country literally does not have to waste, when, like Ed Hillary we could be showing the world that kiwis can do anything and like Charlie Upham, VC and bar, a farmer with guts, we aren't frightened of global bullies telling us they won't trade with us.

I trust that as a panel you will recognise the correct path to follow and recommend to the government that all methane targets be dropped.

Give this great country and especially the farmers who provide 80+% of our export earnings some hope that there is finally common sense in this world.

Thank you in advance of your brave and critical decision.

9(2)(a)



### Submission To The Methane Review Panel

My name is 9(2)(a) . I reside in East Otago with my family on a sheep and beef property. I am a founding member of the Methane Science Accord.

Firstly; Exactly why is New Zealand looking for answers to a problem that current science shows doesn't exist??? Methane is swamped by atmospheric water vapour therefore any effect is negated. Thus, not an issue.

This is a political issue not a scientific one and has become contentious because of those that either derive income directly or are trying to derive income based on GHG emissions being an issue and are subsequently creating an industry around this.

Quite simply if the effect of Methane is shown scientifically to be negated then the logical and honest course is to acknowledge this, move on and search for an actual problem where research and action can achieve a result. **Methane is not an actual problem.**

1. It is important for consideration to note that numerous corporations / companies across the globe are backing away from emissions reduction obligations because they are simply unattainable. Many of these entities claim the cost to their business is too great and cannot be justified at the expense of remaining profitable and even solvent.

Examples: Air NZ, Shell, SBTi axes net zero commitments of 200+ companies, Banks; Societe Generale, HSBC, Standard Chartered and ABN Amro.

2. New Zealand is unique as a protein producer. New Zealand agriculture is already incredibly efficient in comparison to other countries emissions ruminant methane profile and therefore we should be lauding our point of difference and continuing with our already efficient farming practice which will improve as we develop more efficiency over time.

Just to say we need to be seen to be doing something is not an argument, but rather a deflection. If NZ farmers are required to adopt mitigation techniques to limit ruminant methane emissions, then increased feed lotting animals as one of the main mitigation options is likely. Feed lotting just as many other countries do would see NZ lumped into a me-too protein supplier with no point of healthy protein differentiation.

Surely common sense would suggest that for NZ feed lotting is not a viable option for the following reasons:

- a. NZ sheep, beef and venison protein has to date been grass fed, has been successfully marketed as such over a long period of time and is internationally recognized as a safe and quality product that is only fed grass. What a fantastic natural story!!!
- b. To feed grains to sheep, cattle or deer alters the composition of the meat. This is well documented. Meat proteins such as Riboflavin's and Omega 3 concentrations are altered after only 2 weeks of feeding grain.

- c. In the 2023 Nebraska Beef Cattle Report a Nebraska University study (Greenhouse Gas Emissions from Two Beef Systems from Birth to Slaughter in Eastern Nebraska) showed that;

**Conclusion:** *The partial-confinement system resulted in less overall emissions of CO<sub>2</sub> and CH<sub>4</sub>. Calves from this system were smaller at weaning and required more days on feed to achieve market weight. The pasture-based production system produced more emissions of CO<sub>2</sub> and CH<sub>4</sub> but more carbon was sequestered from the annual forages grazed in that system. Cows from this system were either carbon neutral or a carbon sink depending on the GHG accounting metrics used. Traditional research in beef production considers only emissions. The data for these grazing situations indicate that soil carbon uptake is greater than all emissions from beef production. Additional research is needed to measure carbon sequestration over multiple years, varying types of forages and stocking densities to determine how much carbon can be sequestered within the beef production system.*

The conclusion highlights what any critical thinker would look at; to look at the whole picture rather than just one component of it. Common sense unless of course there is a vested interest to skew a result a particular way.

3. It is totally conflicting to claim that methane is an issue yet have the Government through catchment groups and regional councils spending hundreds of thousands of dollars to facilitate increased areas of wetlands with fencing and retiring of grazable land in all regions of NZ. Come on!!! Really, this only increases methane concentrations. **So is Methane a problem or not!!!! The Government seems to want more Methane**

Our local catchment group is receiving \$330,000 from MPI (Government) over 3 years and that is only one catchment group.

4. There is a serious societal issue to consider here as well. Through the combination of multiple factors; (on farm emissions taxing, regulation and bureaucratic cost increases resulting in a decrease in family farms that offsets to an increase in corporate operations, large scale forestry plantings in all regions) there is likely to be serious negative effects on rural NZ towns and indeed the very fabric of New Zealand societal structure. Rural areas and service towns are the very heart of NZ's societal structure. These negative effects being a decrease in local area population resulting in business closures, loss of schools and declining school roles. Subsidised forestry has already encroached too far onto land better suited to agriculture, along with diminished population, less and poorer quality services and more pressure on the remaining farmers at a time when they have significant financial stress.

Individual farms the world over, always have and always will perform with greater efficiency than corporate farms because there is personal financial incentive to do so.

No Government or indeed any individual should want their names associated with playing a part in facilitating the demise of heartland NZ through poor decision making.

I trust that as a panel you will recognise the correct and right path to follow and recommend to the government that all methane targets be dropped.

9(2)(a)

**From:** 9(2)(a)  
**To:** [Methane Panel Secretariat](#)  
**Cc:** [N.M Shadbolt \[EXTERNAL\] \(MASSEY\)](#)  
**Subject:** FW: Methane Science Review Panel  
**Date:** Sunday, 22 September 2024 5:06:36 pm

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**MFE CYBER SECURITY WARNING**

This email originated from outside our organisation. Please take extra care when clicking on any links or opening any attachments.

Hello Nicolía & Review Panel

Below is a copy of my letter sent to Todd McClay & Simon Watts.

I hope my concerns are unfounded and the Review Panel will carefully consider all current science that is available.

---

**From:** 9(2)(a)  
**Sent:** Saturday, 17 August 2024 2:23 PM  
**To:** 'todd.mcclay@national.org.nz' <todd.mcclay@national.org.nz>; 'simon.watts@parliament.govt.nz' <simon.watts@parliament.govt.nz>  
**Cc:** 'Christopher.Luxon@parliament.govt.nz' <Christopher.Luxon@parliament.govt.nz>; Winston Peters (winston.peters@parliament.govt.nz) <winston.peters@parliament.govt.nz>; David Seymour (David.Seymour@parliament.govt.nz) <David.Seymour@parliament.govt.nz>; 'stuart.smith@parliament.govt.nz' <stuart.smith@parliament.govt.nz>; Scott Simpson (scott.simpson@parliament.govt.nz) <scott.simpson@parliament.govt.nz>; 'judith.collins@parliament.govt.nz' <judith.collins@parliament.govt.nz>; 'andrew.bayly@parliament.govt.nz' <andrew.bayly@parliament.govt.nz>; 'andrew.hoggard@parliament.govt.nz' <andrew.hoggard@parliament.govt.nz>; 'mark.cameron@parliament.govt.nz' <mark.cameron@parliament.govt.nz>  
**Subject:** Methane Science Review Panel

Hello Todd & Simon,

Re Methane Science Review Panel

I am very pleased the government has proceeded with the promised Methane Science Review as this is certainly needed with much new science now available since the emission targets were set in 2019.

The government promised an independent review panel but I am very concerned to see the panel members are all from government agencies with no independent members.

Auckland Federated Farmers wrote to you recently expressing this very concern and asking for members independent from government or its agencies.

Under the Methane Science and Target Review Terms of Reference

Conflict of Interest points 27-28, "members must disclose any or perceived or real conflicts of interest to the Chair or Secretariat".

I expect this requirement to be enforced.

The most important new science.

**New science from the IPCC**

The IPCC AR6 report, page 1016 of Chapter 7, said: "...expressing methane emissions as CO2 equivalent of 28, overstates the effect on global surface temperature by a factor of 3-4".

Looking forward to your reply

Regards

9(2)(a)



Virus-free. [www.avg.com](http://www.avg.com)

Submission by 9(2)(a)

I would like the opportunity to speak to this submission if possible.

## Introduction

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I am aware that submissions to this review have not been explicitly requested from the wider public and as such, they may not be deemed material to the conclusions of the review. However after having spent a number of years heavily invested in the policies which have been derived from CCRA (He Waka Eke Noa, ETS etc) and working on behalf of those on the land most impacted by these policies, I am hopeful that this submission can articulate some of the weight of responsibility that this panel currently carries in conveying information that has previously been understated.

I am aware that the review is strictly scientific in nature and owes nothing to political or public opinion, however it goes without saying that its findings and evidence base will substantiate the future positions for both. It is for this reason that I hope to speak to my submission and to highlight three points, as described below.

### **Point 1: Science can be objective, but it's use rarely is.**

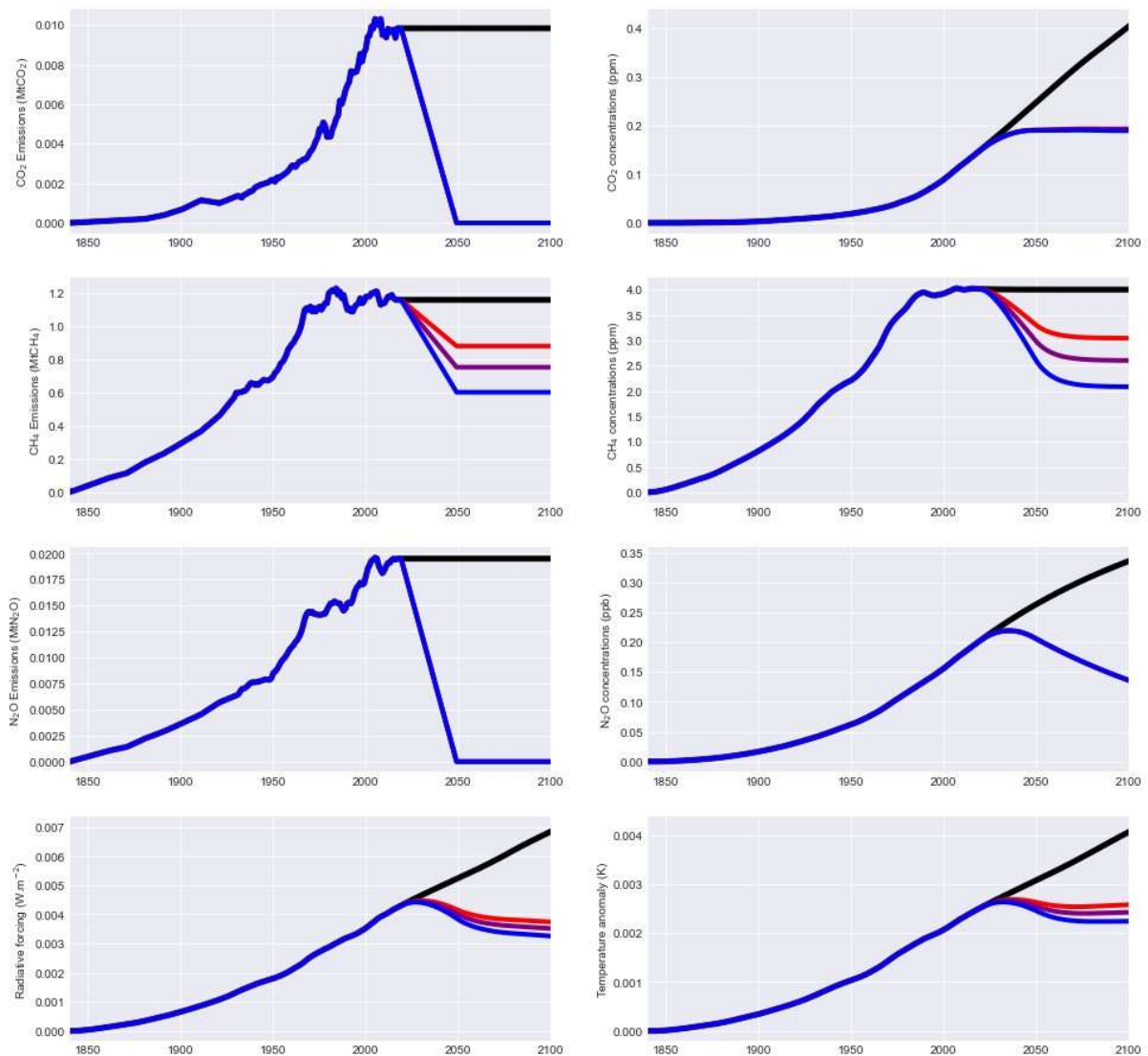
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The review has been tasked with informing the Government on appropriate science with regards to methane reduction targets which would be consistent with no additional warming. It is worth noting and I hope that the panel places great emphasis on the fact that this is the first time that many in the New Zealand public will have been exposed to the idea that the measurement of climate forcing molecules in mass units, and the warming or cooling impact of these units are not the same thing.

While this is not new science for scientists, it represents an area of public understanding which is grossly misunderstood and often very poorly communicated. The review panel must therefore take extreme care to ensure that the presentation of the information which describes this difference is as plain as possible, and interpreted so as to communicate the relevance of these differences to New Zealand in practice, when compared to our international counterparts who share vastly different emissions profiles.

The following graphs were presented by Prof David Frame a number of years ago now, in order to demonstrate the radiative forcing of New Zealand's aggregate emissions if the current emissions reductions pathways were adhered to. This credible and I would argue – very important information has never been made widely available to the public, or compared to the 'mass units' emissions reductions goals which we seem very likely to miss under current policy setting.

Figure 1: Plot of the NDC with three scenarios for methane highlighted



Source: David Frame. Plot of the NDC with three scenarios for methane highlighted - red is -24% by 2050, purple is -35% by 2050, and blue is -47% by 2050. Emissions and concentrations for CO<sub>2</sub> and N<sub>2</sub>O are also shown. (The black line, for reference, is just constant emissions of all three gases at today's levels. Numbers are from Andreas Reisinger.) Radiative forcing is bottom left, and temperature bottom right. I have used the FAIR model (which we used in Chapter 7 of IPCC) to do the model simulations. You can see that all three scenarios have temperatures peak in the late 2030s.

This conflation of two valid scientific reporting methods and a failure to explain them has resulted in the public belief that missing our NDC's and failing to reach the targets set under the CCRA will result in New Zealand increasing global temperatures out to 2050, when in fact we have the potential to be climate positive (decreasing radiative forcing), primarily as a result of reductions in methane emissions. The Panel therefore need to ensure that this conflation is avoided and that information which enables this distinction to be clarified is made available, clear and simple to articulate.

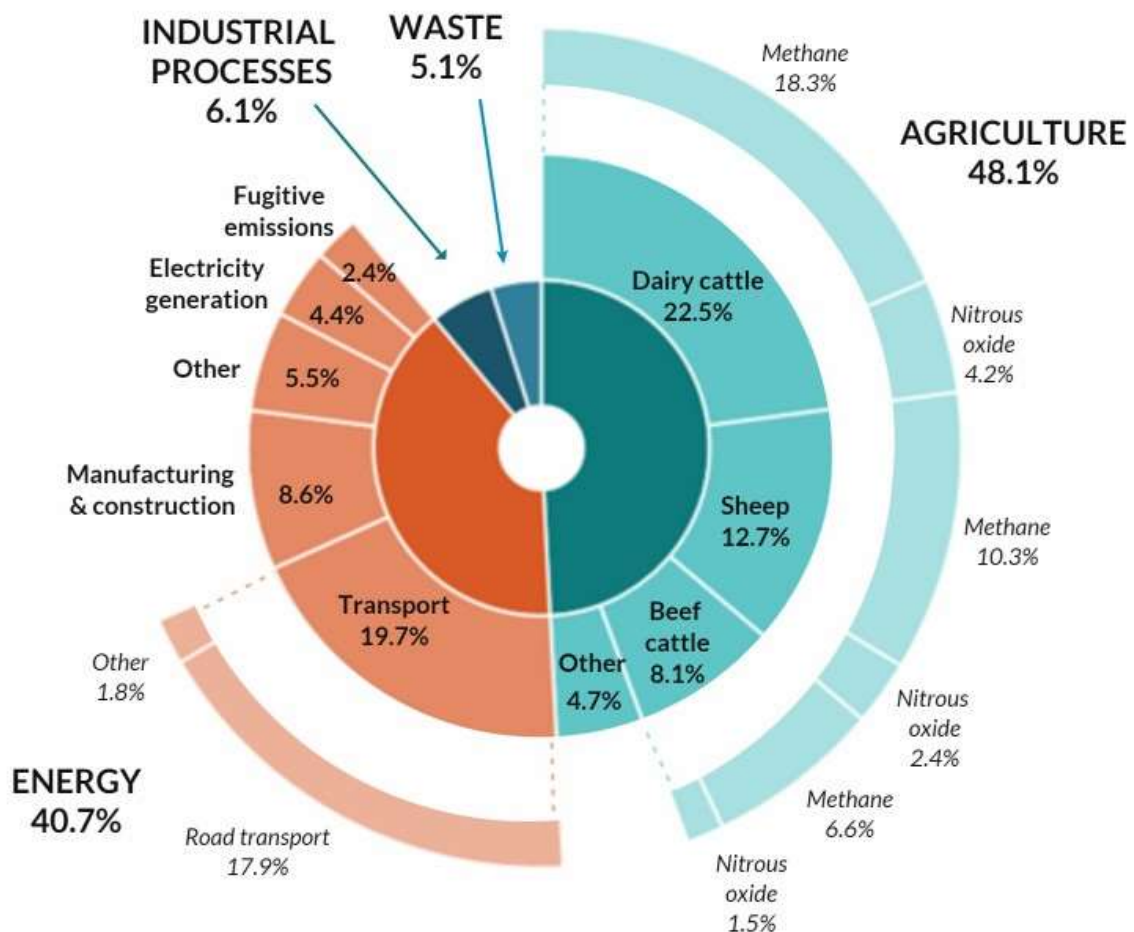
The graph below highlights the point that public (and often political) understanding is based on information that is readily available but not always particularly informative. The simple structure and straight forward metrics of our emissions profile in mass units is repeatedly used to amplify the

argument that methane emissions are accelerating climate change. Given that no corresponding graph exists to illustrate the relative impact that each sector contributes toward climate change in warming terms, in a given year – this is to be expected. Naturally if agriculture were able to attain a level of emissions where no further warming took place, they would then potentially disappear completely from any graph which attributed warming, or at least be confined to those emissions resulting from nitrous oxide.

**The panel has the ability to present and normalise reporting in warming terms and I encourage them to do so given agriculture would potentially pursue the opportunity to eliminate themselves from a graph depicting ‘warming’ with great vigour. The psychological drive to join afforestation as a scientifically verifiable ‘offset’ for other greenhouse gas emissions should not be underestimated in the context of a nation which has no other means of rewarding or compensating removals of biogenic methane, in contrast to many of our international counterparts.**

## NEW ZEALAND'S Greenhouse Gas Emissions

Source: New Zealand's Greenhouse Gas Inventory 1990-2017, published April 2019



Note: Percentages in the graph may not add up to 100 due to rounding.

Fugitive emissions are from the leakage, burning and controlled release of gases in oil and gas operations as well as escaping gases from coal mining and geothermal operations. Agricultural methane is mainly from livestock digestive systems and nitrous oxide is mainly from manure on soil.

## Point 2: There remain substantial knowledge gaps, conflicts and inequities between sectors

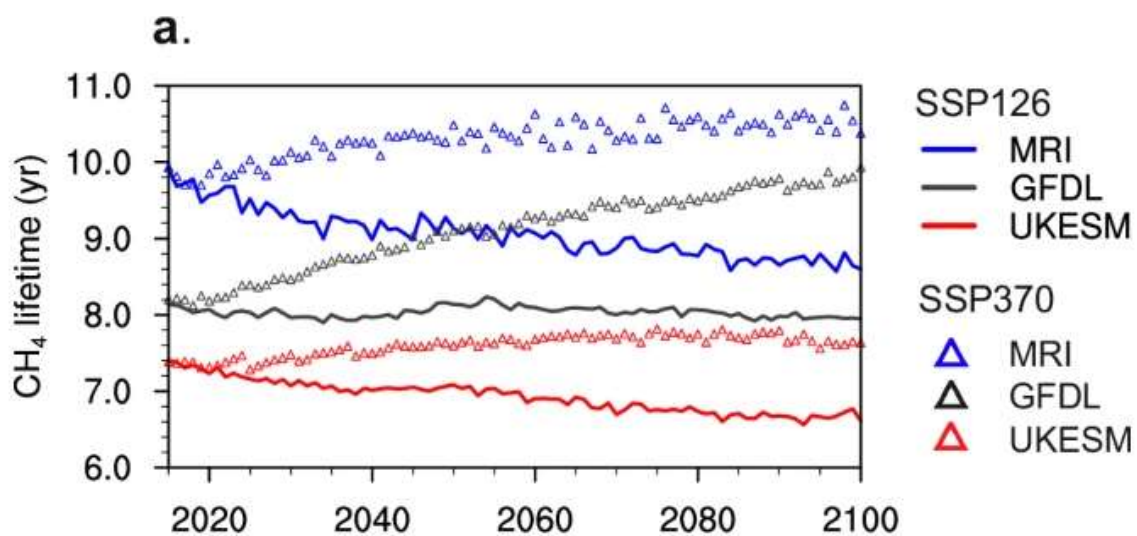
Methane is acknowledged as a biological flow gas which has many sources beyond ruminant livestock, however the understanding of methane's sink (the hydroxyl radical) is far less understood and remains largely absent from any conversation around the management of methane emissions. This is an issue because in the absence of any acknowledgement of methane's sink, the default position has been to confuse carbon sinks (tree planting) as an offset for methane flows maintained at a given level.

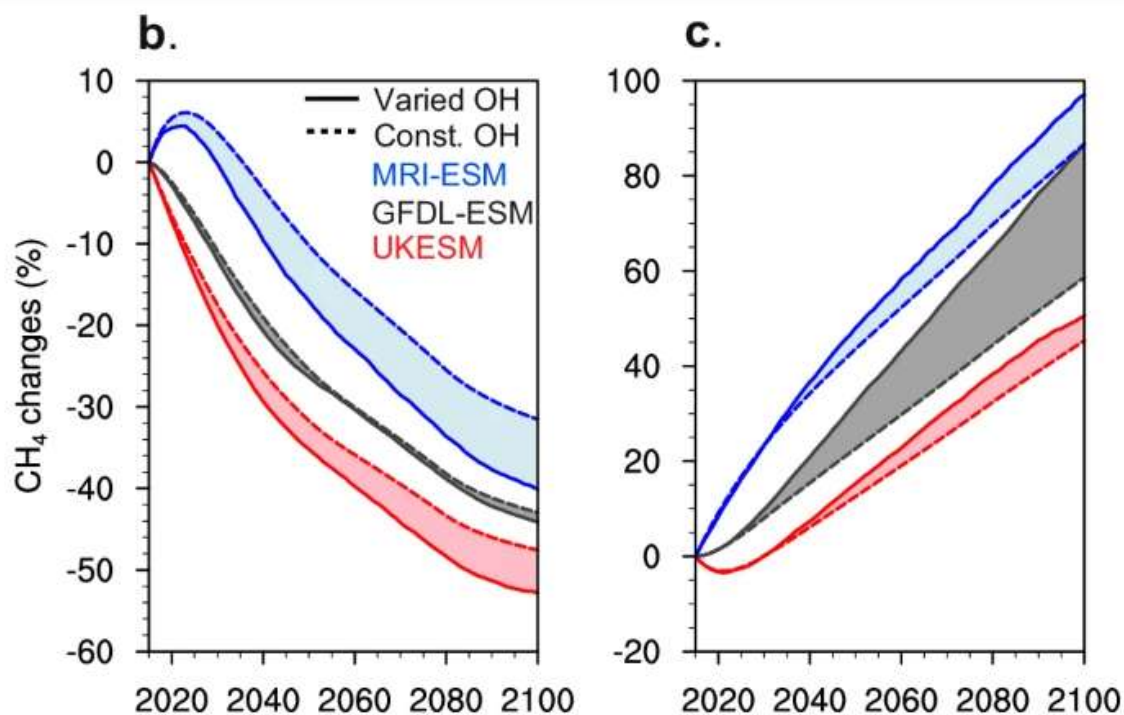
This confusion has significant implications for a nation with a finite land mass and extreme reliance on primary sector productivity. As the Parliamentary Commissioner for the Environment highlights in his report 'The contribution of methane emissions from New Zealand livestock to global warming,' the extent of planting required to reverse historic emissions would be extreme, especially if added to the current reliance on trees to offset fossil fuel emissions.

We know that trees capture carbon and store it while they are alive, while animals release methane and cycle it, relying on atmospheric processes to return CH<sub>4</sub> to carbon dioxide and restart the process. Given high levels of uncertainty around the likely increases or decreases in the availability of hydroxyl radicals as a result of current and future climate policy – there remains almost no scientific narrative around the future lack or abundance of the sink for methane produced from grazing systems. As a result, almost all of the solutions ignore the breakdown of methane, instead choosing to focus on abatement at source. Given the lifetime of methane is highly relevant to its radiative forcing – this appears to be an area where New Zealand in particular should apply a greater degree of focus than we currently do.

The graph below highlight the extent to which modelling currently diverges with respect the relationship between hydroxyl abundance and future climate states, and the corresponding life of methane.

Figure 2: Trends in methane lifetime and concentration -2025-20100





**a** The diagnosed CH<sub>4</sub> lifetimes in the SSP126 and SSP370 scenarios based on three models' results. **b** The evolution of the global CH<sub>4</sub> concentrations reconstructed separately with varied hydroxyl radical (OH) (solid lines) and constant OH (dashed lines) for the Shared Socioeconomic Pathway 1–2.6 scenario; **c**) the same with **(b)** but for the Shared Socioeconomic Pathway 3–7.0 scenario. The effect of temperature changes is also included in our calculation. The comparison of modeled CH<sub>4</sub> trends with the CMIP6 prescribed data is shown in Supplementary Fig. 7.

In addition to the uncertainty with regards to methane's lifespan, there remains substantial disagreement with regards to how it's mitigation is determined to be 'successful'. This is a global feature of all emissions discussions, however it is most pertinent in New Zealand pastoral systems where the distinction between emissions efficiency per unit of output and emissions intensity on a per hectare basis offer extremely different outcomes for New Zealand's primary sector.

This discussion is again subject to the presentation of accurate scientific data reported in ways which make the objective outcomes difficult to understand for many.

The panel should attempt to clarify how warming neutral might be reported in order to avoid 'science' becoming the justification for one industry cannibalising the other in order to attain an overall 'net' position.

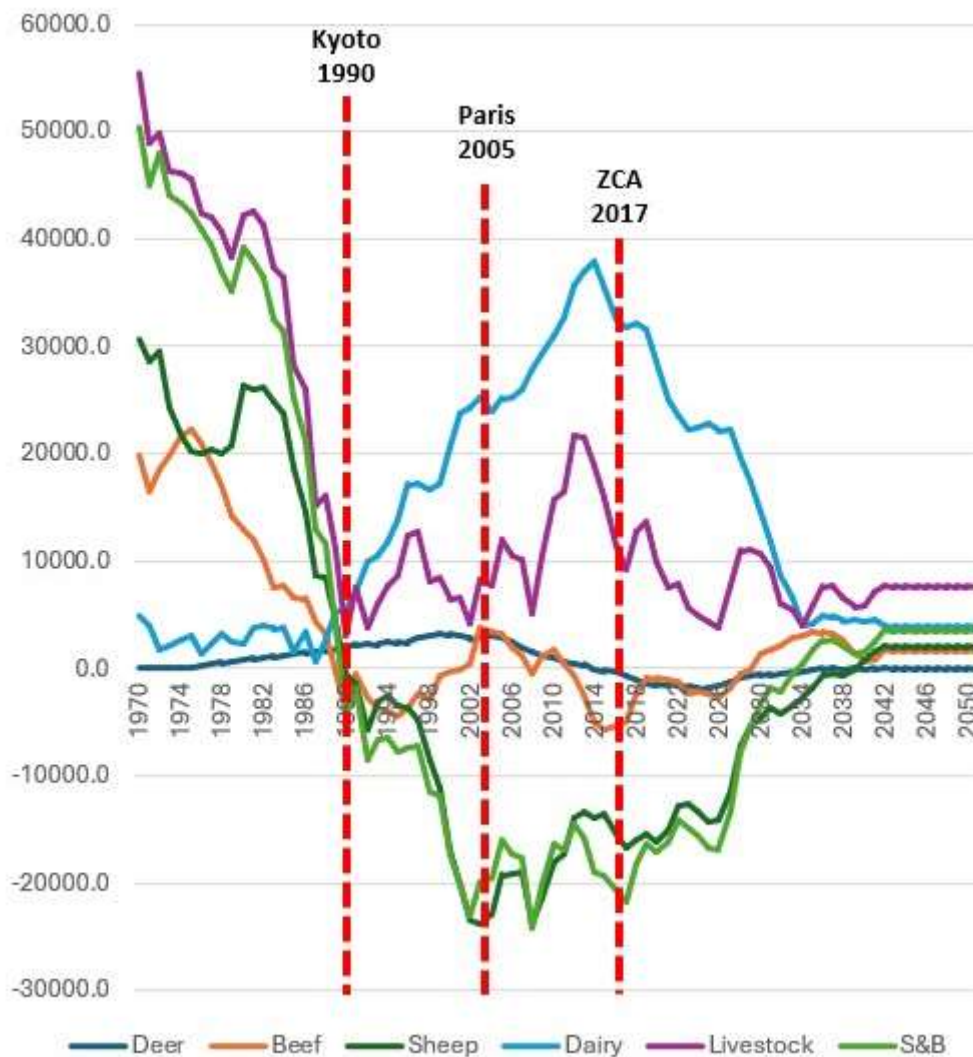
As described earlier – the drive to become 'climate positive' and to be eliminated from measurement reports which record warming impacts may prove to be a catalyst for cross sector collaboration, but it may also achieve something akin to the carbon forestry industry consuming the production forestry industry, to no benefit of the national interests.

This is not a scientific question, but rather a public policy and political judgement, however both of these are informed by the reporting of objective statements of fact and scientific measurement. To ensure that the nation has the best chance of making decisions based on balanced reasoning and an understanding of our context, I am hopeful that the panel will breakdown the meaning of 'warming

neutral' at a sectoral level, and ensure that the trajectory to this point is understood in order to support an accurate understanding of what is possible moving forward.

The review will no doubt consider what appropriate targets are at an aggregate level for agriculture – but I would also urge that more distinct targets are considered given the vastly different industry profiles which New Zealand's pastoral livestock sectors exhibit, and their varying access to viable mitigation technologies as identified by He Waka Eke Noa.

**Figure 3: Livestock Warming Emissions**



The tables below illustrate the challenges with regards to imminent feasibility of mitigations in pastoral systems, in particular for sheep and beef farms. This again supports the need for a 'pull' factor which enables New Zealand farmers to gain credit and potentially resources for eliminating themselves from the 'warming' reporting and instead incrementally gaining ground as an offset for ongoing emissions of stock gasses, for which both recognition and reward could potentially be explored.

**Table 1: Mitigation technology assumptions - effectiveness, cost and date of first availability**

Mitigation		Emission reduction	Cost per animal	1. S.I. High Country	2. S.I. Hill Country	3. N.I. Hard Hill Country	4. N.I. Hill Country	5. N.I. Finishing	6. S.I. Finishing Breeding	7. S.I. Finishing	8. S.I. Mixed Finishing
CH4 Vaccine	Sheep	30%	\$5.00	2031	2031	2031	2031	2031	2031	2031	2031
CH4 Vaccine	Cattle	30%	\$10.00	2031	2031	2031	2031	2031	2031	2031	2031
CH4 Inhibitor	Sheep	30%	\$6.00	NA	NA	NA	NA	NA	NA	NA	NA
CH4 Inhibitor	Cattle	30%	\$12.00	2031	2031	2031	2031	2031	2031	2031	2031
N2O Inhibitor	Sheep	50%	\$1.00	NA	NA	NA	NA	2030	NA	2030	2030
N2O Inhibitor	Cattle	50%	\$8.00	NA	NA	NA	NA	2030	NA	2030	2030
Genetics	Sheep	10%	\$0.75	2025	2025	2025	2025	2025	2025	2025	2025
Genetics	Cattle	10%	\$2.00	2031	2031	2031	2031	2026	2031	2026	2031

Source: Phil Journeaux, AgFirst, (pers comm)

**Figure 21 Cost curves for mitigations**



### Point 3: International parity

New Zealand has thus far failed to adapt the IPCC advice to our domestic circumstances and has instead adopted 'default' positions with regards to our targets, giving almost no consideration to the distinct and rare composition of our emissions profile as a sparsely populated and highly agricultural developed nation. This profile has no directly comparable counterparts and those with which we share some similarities (Ireland) have access to both the EU's Common Agricultural Policy and close proximity to wealthy markets with diverse economic advantages.

New Zealand by comparison has a heavy reliance on developing markets (China) a complete absence of agricultural supports (beyond natural disasters) and vastly fewer people over which to spread our 'per capita' emissions for reporting purposes.

We also have extraordinarily large areas of conservation estate and vast amounts of unfarmed land within private and Moari freehold title areas, little of which is considered when measuring ourselves against our international peers. For many reasons this places us at a disadvantage because we have so far been unwilling to measure or report the aggregate contribution of this style of land management relative to our international counterparts for whom 'cut and carry' is the norm, in addition to vast shipments of imported proteins and grains which are then fed to housed animals capable of being fed inhibitors.

Our collective failure to record and articulate these differences and to understand their weaknesses and strengths has led to a myopic definition of success with regards to New Zealand agriculture and emissions reductions. We have utterly failed to celebrate the distinctions that make us unique and sustainable, in favour of international comparisons based on less sustainable models incorporating

vast requirements for arable land and associated infrastructure. New Zealand agriculture has remarkably little infrastructure and correspondingly few inputs at a landscape level, however we have thus far failed to appreciate this distinction or to understand its place in our climate change aspirations. We seem especially reluctant to consider where emissions exist and are cycled at an ecosystem level perhaps owed to the extraordinary complexity of natural and biological interactions, but given that the majority of our farms operate largely in an ecosystems within nature – in situ ; so to speak, it seems sensible to adopt targets and tools that fit with such an approach.

Contrary to this, we have till now been complicit in using metrics and reporting tools more appropriate for economies where fossil fuels and manufacturing comprise the bulk of emissions, and have not used our unique position to lead those developing nations with whom we share a more similar profile.

The information our leaders have worked with has played a role in this. It is imperative that this review aims to further arm our policy makers with information and tools to distinguish ourselves globally and to sustain ourselves into the future in ways that acknowledge our unique profile and place in the world.

As an illustration of just how little attention we have tended to give positive opportunities, research by NIWA indicated that substantial carbon sinks in the south island appeared to be sequestering 60% more carbon than standardised models indicated they should be, and for which a number of theories were initially proposed.

*“The story the atmosphere is telling us is that there’s a big carbon sink somewhere in the South Island, and the areas that seem to be responsible are those largely dominated by indigenous forests. However, we cannot rule out an important role for carbon uptake in the hill country or from pasture from our current data.” Indigenous forests cover about 6.2 million hectares in New Zealand.*

*Dr Mikaloff-Fletcher says that was a very surprising result mainly because strong carbon sinks are expected when there is a lot of forest regrowth.”*

The absence of interest in this research, and others like it have tended to reinforce the idea publicly that methane targets have little interest in the physical and material impacts of climate change and owe more to political point scoring and international posturing. A more balanced means of reporting both the challenges AND the opportunities is likely to reinforce more confidence that science is in fact objective, and not politically coloured.

The final point I would make, is that this panel is being asked to provide more information on a policy area which is immensely complex, and it is worth understanding the role of information in complex settings.

- Complicated issues are those for which a discrete number of ‘unknowns’ exist and gathering information which fills the requisite gaps is sufficient to then co-ordinate a response between interested participants who share similar values.
- Complex issues on the other hand, contain a myriad of unknown unknowns, for which further information may be of little value other than to further highlight how much more is ‘unknown’, given the potential for disparity in human values, desires and definitions of the problem, or success.

In this context, more information is of limited value compared with better alignment between the participants in order to ensure that there is collective will to address the issue.

In summary, complicated issues can be solved with more information and better science, complex issues cannot be solved without a collective commitment on the part of the people.

This panel is being asked to provide information to inform an issue which requires collective commitment and a shared definition of success. If you are to aid in the Government addressing this extremely complex policy area, then your information must be framed with the point above in mind, in order to enable a shared sense of commitment and some hope of obtaining a shared definition of success.

If we don't have the people, all the information in the world won't solve the problem.

Thank you for the opportunity to provide a submission and I wish you well in your endeavours to provide a useful report that moves us forward together.

## NZ FARM METHANE EMISSIONS AND WARMING, A FARMER'S PERSPECTIVE

In this submission I express my views as a farmer, I am not a scientist and am not pretending to be one. I am more that happy to answer any queries you may have, and I will be happy to speak with the presentation of this submission if you wish. A very good teacher told me long ago that an expert is someone who knows a whole lot about very little and with the farm methane debate I see many experts with this silo mentality. Example, many scientists get all worked up about reducing methane emissions without giving any thought to what happens with the methane after it enters the atmosphere.

Methane is a short-lived greenhouse gas (GHG) that stays in the atmosphere for about 12 years. With a constant rate of emissions as in NZ farming the result is that after about 18 years of such ongoing emissions there will be an equilibrium where the rate of emissions is equal to the rate of decay. Such emissions are therefore **net zero, emissions are completely offset by decay**. However, scientists have found that there still is some warming impact from these net zero emissions caused by a 'lingering' effect from the decayed methane. To account for this Allen and Cain have calculated that **"methane emissions need to reduce 0.3%/year to have no impact on warming"**. This is easily met by NZ farming because livestock numbers have fallen more than 1 %/year for the last 10 years because of forestation, urban spread and expansion of horticulture. **It is therefore crystal clear that NZ farm emissions have no impact on additional warming and are below net zero.**

The problem for farmers started in 1997 when the IPCC adopted **GWP100** as the metric for reporting all GHG emissions so that their impact on warming could be compared. **This metric treats methane as if it is a long-lived gas that accumulates in the atmosphere**, GWP100 simply multiplies the CH<sub>4</sub> weight of ongoing emissions by 25 to calculate the warming potential. As I have explained in the second paragraph **this is clearly wrong. Methane decay offset emissions, NZ farm methane emissions are below net zero and actually have a cooling effect.**

It is often stated that methane emissions don't need to go to zero to have no warming impact. This is misleading and confusing, they are below net zero, the problem is with the metric **GWP100 that is designed for long-lived GHG and doesn't work for short-lived GHG like methane**. Allen and Cain have demonstrated that the GWP100 underestimates the warming impact of rising methane emissions and more importantly it overestimates the warming impact of constant or falling emissions. **It's use for recording ongoing methane emissions is fundamentally wrong and leads to all sorts of perverse policy outcomes that are bad for the planet and the people.** For example, in NZ and the EU synthetic (oil based) fibres are currently classed as more sustainable than wool.

In 2022 the amount of NZ ag methane emissions was 37.7 MtCO<sub>2</sub>-e (NZ GHG Inventory). Because ag methane emissions have been declining slightly (>1%/year) for about 10 years I can assume that the **amount of methane removed (decay) from the atmosphere was about 39 MtCO<sub>2</sub>-e in 2022. This is the biggest CO<sub>2</sub>-e removal in the NZ economy, the CO<sub>2</sub>-e removal from forestry was only half of that at 19.2 MtCO<sub>2</sub>-e. It just makes no sense whatsoever that the largest amount of CO<sub>2</sub>-e removal in NZ is not accounted for in the NZ GHG Inventory that is supposed to account for all GHG emissions and removals.**

**The use of GWP100 has created the false public perception that farm methane emissions play a big role in global warming and that consuming meat or dairy and using wool is bad for the planet.**

There have been numerous submissions to the CCC in NZ and presentations to the IPCC to reconsider the use of GWP 100 for farm methane emissions (GWP\* the best-known alternative in NZ), but mostly these have fallen on deaf ears. **The NZ GHG Inventory is still using GWP100 for reporting methane emissions.**

## **HOW BIG IS THE WARMING IMPACT OF METHANE?**

If you read the big numbers like 38000 kilo tonnes CO<sub>2</sub>-e of methane emitted in NZ in 2022 you could think that the air is thick with methane. But the **atmosphere** is a big place, and only **contains** about **0.0002% or 2 ppm methane** and 0.3 ppm N<sub>2</sub>O. **The dominant GHG in the atmosphere is water vapour**, between 1 and 2% in NZ. For the next calculation, I take an average of 1.5% or 15000ppm of water vapour; CO<sub>2</sub> is about 419 ppm. Of that 2% methane about half is man made, 1 ppm. Of that man made methane more than half is from the fossil fuel industry, waste and rice paddies. That leaves less than half or, **0.00005% or 0.5 ppm of total GHG gases in the atmosphere coming from livestock methane emissions. For every molecule of livestock methane there will be 40000 molecules of water vapour and. The CO<sub>2</sub> methane is completely outnumbered, and its impact is miniscule.**

### **Conclusion.**

There is overwhelming evidence that the GWP100 metric does not represent the warming potential of ongoing methane emissions like in NZ farming.

Even **with conventional science** using the findings of Allen and Cain that methane emissions need to **reduce 0.3%/year to have no impact on warming, the reduction target by 2050 should be 10%.**

**Livestock methane in the atmosphere is outnumbered 40000 to 1 by water vapour and CO<sub>2</sub>. Reductions in livestock methane emissions will have a miniscule and negligible impact on the climate.**

**Current NZ livestock emissions are completely sustainable.**

**There is no need to record individual farm methane emissions because there is no warming problem, this will create massive cost savings together with the unnecessary massive amounts of money wasted on methane mitigation projects.**

**I believe that methane is the biggest farming issue of our time, and it will not go away until the reality, that methane has no impact on the climate, is addressed. Now is the time for our farming leaders and government to step up and make a change. The EU is seeing a wave of centre right new governments, and we may be surprised to see how many would look to little old NZ for leadership on this issue.**

9(2)(a)





# **Submission to the Methane Panel**

## **Who Am I?**

I am a sheep & beef farmer in the hill country west of Gisborne who is also a founding member of the Methane Science Accord. But most importantly, ever since I heard about the prospect of pricing livestock methane back in late 2008, I have worked hard, but to no avail, on our various farming leadership groups to get them to focus on warming, not emissions. I therefore welcome this opportunity to present my thoughts to you, first in written form here, but I would also like the opportunity to speak with the panel.

## **My Thoughts on Methane**

The warming from livestock methane is so miniscule it is impossible to provide a positive cost benefit analysis of any mitigation measure. This is just logical common sense and should not be a surprise to any science literate individual. Methane is produced by livestock as part of a natural cycle. Livestock have been doing this for millennia. If this cycle caused significant measurable warming over time it would have happened by now. It hasn't. so please recommend that there is no case for a price on methane and no case for farmers to adopt expensive mitigation measures, if and when they appear as they will have no measurable impact on global temperature.

The often quoted justification for the need to reduce emissions is that our customers are demanding it. But when demands are based on misinformation and misunderstanding we need to correct that, not cave in and submit to it. I have been campaigning to this effect since at least 2011. If all the \$191 million so far committed to the AgriZero joint venture plus \$100s of millions that have been swallowed up by the Global Research Alliance and the Pastoral Greenhouse Gas Research Consortium had been spent instead on a global education program in partnership other livestock producing nations we would

not now need to be holding this review. Further, research shows that food safety, natural production and quality at a reasonable price are the consumers main drivers of choice. If our product is artificially altered to reduce methane emissions, will it end up as discounted product?

**Final Conclusion: There is no scientific or political justification for taking any action to tax, curtail or require mitigation measures against ruminant methane emissions and the Panel should resist taking any step to impose reduction targets. The Panel should advise the Government to launch an international campaign to have all references to restricting ruminant methane emissions removed from the UN and IPCC briefs.**



## Methane Science and Target Review.



This submission is made by the Methane Science Accord, a grouping of Groundswell, F.A.R.M., 50 Shades of Green and R.A.N. with a membership of over **100,000** farmers, scientists, and rural supporters.



## Methane Science and Target Review

### Submission Content:

- a. Comments on the Terms of Reference
- b. Current understanding of the Science of Methane and the Atmosphere
- c. Ruminant Methane Science
- d. Targets for 2050
- e. Political Considerations
- f. Recommendations
- g. Appendices and References

### Submission Recommendation:

*The Methane Science Accord submits that ruminant methane emissions:*

- *are too minor and immeasurable to factor accurately for taxing purposes or mitigation*
- *that current science confirms their warming ability is inconsequential*
- *that farms have an adequate offset in photosynthesis and sequestration ensuring they are carbon positive, making curtailment or taxing inequitable*
- *that there is no scientific or political basis to establish targets for reduction*

*The Methane Science Accord submits that the Panel should not make any recommendation on reduction targets for 2050 but submit that the New Zealand Government, at the highest level, should solicit support from other countries that have ruminant methane emissions, in an endeavour to have those emissions removed from the purview of the United Nations and the IPCC.*

### Submission Conclusion Summary:

1. Ruminant methane is too miniscule to have any measurable effect on temperatures..... Page 4
2. Correctly measuring methane by volume not weight renders methane impacts minor..... Page 4
3. Correcting doubling estimates further renders methane impacts of no consequence..... Page 5
4. On the electromagnetic spectrum, methane is either in any area where it is unable to absorb energy or in an area where water vapour dominates, being at least 8,000 times stronger..... Page 5
5. The GWP100/GWP\* debate proves the science is not settled and major differences in impact on agricultural economies from recent findings are possible..... Page 7
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7. The Paris Agreement requires that food production be not threatened..... Page 9
8. NZ has the lowest carbon footprint among all food exporters and should be the focus of increasing production to feed the extra 2 billion people entering the world..... Page 9
9. The case against ruminant methane is not scientific but politically contrived and should be dealt with accordingly.



**a. Terms of Reference:**

The dominant considerations in the Terms of Reference are:

1. The “review of methane science and the 2050 target”
2. Determining the precise meaning of “no additional warming”
3. “Understanding methane and its warming impact” on the atmosphere
4. Providing advice on what a biogenic methane target consistent with the principle of no additional warming
5. estimates of biogenic methane emissions reductions needed in 2050 and 2100 to achieve and maintain a state of no additional warming from New Zealand’s biogenic methane emissions relative to 2017 levels of warming.

The Methane Science Accord (“MSA”) submits that a detailed understanding and broad acceptance of what is deemed “no additional warming” is central to the Review Panel’s task. There is no internationally accepted definition of “no additional warming” so the MSA believes that the commonly held and most literal meaning should be adopted. Therefore, measurements of methane gas emissions now and in the future must relate back to the levels tested and recorded in 2017.

The Department of Statistics 2017<sup>1</sup> shows all methane emissions were **34,254 tonnes** of CO<sub>2</sub>-e, down nearly 2% on the average of the previous 5 years. It is considered but not fully proven that 85% of New Zealand’s methane emissions are biogenic, originating from the country’s sheep, deer, goats and cattle.

In the year ended June 2023<sup>2</sup> these emissions had fallen to **32,139 mts** which is a creditable **6.17%** reduction from 2017 and well on the way to achieving over 10% by 2030 without any other interference or mitigation measures applied.

The MSA contends that there is no need for any precipitate action while reductions are averaging over 1% per year.

The effect of falling levels of ruminant methane entering the atmosphere and methane lasting less than 12 years before oxidising means the ‘pool’ of methane is reducing and less warming is occurring. The corollary of less warming is cooling. Efforts by the Climate Change Commission to dispute this point are, frankly, weak and disputable. The fact remains that New Zealand farmers are helping to cool the atmosphere even if in a very minor manner.

Estimates of methane emissions are subject to a high degree of uncertainty, with the possibility of published estimates being + or - 40% and the unknown methane emissions from poorly understood origins like undersea vents. New Zealand’s only measuring site is poorly placed to achieve accuracy.

**Conclusion: NZ is already achieving “no additional warming” reducing emissions by over 1% per annum and will meet a 10% reduction by 2030. In fact, farmers are helping to cool the atmosphere in a minor manner**



## **b. Current understanding of the Science of Methane and the Atmosphere**

### **1. Ruminant Methane's size.**

All methane from all sources makes up 0.00019% (1.9 parts per million by volume) of the 'atmosphere which is miniscule – less than two small cups in an Olympic sized swimming pool. Of this amount most authorities state the world's ruminants' emissions contribute 14 – 15% which further reduces its intensity. New Zealand has less than 1% of the world's ruminants.

It is a brave assumption that suggests 0.000000285% ( $0.00019\% \times 15\% \times 1\%$ ) of the atmosphere is capable of impacting worldwide temperatures.

According to NOAA average world temperatures have risen by 1.1 degrees C since 1880. It notes that 15% to 45% of this increase is due to methane emissions. (That assumes that methane is 28 times more effective than CO<sub>2</sub> as a Greenhouse Gas – a finding we believe is demonstrably wrong by a factor of 2.47 times). Based on NOAA's data New Zealand's ruminants could have only contributed 0.000247 to 0.000745 degrees C in total over 144 years – an infinitesimal, inconsequential amount unable to be definitively assessed with any accuracy suitable for taxing purposes.

This minor amount is confirmed by Dr William van Wijngaarden who, in personal correspondence, assessed the contribution to warming of New Zealand's ruminants as 1.7 millionths of one degree centigrade per year going forward and Professor David Frame who stated to farmers in Invercargill that warming from New Zealand ruminants from 1850 to 2000 was likely 1.4 thousandths of a degree and from 2000 to 2100 is estimated at 1.7 thousandths of a degree.

**Conclusion: Ruminant methane emissions are too minor to be impacting temperature in a measurable manner**

### **2. Correcting the warming potential of methane.**

The MSA contends that measuring methane by tonnes, either as CO<sub>2</sub>-e or on its own is unhelpful, unscientific and unjustified. Warming is widely calculated on additional tonnes of Greenhouse Gas emitted.

The fallacy is that any warming that might occur is done on a molecule by molecule basis, not weight. Methane has an atomic mass of 16 (C=12, H=1), whilst CO<sub>2</sub> (O=16) has a mass of 44. So, one kilogram of methane has 2.75 times the number of molecules in an equal weight of CO<sub>2</sub>.

Avogadro's Law states that equal volumes of gases under the same conditions of temperature and pressure contain equal numbers of molecules. However, the mass of a gas molecule depends on the masses of the atoms that make up the molecule so equal volumes of gases will have different masses if the gas molecules are of different mass.



If equal volumes of the two gases are compared, rather than equal weights, the normally accepted 28 times for calculating methane's relative warming ability is grossly over-stated. Molecule for molecule, the warming ability of methane compared to carbon dioxide is 28 divided by 2.75 times (44/16) – i.e. a much more modest multiplier of 10.2.

It is critically important for the Panel to identify and correct this misconception. A methane molecule does not have a warming ability that the IPCC claims - 28 times that of a carbon dioxide molecule – when its GWP of added gases is incorrectly based on the weight, not volume.

It should be noted there is much less methane in the atmosphere than water vapour and methane and that absorption of infrared energy diminishes logarithmically as concentration increases.

It should also be noted in regard to uncertainty that In New Zealand, Van der Lingen (2009) pointed out that we have no idea why New Zealand's atmospheric methane measurements were static while livestock numbers were rising in the 1970s and 1980s but then increased after the numbers stabilised in the 1990s.

**Conclusion: The warming potential of added methane used by the IPCC is grossly exaggerated by not focusing on a molecule by molecule basis.**

### 3. The misuse of doubling calculations.

An estimate for the total volume of CO<sub>2</sub> in the Earth's atmosphere is 950 gigatons and for methane the figure is 9.8 gigatons. Therefore, there is 97 times more CO<sub>2</sub> in the atmosphere than methane. So, if the atmospheric concentrations of both carbon dioxide and methane were doubled over time the warming produced by the methane would not be 28 times that of carbon dioxide but roughly 28/97 i.e. one third of the warming produced by doubling carbon dioxide.

If this correction is added to the estimated molecule by molecule warming ability previously pointed out the effect of adding methane to the atmosphere is minor. This accords with findings by Happer and Wijngaarden who showed an increase in temperatures of 0.085 C per 100 years.

Flood, W. (2011). The Methane Misconceptions. Energy & Environment, 22(3), 233-239.  
<https://doi.org/10.1260/0958-305X.22.3.233>

**Conclusion: A further error occurs when the huge disparity between CO<sub>2</sub> and methane already in the atmosphere is ignored when calculating the effect of added GHG's.**

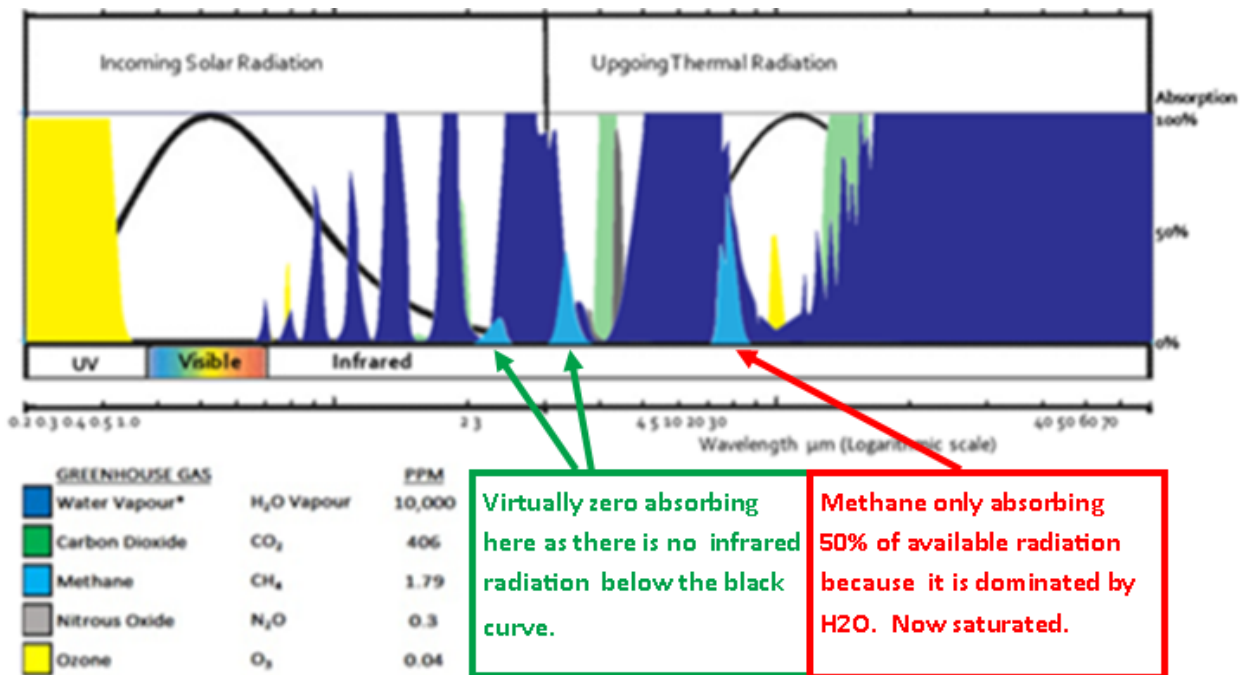
### 4. Methane and Infrared absorption.

It has been noted above that methane molecules are very scarce in the atmosphere. Additionally, they absorb outgoing infrared photons in three places, two of which can only absorb extremely minor amounts and only one extremely narrow sector (7-8 microns) of the electro-magnetic spectrum where there is also only minor absorption. Even in that tiny sector, methane molecules must compete with water vapour molecules which absorb photons equally as effectively.



The level of water vapour in the atmosphere (i.e. humidity) varies widely in time and space. Allison & Sheahan (2019) takes the average level of water vapour as a conservative 15,000 ppm, or some 8,800 times the volume of atmospheric methane. At this ratio the minor amount of methane is almost completely “out-absorbed” by water vapour.

Common sense tells us the chances of a methane molecule colliding with a 7-micron photon must be very small.



This graph clearly shows that the infrared absorption / re-radiation curve envelopes for methane are smaller than those for carbon dioxide both in bandwidth (potential absorption range) and magnitude (amount absorbed). Water vapour completely dominates the same wavelength.

GHG	wavelength	distance
Carbon dioxide	15 microns	20 cm
Methane	7.65 microns	250 m
Water Vapour	7.65 microns	4 mm (NZ)

Given the molecular density and wavelength, physicists can calculate the average distance that a photon will travel before it strikes a GHG. These distances for sea level pressures are shown in the chart below.

This means that almost all of the radiation that can be absorbed by GHGs is absorbed within the first few metres of the Earth surface. Discussion about absorption at higher altitudes where there is less water vapour becomes immaterial as there is virtually no methane left to absorb out-going photons.

**Conclusion:** Methane only absorbs outgoing infrared photons in only one extremely narrow sector (7-8 microns) of the electro-magnetic spectrum. Even in that tiny sector, methane molecules must compete with at least 8,000 more water vapour molecules which absorb photons just as effectively.



## 5. Global Warming Potential

The MSA does not believe the use of formulae that compare the warming ability of various Greenhouse Gases is particularly helpful, tending to add confusion rather than improved understanding. Global Warming Potential was introduced into the IPCC's consideration at the demand of politicians and was opposed by scientists as being a difficult and largely meaningless artifice as GHG properties are significantly different.

The dispute between GWP100 and GWP \* reveals two important considerations relevant to the Panel's determinations.

- a. It demonstrates that on a matter of major importance to New Zealand the "science is not settled". New findings can and should alter the state of knowledge on any aspect of such a complex and, as yet, poorly understood fields of science. The MSA proposes changes to the previous positions on methane and suggests they also be embraced as developments that improve our overall knowledge.
- b. The choice of one formula over another, in this case, potentially alters a farmer's liability by 300% to 400% - a sum that is disturbingly consequential. Early assessments by the Climate Change Commission and Federated Farmers suggested the financial liability of an average dairy farm could be over \$60,000 p.a., without mitigation, so a reduction of 300% to 400% would be critically important. The MSA's submission includes claims that will reduce the liability even more dramatically.

**Conclusion: The adoption of GWP\* demonstrates that there is no such state as "settled science" and that more recent findings that show ruminant methane is significantly less effective as a GHG should be adopted.**

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**The MSA submits that there is no credible scientific case to establish reduction targets for ruminant methane. If the various submissions the MSA are adopted based on more recent science the contribution of ruminant methane emissions to the increasing global temperatures is so negligible and immeasurable it should be removed from all international and local calculations and regulations.**

**However, it is suggested that New Zealand must be seen to be "pulling its weight" on reducing methane emissions. It is further claimed our customers demand action of some sort.**

**We believe there is also no "political" case to be made against ruminant methane emissions or any country affected by ruminant emissions needing to take any action of any sort to tax or curtail such emissions.**



### **The Political Case against including Ruminant Methane Emissions:**

New Zealand has a unique position with its low human population, relatively minor heavy industry and users of fossil fuels but large ruminant numbers with almost 90% of its food production being exported. No other country has the same inter-relationships. This should have been the subject in the early days of the IPCC of a strong position for a “special case” argued by our Government of the day. Countries similarly affected should have formed a bloc led by New Zealand taking an initiative to the international governing bodies to have ruminant methane excluded from any taxing, regulation or curtailment.

We believe the grossly overstated impact of methane, and ruminant methane, in particular, as a Greenhouse Gas puts New Zealand in an invidious position that will require the present Government to prepare and take to the United Nations, world Governments and the IPCC the most robust scientific case possible for all ruminant methane emissions to be excluded from any curtailment or taxing. Other countries who have similar difficulties because of their exposure to ruminant methane reduction pressures should be approached at the most senior level with the corrected science, to support the case.

It has been proposed that New Zealand needs to “pull its weight” even if it is accepted that its warming contribution is miniscule and unable to be measured. The MSA submits that this is unnecessary for the following reasons:

#### **1. Offsets:**

Ruminants are the only emitters of Greenhouse Gas that have a natural offset through the photosynthesis process nullifying any negative effects from their eructations. Dr Frank Mitloehner, PhD, US Davis Department of Animal Science argues cogently that in a pasture-based situation there is no additional warming if numbers of ruminants are static as they are in New Zealand.

Dr Kevin Trenberth, Distinguished Scholar at the National Center for Atmospheric Research, USA, and honorary academic at the Faculty of Science, University of Auckland, said in 2023 that, “the climate has already adjusted to methane levels from New Zealand cows and beef, and, provided there is no increase in stock, the biogenic methane produced won’t contribute to further climate change”.

Humans, who contribute a significant 1.7 gigatons of CO<sub>2</sub> annually, are judged by the IPCC to be part of a natural cycle where eating greens from plants grown by photosynthesis absolves them from any need of curtailment or corrective action. Yet ruminants who do the same thing because they are part of the same natural cycle face severe penalties.

New Zealand farmers sequester significant amounts of carbon in their soils. Light sandy soils, volcanic/pumice soils, allopharic soils, pallic soils that are common across the country all have an ability to continue sequestering significant amounts of carbon from the atmosphere.



The use of ground rock, compost, micro-minerals and nutrients have the capacity to increase carbon at a rate of 4 to 6 tonnes per hectare or 10 to 20 tonnes of CO<sub>2</sub><sup>3</sup>. The build-up of nutrients on sandy soils and pumice soils over many years has involved significant sequestration of carbon.

A NIWA study, Steinkamp et al (2017) found that New Zealand's calculated annual Greenhouse Gas Inventory (NZGGI) is substantially at odds with real world measurements:

"The terrestrial biosphere in New Zealand is estimated to be a net CO<sub>2</sub> sink, removing 98 (±37) Tg CO<sub>2</sub> yr<sup>-1</sup> from the atmosphere on average during 2011–2013. This sink is much larger than the reported 27 Tg CO<sub>2</sub> yr<sup>-1</sup> from the national inventory for the same time period."

Those years were not an anomaly. Bukosa et al (2021) found that in 2013-20:

"Our new results suggest that the strong sink observed in 2011-2013 did not diminish, but for recent years we have found an even stronger sink than for before."

NZGGI consistently under-estimates the sink value of our forestry and land use sectors as being 27 Tg CO<sub>2</sub> per year, when it is actually nearly five times higher. This huge difference is attributed to forestry and soil carbon effects that are not taken into account by the IPCC measurement guidelines.

The MSA contends that New Zealand as a whole and farms individually are **carbon neutral** or carbon positive and are actually subsidising other countries with much lower footprints.

## 2. Paris Agreement:

Article 2 (b) of the Paris Agreement, signed by New Zealand, states very clearly that no measures to reduce Greenhouse Gases should be taken that "threaten food production". This measure was promoted by third world countries and those nations that depend on importing food for obvious reasons. New Zealand food exports feed some 40 million people and on a protein basis an even greater number.

Though the MSA submits no such clause should be necessary given methane's insignificant warming capability it is ironic that as a signatory to the Paris Agreement New Zealand continues to ignore this important provision and use it strategically.

As reported by the Food and Agriculture Organization (FAO) (2009) and the United Nations (UN) (2017), the global population will increase by over a third (or 2.3 billion people) between 2009 and 2050. New Zealand, as a leading food exporter must be able to increase food production to meet its obligations to counter this challenge. In fact the priority focus for increasing food production and exports should be on the country with the lowest carbon footprint – New Zealand. On that basis alone the Coalition Government has a robust case to take to the world for ruminant methane emissions to be excluded from the IPCC's purview.

There are no measures available to farmers to reduce methane emissions in any substantial way that do not also reduce production despite over \$1 billion and some 15 years of Research and Development.



Further, any reduction in food production in New Zealand will inevitably lead to another country taking up the opportunity to supply, a situation referred to as “leakage”. Food production should be excluded from any restrictions to avoid the inevitability of leakage occurring.

Most food producing nations, internationally, subsidise their food production which will allow them to appear to be introducing strict measures on emissions while leaving the ability of its farmers to increase output, ironically doing so with a higher impact on the atmosphere.

As New Zealand has the lowest carbon footprint by at least 40%, the end result of New Zealand lowering production and leakage occurring will lead to a markedly worse outcome for the environment.

A study by “Potential carbon leakage under the Paris Agreement” Lewis C. King & Jeroen C. J. M. van den Bergh 2021 stated, “Depending on model elasticities, we find medium carbon leakage in the range of 1–9% (with a central estimate of 3–4%) under co-ordinated Paris Agreement policy across countries, compared to high leakage of 8–31% when countries operate in isolation”.

### 3. Consumer resistance

It has been proposed by parties demanding measures being taken on ruminant methane emissions and by some food exporters that consumers are demanding New Zealand concerted action to immediately reduce emissions. It is difficult to assess the strength and breadth of such demands as groups like purchasing supermarkets will seek any excuse to bargain down buying prices.

Such concerns are largely driven by perceptions gained by media dramatizing the dangers of increasing temperatures. Fed by some scientists and officials anxious to retain tenure, high profiles and assured income the media chose to ignore the reality of the IPCC’s much calmer assessment that almost all changes in weather events that may be disadvantageous are forecast for some time ahead and are not happening yet.

It would be incumbent on any plan by New Zealand to have ruminant methane emissions excluded from any regulatory regime to undertake a well-constructed promotional and educational campaign using MSM and social media to correct the mistakes and misapprehension currently in vogue.

### 4. Mitigation measures

New Zealand state-funded scientists along with their counterparts in many countries along with a significant but unknown contribution from the private sector have been diligently seeking techniques for reducing ruminant methane emissions. After 15 years of intensive research and over \$1 billion of funding no cost-effective measures have been produced, especially for pasture based agriculture practised in New Zealand.

Various unsuccessful attempts to identify solutions have only led to the prospect of lower production, interference in natural processes that could lead to a consumer backlash and unnecessary expenditure for farmers acerbating an already dire financial situation especially for sheep and beef farmers.



It is a dangerous and absurd scenario that requires farmers to meet expensive and impracticable solutions that lead to financial ruin to make no measurable or politically justified impact on the planet's temperatures. Many of the proposed measures are time-consuming and require additional handling of stock when farmers are short-handed and working long hours.

It is ironic that most suggested mitigation involves lower production and higher costs at a time when the farming industry is under severe pressure from inflation and modest farmgate returns. Much of what is suggested as mitigation favours feedlot and housed stock situations which are less healthy and have lower animal welfare standards.

**Final Conclusion:** There is no scientific or political justification for taking any action to tax, curtail or require mitigation measures against ruminant methane emissions and the Panel should resist taking any step to impose reduction targets. The Panel should advise the Government to launch an international campaign to have all references to restricting ruminant methane emissions removed from the UN and IPCC briefs.

<sup>1</sup>Department of Statistics 2017.

<sup>2</sup>Department of Statistics 2023

<sup>3</sup><file:///C:/Users/ojenn/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/TV4BB7RI/Unveiling%20the%20crucial%20role%20of%20soil%20microorganisms%20in%20carbon%20cycling%20-%20a%20review.pdf>

#### Appendices:

1. According to Prof. Windisch, as reported by the Bavarian Agricultural Weekly News on November 25, 2021, "The role of ruminants with regards to climate protection has up to now been overestimated by at least a factor of 3 to 4. An enormous climate contribution to climate warming has been **falsely attributed** to ruminants: 15 to 20%."
2. Dr Gavin Schmidt et al:(2010) in "Attribution of the present-day total greenhouse effect". "We review the existing literature and use the Goddard Institute for Space Studies ModelE radiation module to provide an overview of the role of each absorber at the present-day and under doubled CO<sub>2</sub>. With a straightforward scheme for allocating overlaps, we find that water vapour is the dominant contributor (~50% of the effect), followed by clouds (~25%) and then CO<sub>2</sub> with ~20%. All other absorbers play only **minor roles**. In a doubled CO<sub>2</sub> scenario, this allocation is essentially unchanged..."
3. Methane-oxidizing (methanotrophic) bacteria consume 30 million metric tons of atmospheric methane per year. No accounting of this is factored into any literature counting New Zealand's net methane situation.

**Submission**  
to the  
**Methane Review Panel**  
**9(2)(a)** for the **Methane Science Accord**  
September 2024

### **Aspects Covered**

- GWP, GWP\* & GTP
- Absorption of infrared at ground level
- Above the surface
- Emissions height and above
- Forcings
- Converting Forcing to Temperature
- Feedback
- Climate models
- Lifetime of GHGs
- Future projections of methane
- Warming effects of radiation from methane
- Peer review
- References
- Appendix - calculations of feedback and conversion to temperature

**The Methane Science Accord and its partners wish to acknowledge the debt that farmers have to the work of the late Dr Jock Allison.**

In particular his paper on Methane co-authored with Dr Tom Sheahan. [1]  
Consultation with Will Happer during the preparation of this paper became the stimulus for the Wijngaarden & Happer paper. The most comprehensive analysis of the spectral lines of greenhouse gases ever undertaken.

# GWP GWP\* GTP

These are the metrics used to compare the efficacy of the various greenhouse gases.

There are several issues with this metric.

## 1. The use of mass

The comparison often made is that a tonne of methane is some 28 times worse than a tonne of CO<sub>2</sub>.

This ignores the fact that absorption of infrared is a **molecular property**, the comparison should be between equal number of molecules (moles)

A given mass of methane contains 2.75 times more molecules than the same mass of CO<sub>2</sub>.

This distorts the issue from the outset regardless of the radiative properties of the GHGs being compared.

## This needs to be corrected

2. The major difference between CH<sub>4</sub> and CO<sub>2</sub> is in the effect of concentration. At very low concentrations an increase in any GHG will have a significant effect while for gases which are saturated the effect will be minimal.

In the diagram (below) the red triangles all have the same increase in ppm but the increase in absorption is vastly different.

Above 200 ppm CO<sub>2</sub> would be considered saturated.

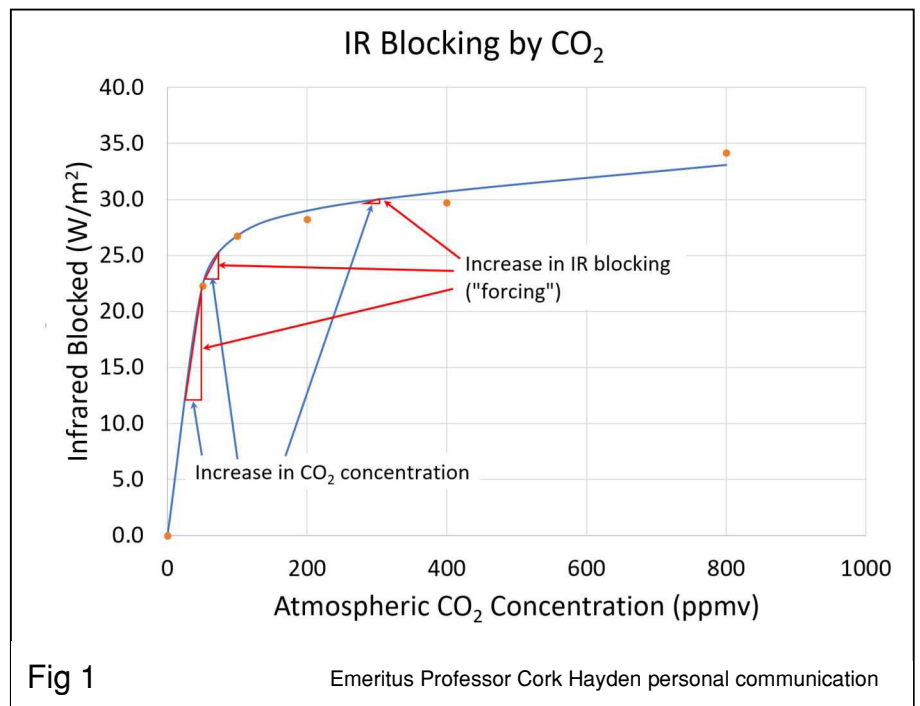
Saturation being the point where CO<sub>2</sub> has absorbed virtually all the radiation from the Earth (that it is able to absorb) so adding more CO<sub>2</sub> has little effect.

The issue is that using this metric ignores the fact that while the per molecule forcing might be 30 times or whatever, the concentration is so small that the actual effect on absorption of radiation is minimal.

3. To get its GWP the IPCC divided the increased absorption from pulse of methane to the increase from an equivalent pulse of CO<sub>2</sub>. This is like taking the increase from the leftmost red triangle (right)(but on a curve for methane) and dividing it by the increase from the right triangle. The difference is that CO<sub>2</sub> is near saturated and the methane is not. The issue is that the methane curve (calculated from hi trans data) did not include the overlap from water vapour, which absorbs the same wavelengths of infrared. Had the calculation been made on an atmospheric mix then the result would be very different.

This is represented in fig 1b (below) with a gas spectrophotometer. the left blue panel is how the IPCC did it and the right panel is how it should have been done.

To gauge the effect of having water vapour present, it is useful to compare the photon path lengths which are based on water being ~15000 ppm and CH<sub>4</sub> at 1.8ppm

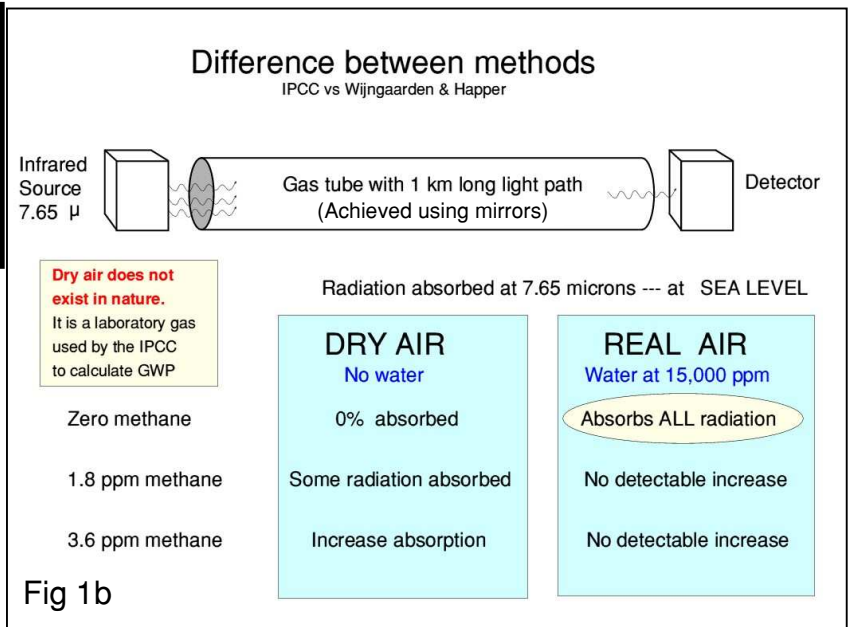


## Photon path length at 7.65 $\mu$

Water	~ 4 mm
Methane	250 m
CO2 (at 15 $\mu$ )	20 cm

This means that virtually all radiation from the Earth at 7.65 $\mu$  is absorbed by water within a few centimetres of the surface of the Earth.

As methane amounts to only 0.013% of water vapour then its contribution to absorption is of that order.



Doubling methane will only increase its contribution to 0.026 % -- Insignificant.

**GWP that ignores the absorption overlap with water it is not scientific, it is dishonest and misleads politicians and the public.**

## GTP

Like GWP, GTP is based on mass and therefore misrepresents the role of methane by a factor of 2.75.

It also depends on model manipulation to arrive a temperature value, this is discussed further on.

## Summary.

The claim that methane is 28 times worse than CO2 has been used to brainwash the public and politicians that this is a real problem that has to be dealt with.

**No scientist should accept this claim.**

While the per molecule forcing of methane is some 30 times that of CO2 the IPCC claim that methane is 28 times worse fails for three reasons;

1. Because that comparison is made in the absence of water vapour. which ignores the overlap in absorption spectra from water vapour.
2. The low concentration of methane means that even though the per molecule forcing is high, the amount of warming caused is minute, simply because there is not enough methane present to have a significant effect.
3. The time scale over which a doubling might occur has been ignored. When the calculated temperature change is spread out over the doubling time, the change on a yearly basis is very very small. e.g. at 0.0076 ppm /year for a methane the doubling time is **250 years**.

The role of methane has thus been misrepresented to the public and to politicians and this needs to be corrected.

**Corrected for these issues, then the warming effect of methane becomes minuscule.**

# Absorption of infrared at ground level

At ground level (in NZ) the molecules absorbing in the regions either side of the transparent window are shown in fig 2. Radiation in the 8-12 micron region (the window) goes straight to space.

7 to 8 micron band	
Water	~15000 ppm,
Methane	1.9 ppm
Nitrous oxide	0.3 ppm
12 - 20+ micron band	
Water	~15000 ppm
Carbon dioxide	420 ppm

Fig 2

Warming of the atmosphere is caused by GHGs absorbing infrared radiation from the Earth. Of those molecules absorbing in the 7-8 micron range **water** (at 15000 ppm) constitutes 99.987% and methane at 1.9 ppm 0.013%. If methane is doubled to 3.8ppm (0.025%) then water would constitute 99.975% of the molecules absorbing in the 7-8 micron band.

Given the absorbance of both is of the same order of magnitude then one can conclude that the effect of doubling methane is insignificant.

Water absorbs virtually all the radiation from the Earth in the 7-8 micron range within a few centimetres of the surface of the Earth.

The energy once absorbed will be transferred by collision within a billionth of second to other gases, mainly nitrogen and oxygen and the infrared energy radiated will have been converted to kinetic energy.

As Temperature is a measure of the average kinetic energy then the absorption of infrared will increase the temperature of the atmosphere by some small amount.

**Virtually all energy radiated as infrared (excluding window wavelengths) is absorbed by the atmosphere and transferred to kinetic energy of the atmosphere within a few metres of the surface.**

## Above The Surface

Greenhouse gases are also re-energised by collision and again, either lose that energy in collision or radiate it away.

Excited GHGs retain the energy for about 1 millionth of a second while collisions occur at about a billion/second.

As altitude increases the rate of collisions decreases allowing more, excited GHGs, to radiate and the photon path length increases to the point where some upward directed photons will escape to space.

The molecules radiating to space change with altitude as water is gradually frozen out of the mix (above 8 km on average) leaving CO2 to be the major radiator into the stratosphere.

Methane has little effect as a radiator to space because;

- its concentration is too low
- even into the stratosphere it competes with water vapour which up into the stratosphere remains twice that of methane at 4 ppm (Fig 3)
- Temperature above 8 km is of the order of  $-50^{\circ}\text{C}$ . At this temperature the Stefan-Boltzman curve has moved to longer wavelengths and there is very little radiation in the 7-8 micron range from this altitude. (Fig 4)

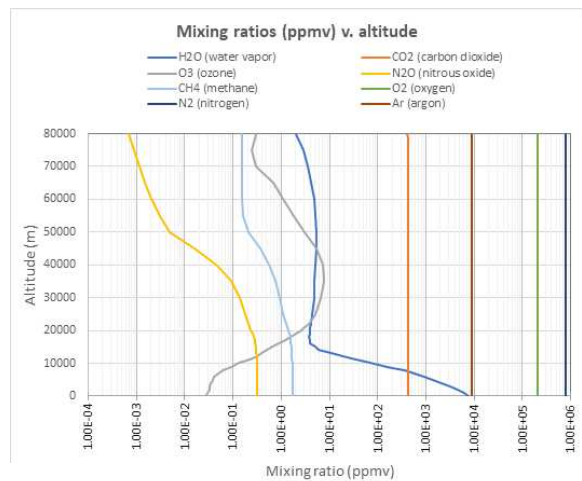


Fig 3

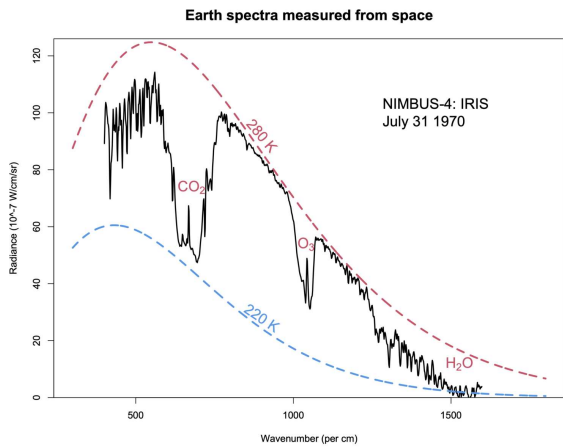


Fig 4

Earth's spectra showing Stefan-Boltzmann curves for 280 K (7°C) and 220 K (-53 °C).

Note that there is very little radiation in the 7-8 micron (1250 -1420 wave numbers/cm) region at 220K

The 7-8µ radiation above the 220K line has come from lower altitudes, mainly from water vapour.

## Emissions Height

This is the altitude that radiation to space starts. That altitude varies with the GHG involved.

For CO2 at 420 ppm the emissions altitude is in the stratosphere.

For water (on average) is about 7-9 km, the altitude where its concentration decreases to a point where photons can escape to space as opposed to being absorbed by other water molecules..

David Frame

Contends that warming is determined by the emissions height and therefore any increase in concentration will increase the emissions height and therefore increase warming.

The doubling of methane he contends will therefore raise the emissions height and cause warming.

Given that water vapour varies over a range of 50,000 ppm to 5000 ppm, and that this variation can occur over short distances and time spans makes a mockery of that claim.

An increase of 1.9 ppm in an absorbing gas is insignificant compared to the range of water and changes in water vapour that happen on minutes to hours every day

The examples below all produce an increase in water vapour greater than 80 ppm;

- 0.56 °C temperature increase within the daily temperature range and with Relative Humidity held constant at 65%. Such atmospheric changes easily occur in less than 1 hour.
- ONLY a 2% INCREASE in Relative Humidity from 65% to 67%: NO temperature change: Results presented at base-level temperatures from 6.5 °C to 25 °C. Change easily occur in 1 hour..
- ONLY a 1% INCREASE in Relative Humidity from 70% to 71%: NO temperature change: Results presented at base-level temperatures from 18 °C to 25 °C. Changes easily occur within an hour.

80 ppm is greater than the rise in CO2 over 43 years.

Methane pails to insignificance

Data from Emeritus Professor Geoff Duffy Auckland University (including diagram below)

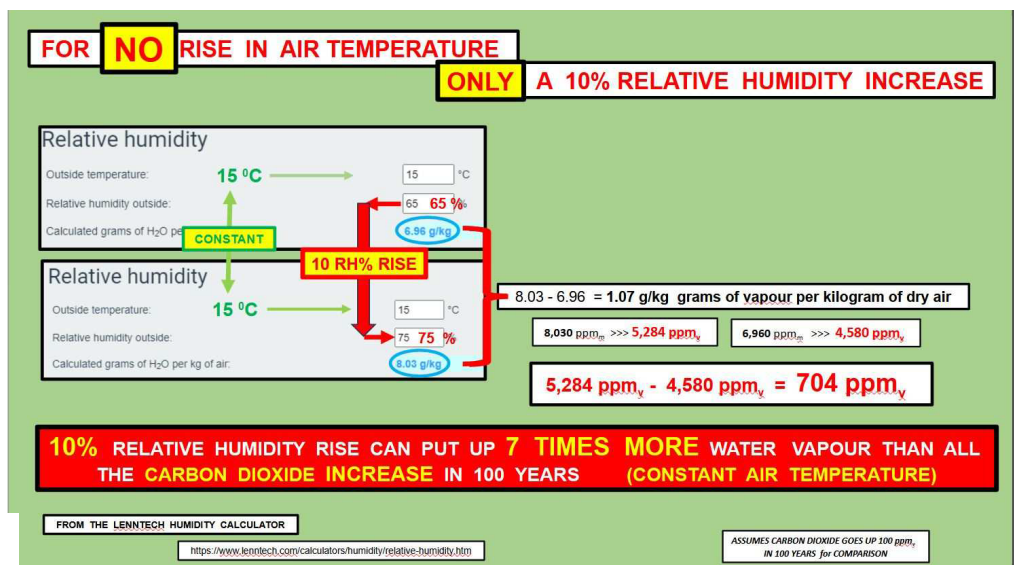


Fig 5

# Forcings

At right are the column densities of gases. While water is far more concentrated at the bottom of the column its total density is still a 1000 fold greater than methane.

$i$	Molecule	$\hat{N}_{sd}^{\{i\}}$ ( $\text{cm}^{-2}$ )
1	H <sub>2</sub> O	$4.67 \times 10^{22}$
2	CO <sub>2</sub>	$8.61 \times 10^{21}$
3	O <sub>3</sub>	$9.22 \times 10^{18}$
4	N <sub>2</sub> O	$6.61 \times 10^{18}$
5	CH <sub>4</sub>	$3.76 \times 10^{19}$

In the chart below, the per molecule forcings at the optically thin limit (column 1 ( $z$ )) show that water is 3 times better and CO2 5 times better at absorbing radiation than methane.

In the second column ( $z,0$ ) water is ~5 times better and CO2 ~10 times better at absorbing radiation. In the third column is the effect of adding one molecule to the existing atmosphere. In this case water is 100 fold less than methane because

Fig 6 Wijngaarden & Happer 2020

$i \setminus z$	$P_{ot}^{\{i\}}(z)$		$P_{sd}^{\{i\}}(z, 0)$		$P_{sd}^{\{i\}}(z, 1)$	
	$z_{tp}$	$z_{mp}$	$z_{tp}$	$z_{mp}$	$z_{tp}$	$z_{mp}$
H <sub>2</sub> O	1.49	1.49	1.16	1.19	$3.3 \times 10^{-4}$	$2.5 \times 10^{-4}$
CO <sub>2</sub>	2.73	3.45	2.24	2.53	$9.0 \times 10^{-4}$	$4.9 \times 10^{-4}$
O <sub>3</sub>	2.00	5.69	1.68	4.57	$3.3 \times 10^{-1}$	$3.8 \times 10^{-1}$
N <sub>2</sub> O	1.68	2.24	0.73	0.91	$2.1 \times 10^{-1}$	$2.0 \times 10^{-1}$
CH <sub>4</sub>	0.51	0.71	0.21	0.27	$2.8 \times 10^{-2}$	$2.6 \times 10^{-2}$

Table 4: Forcing powers (49) per additional molecule in units of  $10^{-22}$  W at the altitude  $z_{tp} = 11$  km of the tropopause and  $z_{mp} = 86$  km of the mesopause. The surface temperature was  $T_0 = 288.7$  K, and the altitude profiles of temperature and number density were those of Fig. 1.  $P_{ot}^{\{i\}}(z)$  of (54) is for the optically-thin limit.  $P_{sd}^{\{i\}}(z, 0)$  from (51) is for an atmosphere that previously had no molecules of type  $i$  (so  $\hat{N}^{\{i\}} = 0$ ) but all other greenhouse molecules had standard concentrations.  $P_{sd}^{\{i\}}(z, 1)$  from (51) is for a single molecule of type  $i$  added to an atmosphere that previously had standard densities for all greenhouse gases.

Fig 7 Wijngaarden & Happer 2020

water is saturated, however the effect of methane is still insignificant. This is shown graphically in the following chart where the;

- Blue lines** represent the optically thin limit (column 1)
- Green lines** represent adding one molecule where previously there were none
- Red line** is the effect of adding a molecule to a mix where all gases are in their standard densities

The suppression of red lines for water and CO2 show the extend of saturation.

This data shows that the forcing from an additional water molecule is suppressed by four orders of magnitude.

**The suppression of forcing from methane in the presence of water is clear.**

The IPCC uses the blue line when it should use the red line to compare the effect of methane in the presence of water.

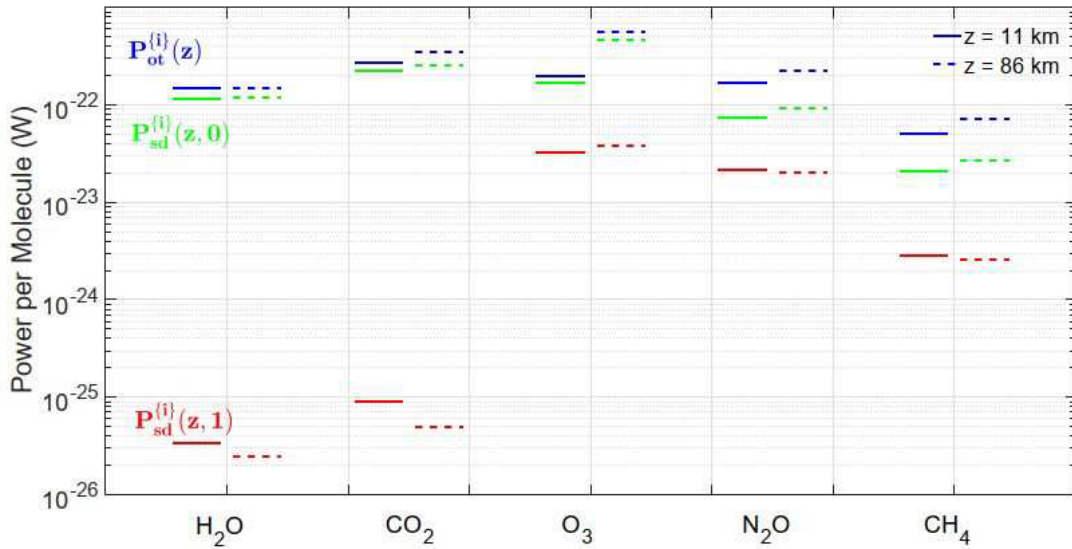


Figure 21: A graphical display of the per-molecule forcing powers of Table 4. At standard column densities the (red) powers,  $P_{sd}^{(i)}(z, 1)$ , for abundant  $H_2O$  and  $CO_2$  are suppressed by four orders of magnitude from their values in the optically thin limit (blue) where the powers are  $P_{ot}^{(i)}(z)$ . This is due to strong saturation of the absorption bands. The effects of saturation (the difference between the blue and red lines) are much less for the minor gases,  $O_3$ ,  $N_2O$  and  $CH_4$ . The green lines are the powers per molecule,  $P_{sd}^{(i)}(z, 0)$ , of the  $i$ th greenhouse gas in its low-concentration limit, but when the forcing power is suppressed by other gases at their standard densities. Interference effects (the difference between the blue and green lines) are more pronounced for the minor greenhouse gases,  $N_2O$  and  $CH_4$  than for the major greenhouse gases,  $H_2O$ , and  $CO_2$ . As one can see from Fig. 6 or Figs. 10 – 12, the strongest bands of  $O_3$  overlap little with those of other greenhouse molecules, which minimizes interference effects.

Fig 8

Wijngaarden & Happer 2020

The effect of doubling methane is the difference between the black line and the red line (below).

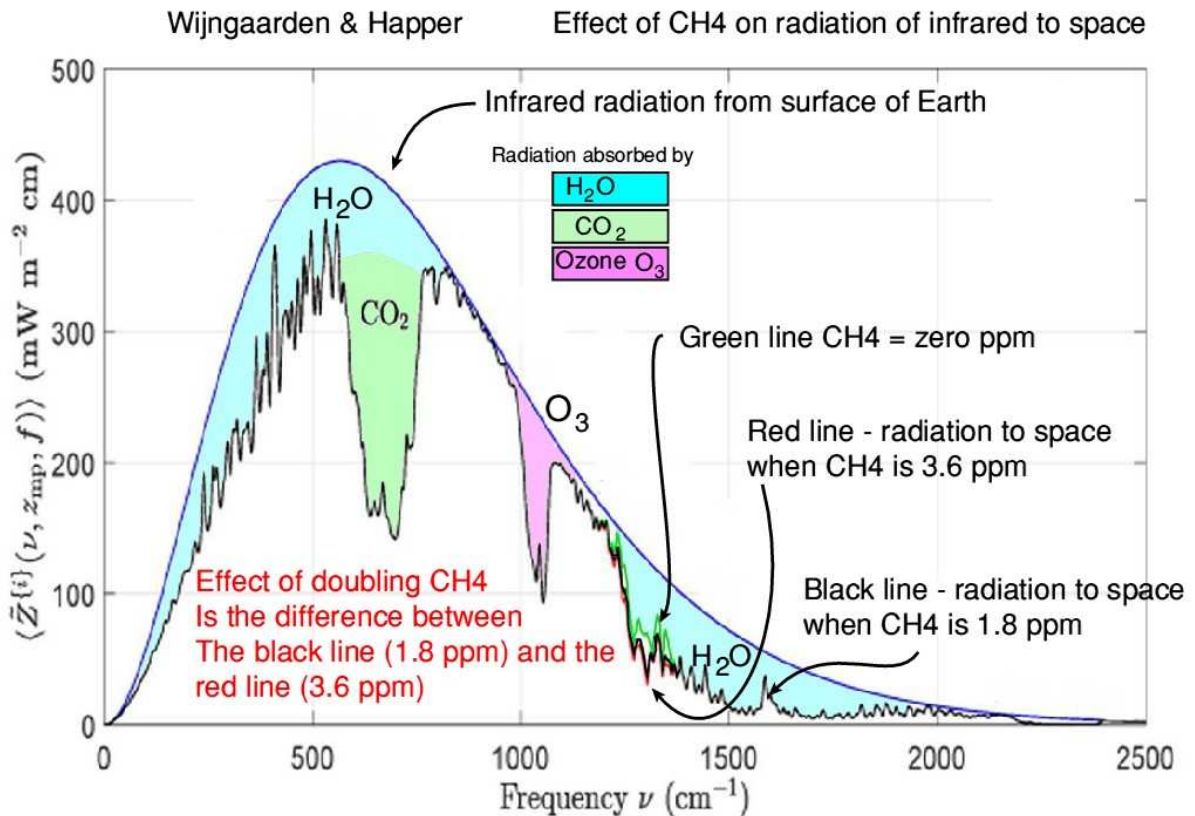
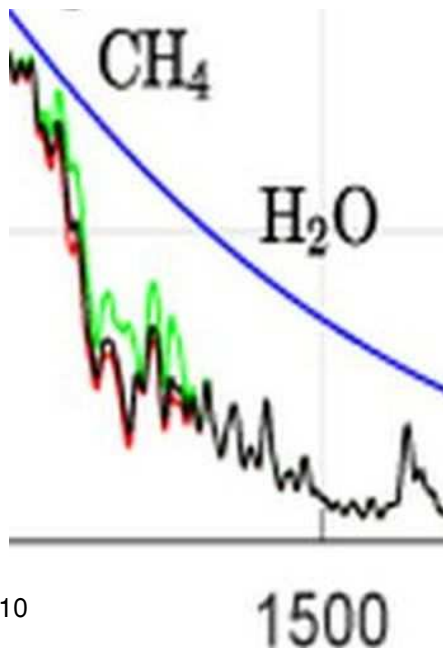


Fig 9



An enlarged view of the effect of doubling CH<sub>4</sub>. It can be seen that the doubled line (red) is almost indistinguishable from the black line (present concentration).

Fig 10

Below - An enlargement of these forcings in **milliWatts** methane in black dashes.

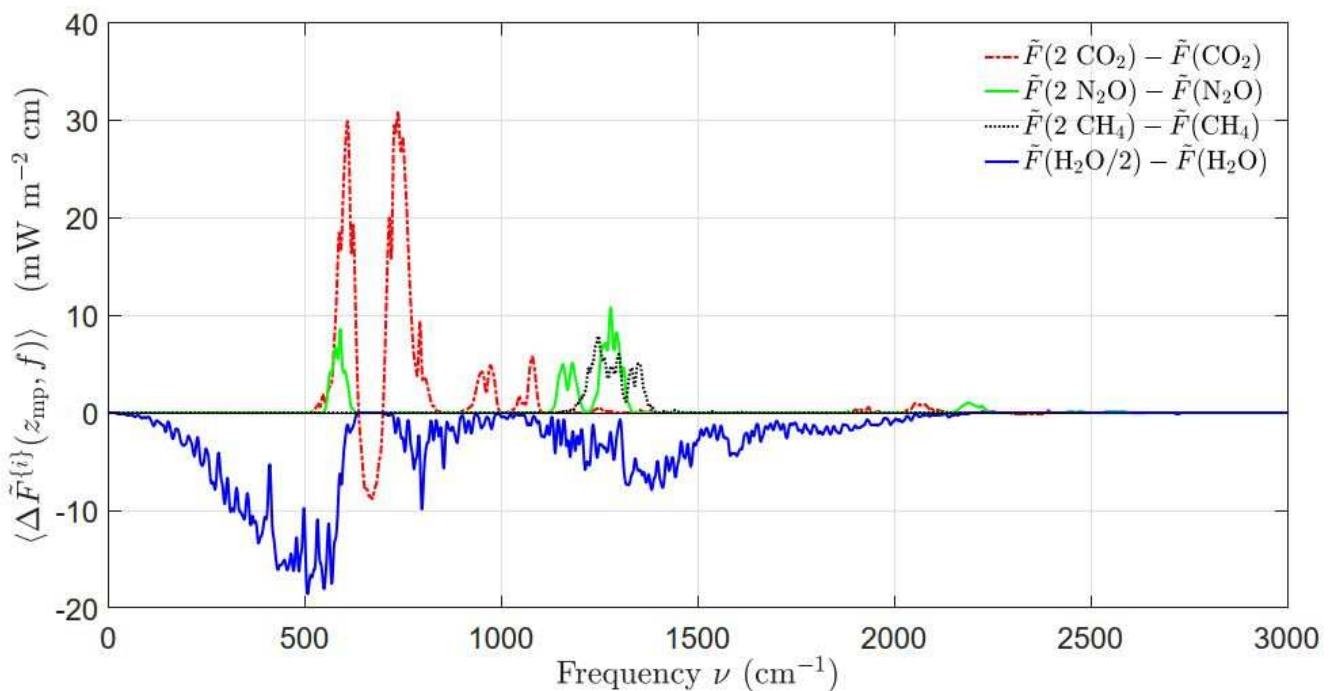


Figure 14: Spectral forcing increments (103) for doubled concentrations of CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>. These are the magnified differences between the black and red curves of Figs. 10–13. The frequency integrals (104) are tabulated in Table 2. For most frequencies  $\langle \Delta \tilde{F}^{(i)}(z_{mp}, 2) \rangle$  is positive. This is because doubling the concentrations of greenhouse gases shifts the emission heights  $z_e$  of (96) to higher, colder altitudes in the troposphere. An exception is the band of frequencies near the center of the exceptionally strong bending-mode band of CO<sub>2</sub> at 667 cm<sup>-1</sup>. Here doubling CO<sub>2</sub> moves the emission heights to higher, warmer altitudes of the stratosphere, where molecules can more efficiently radiate heat to space. Also shown are forcing increments for halved concentrations of H<sub>2</sub>O. Halving ensures that the relative humidity does not exceed 100 %, and it reduces the clutter of the graph.

## Converting Forcing To Temperature.

Will Happer commented that the forcings were easy to calculate but that the mischief starts with converting the forcings to temperature.

In our discussions with David Frame he made the following point regarding the W&H paper.

Happer and Van Wijngaarden claim “Methane concentrations may never double, but if they do, WH[1] show that this would only increase the forcing by  $0.8 \text{ W m}^{-2}$ .”

The equation in Box 7.1 of the WGI report from IPCC AR6 relates top of atmosphere radiative imbalance,  $\Delta N$ , to radiative forcing,  $F$ , and surface temperature,  $\Delta T$ , via  $\alpha$ , the feedback parameter.

$$\Delta N = F + \alpha \Delta T$$

In equilibrium,  $\Delta N = 0$ , so we can rearrange the equation to  $F = -\alpha \Delta T$ .

Taking Happer and van Wijngaarden's estimate of  $F_{CH4} = 0.8 \text{ W m}^{-2}$  alongside the feedback parameter estimate from later in Chapter 7 (p978) of  $\alpha = -1.16 \text{ W m}^{-2}$ , this gives

$$\Delta T = 0.69^\circ\text{C}.$$

In other words, taking Happer and van Wijngaarden's forcing estimate for a doubling of methane at face value, we get an equilibrium surface warming in response of  $0.69^\circ\text{C}$ . This makes it the second most important anthropogenic greenhouse gas, behind  $\text{CO}_2$ ; which is what the mainstream science community has said all along.

In still other words, far from showing methane's irrelevance, Happer and van Wijngaarden have simply underscored its relevance. That's what their numbers actually show.

There is a serious problem here. The derived equation from the IPCC  $F = -\alpha \Delta T$  is wrong. It rearranges to  $\Delta T = F/\alpha$ . Forcing divided by the feedback factor alpha.

This means that if the researcher chooses a lower value for feedback then the temperature change gets larger. Many researchers consider the feedback to be near zero or negative. As feedback approaches zero this equation would return temperatures approaching infinity i.e. reduce the feedback and the world becomes a ball of plasma - what nonsense.

Feedback is mainly due to the theoretical increase in water vapour, a larger feedback value should result in a higher temperature. The IPCC equation does the opposite.

This equation  $dT = \alpha' dF$  change in  $T = \text{feedback} \times \text{change in forcing}$ . This is the inverse of that used by the IPCC and gives the correct relationship between feedback, forcing and temperature. So an increase in feedback increases forcing as would be expected.

The derivation of this equation  $dT = \alpha' dF$  is in **appendix 1**

To get a temperature we need to solve the equation  $Z = \epsilon \sigma T^4 = 277 \text{ W m}^{-2}$

Emissivity from doubling  $\text{CO}_2$   $d\epsilon/\epsilon = -1.1\%$ .

Solving for  $dT = -(1/4)(d\epsilon/\epsilon) T$ . with  $T$  at  $290\text{K}$

gives a temperature increase from doubling  $\text{CO}_2$  of  $dT = -(1/4)(-1.1\%)290 \text{ K} = 0.8 \text{ K}$

Therefore the **temperature change =  $0.8^\circ\text{C}$** . for doubling  $\text{CO}_2$ .

Putting this in IPCC speak.

$$\alpha = dT/dF = T/(4\epsilon\sigma T^4) = 290 \text{ K}/(4 \times 277 \text{ Wm}^{-2}) = 0.26 \text{ C m}^2\text{W}^{-1}$$

So a forcing of  $dF = 3 \text{ W m}^{-2}$  from **doubling CO2** should cause a temperature increase of

$$dT = \alpha \cdot dF = 0.8 \text{ }^\circ\text{C},$$

Doubling methane has no more than  $\frac{1}{4}$  of the forcing from doubling CO2 and would take centuries to happen. But it would increase the temperature by

$$dT = 0.2 \text{ C for doubling CH}_4.$$

The much larger temperature increases quoted by the IPCC and its acolytes assume huge positive feedback, supposedly from water vapour and clouds. Most net feedbacks in nature are negative, not positive. So the actual warming from doubling CO2 or CH4 will probably be less, not larger than the feedback-free estimates of  $0.8 \text{ }^\circ\text{C}$  and  $0.2 \text{ }^\circ\text{C}$  above.

At the present rate of increase, doubling will take 250 years, therefore warming from methane would be of the order of  $0.0008 \text{ }^\circ\text{C/year}$ .

$$0.0008^\circ\text{C / year}$$

**Insignificant, inconsequential unmeasurable**

## Feed Back

Many scientists consider the feedback values used by the IPCC are extreme Ollila, Lindzen, Happer etc.

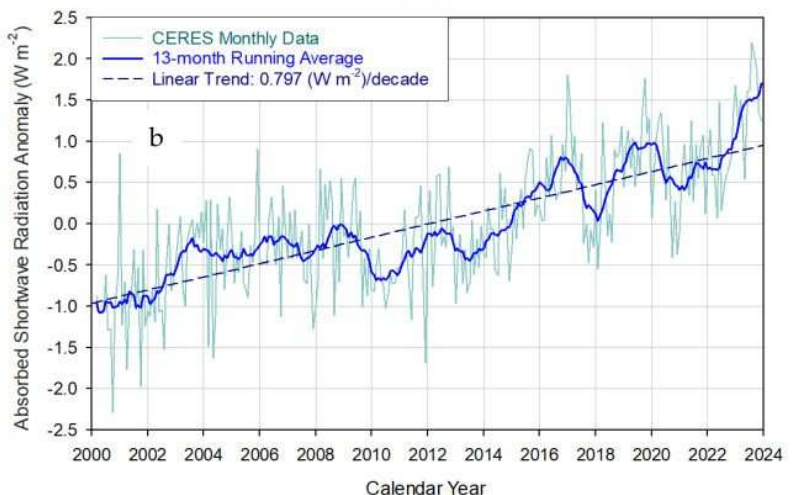
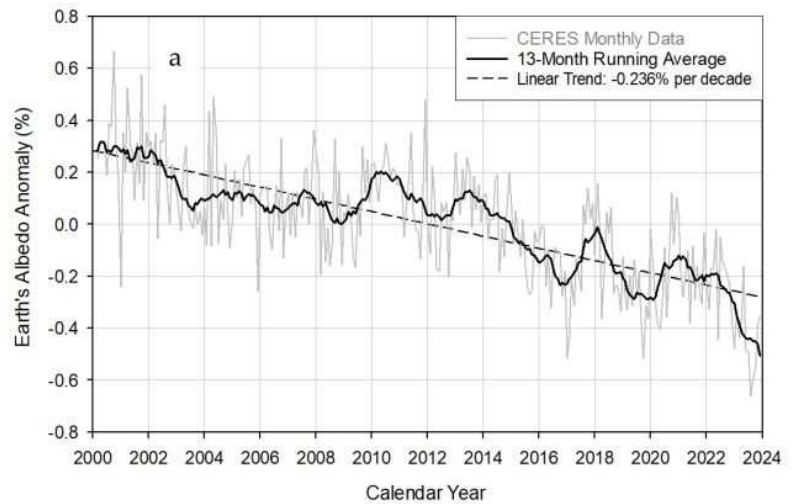
That feedback, is based on the theory that a warming atmosphere will allow more water vapour as per the Clausius-Clapeyron Equation. More water vapour = more forcing = more warming

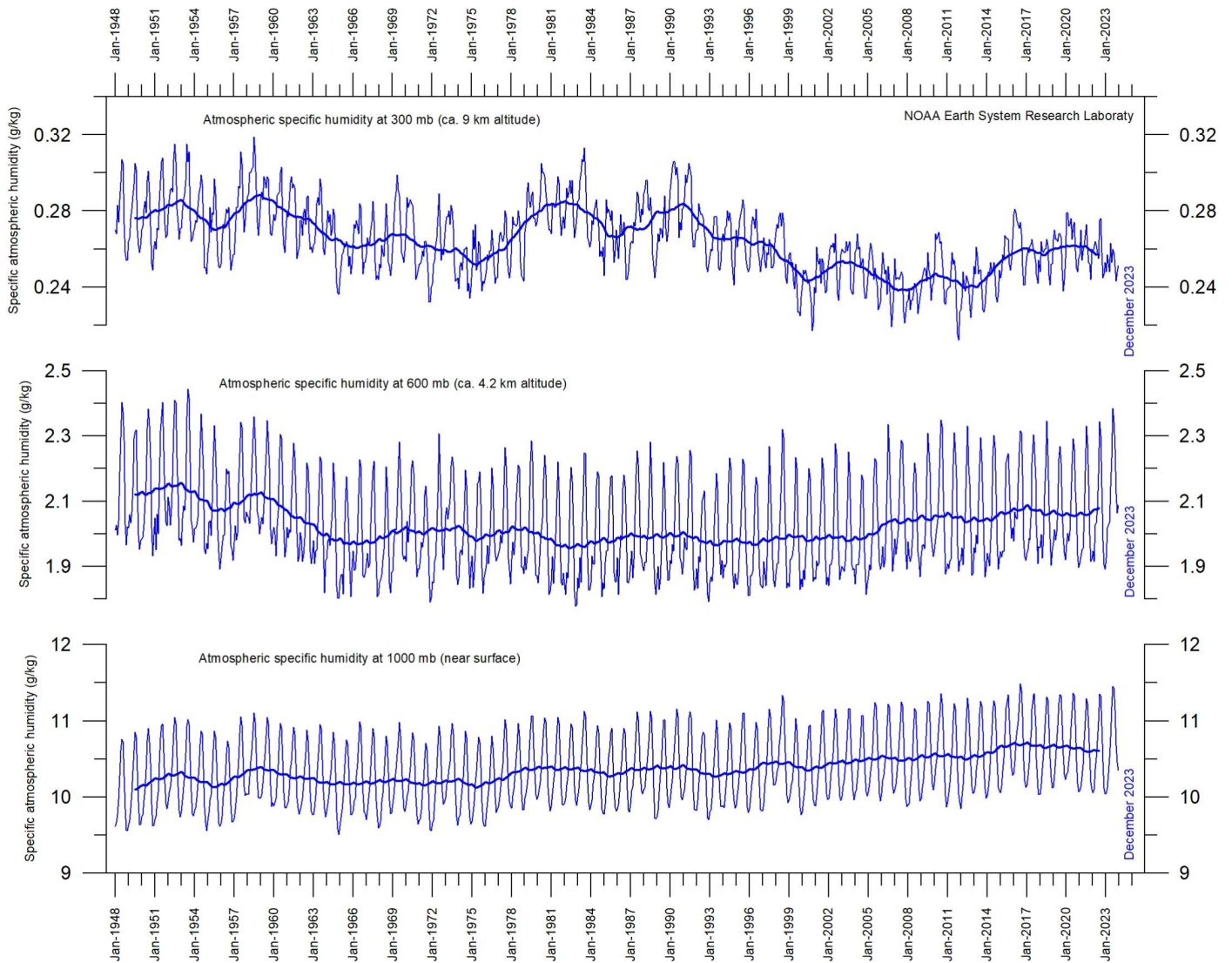
The feedback used by IPCC aligned scientists ignores the reality of actual data.

Earth has warmed because albedo has decreased allowing increased absorption of short wave infrared from the sun, (see graph to right)

An increase in outgoing longwave infrared has also been observed which would be expected with the increased warmth.

The graph of specific humidity (below) clearly shows that water vapour in the upper troposphere has been declining for over 70 years, only surface level specific humidity has increased (ever so slightly)





This is not what the models predict. The scientific method requires that if a hypothesis is not supported by observation /experiment then it is wrong. Richard Feynman.

The feedback from water vapour has not increased, in the all important upper troposphere it has decreased. Therefore the magnitude of the feedback used by the IPCC is WRONG.

The Nazis challenged Einstein saying there are a 100 scientists who say you are wrong. Einstein responded, Why 100, it only take **one** to prove me wrong. A lesson the climate fraternity has yet to learn.

With GWP, feedback, and effect of water vapour overlapping methane, the IPCC is travelling a path that is not supported by observations.

Genuine scientists would seek to correct this situation.

In addition, Cork Hayden has pointed out that if the Earth warmed 3°C (average from IPCC models), then the Earth would radiate an additional 16.7 Wm<sup>-2</sup>. Of which, CO<sub>2</sub> if doubled, would absorb only 3 - 3.7 Wm<sup>-2</sup>. So what happens to the other ~13 Wm<sup>-2</sup>? the Earth cools? until it returns to the temperature that matches the 3.7 Wm<sup>-2</sup> i.e. 0.65°C

## Climate Models

The IPCC (**AR6 report**) has concluded that a signal of climate change has not yet emerged beyond natural variability for the following phenomena: It then lists almost every form of extreme weather.

### So there is no climate emergency

The report also makes it clear that for a great portion of the planet, a detectable change in the rate of relative sea level rise (RSLR) hasn't been found (and might not even emerge before 2100),

### So the sea will not rise up and flood the land in the next few decades.

Both of these statements contradict the fairy tales of an imminent global catastrophe.

So where does “the Earth is boiling” and “the oceans overflowing” come from, along with eating meat is bad for the planet.

### Answer - the climate models

The general circulation models that produce all sorts of forecasts for the next 100 years are quite incapable of forecasting anything. They are research tools that at this stage are not fit for purpose.

The IPCC in AR5 said that it knew neither the **sign** nor the **magnitude** of the effect of warming on low cloud.

Low cloud is one of the most important parameters because it reflects sunlight and shades the Earth. All models have to input a value for what low cloud will do with warming, but that value is unknown and therefore a guess. But that is not all, a recent review by Roy Clark [16] makes devastating reading as it highlights the huge range of inbuilt errors in the climate models.

It becomes clear that no paper that uses these models, such as **Allen et al**, [21] is worth a damn. The approximation they have to warming is simply obtained by fiddling the figures until you get something that fits your expectations. (*Koonin Unsettled*)

The models cannot work backwards and reproduce past climate change. Therefore they fail the validation test that all good scientific models achieve.

Overall the models produce too much heating.

As I have shown the models use a derived value for water vapour in the upper troposphere that totally ignores the actual values that have been around for decades. As a consequence the IPCC feedback is far too large.

Most feedbacks in nature are negative.

# Life Time Of Greenhouse Gases

The IPCC has used the longevity of GHGs as a way of explaining how such a small proportion of a GHG such as CO<sub>2</sub> can have any long term effect on the level that GHG in the atmosphere. For example, if CO<sub>2</sub> lasted only 4 or 5 years it would be impossible to blame the 3% contribution of humans for the increase that has occurred.

Consequently the Bern model was developed to make out that CO<sub>2</sub> lasted thousands of years, hence any human addition would last and accumulate.

This has been debunked in many papers, most estimate the longevity of CO<sub>2</sub> to be in the order of 5 to 10 years. eg Frank [11], Koutsoyiannis [12] Berry [24]

However, longevity is a false argument.

Consider lake Benmore on the Waitaki River. The lake level is determined by two factors and only two; The inflow and the outflow. If inflow > outflow then the lake level will rise  
If outflow > inflow then the lake level will fall

**How long an individual molecule lasts in the lake is irrelevant.**

My background is in biochemistry where everything is in steady state. Equilibrium = death. But no one cares how long an individual molecule lasts. The concentration of a substance is only dependent on rates of formation and rates of removal and those depend on concentrations of substrates and products. The longevity of an individual molecule is irrelevant. So it should be with climate.

There is one more important parameter. Providing lake control measures are not used then as inflow increases so outflow also increases.

The lake level rises or falls because of a lag between the two.

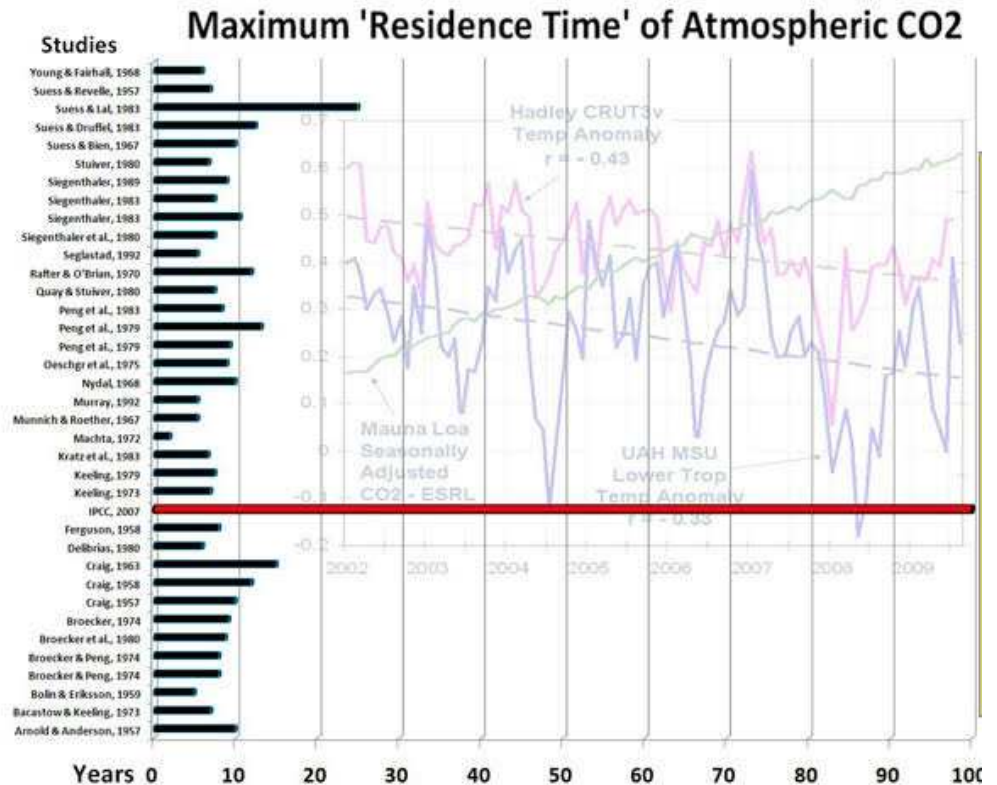
The same is true for both methane and CO<sub>2</sub>

For methane, when the lake level rises so do the outflows of

- atmospheric oxidation of methane to CO<sub>2</sub> and water. [18][21][22]
- oxidation by methanotrophs in soil. [9]
- oxidation by methanotrophs in water [20].

While the atmospheric oxidation is a complex reaction involving many stages, the reactants (apart from CH<sub>4</sub>) are in plentiful supply so the limiting factor for the reaction is the concentration of methane. The reaction rate is therefore dependant on [CH<sub>4</sub>] concentration.

The radiative effect of a GHG is instantaneous, double CO<sub>2</sub> tonight and tomorrow the world will be half a degree warmer including any feedback effects from water vapour. AGW proponents will say but it take time to heat the ocean. GHG's cannot heat the ocean. penetration too little (0.01mm).



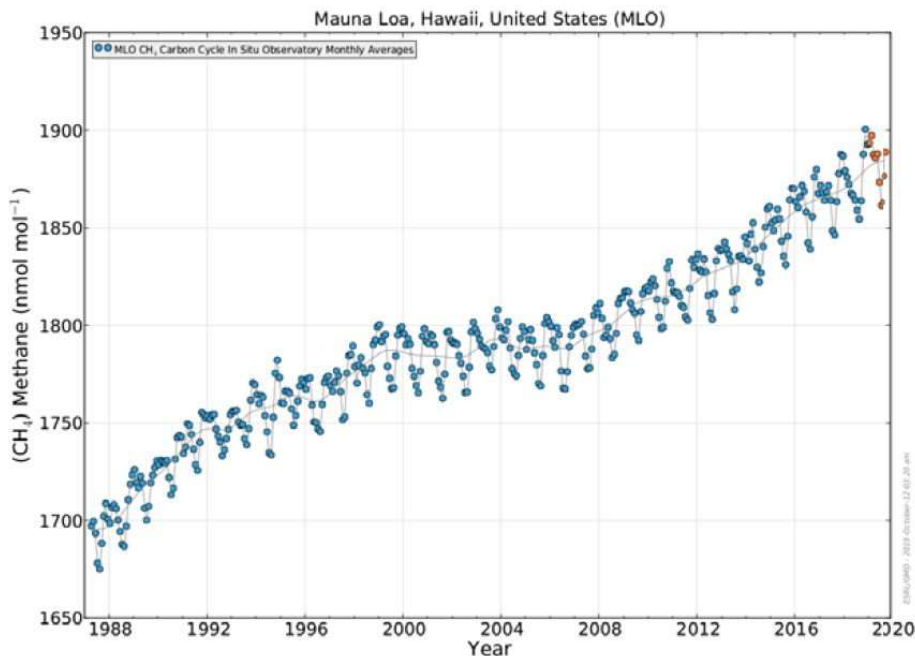


Figure 7: Atmospheric concentrations  $\bar{C}^{(i)}$  of methane molecules ( $i = \text{CH}_4$ ) versus time [20]. For the past 10 years, the average rate of increase has been about  $d\bar{C}^{(i)}/dt = 0.0076 \text{ ppm/year}$ .

Path length limits effective radiation to a few centimetres only and for every molecule radiating into the ocean there are 85000 radiating out. [14]

To attempt to calculate the effect a pulse of GHG today will have in 20 or 50 or 100 years time is pure nonsense. Humans have no control over most methane emissions. Ruminants including wild ones are 14% of which NZ agriculture is about 1% Therefore as a source farmed animals in NZ constitute 0.14%. Tinkering on the fringes of that will make no difference at all in the big picture.

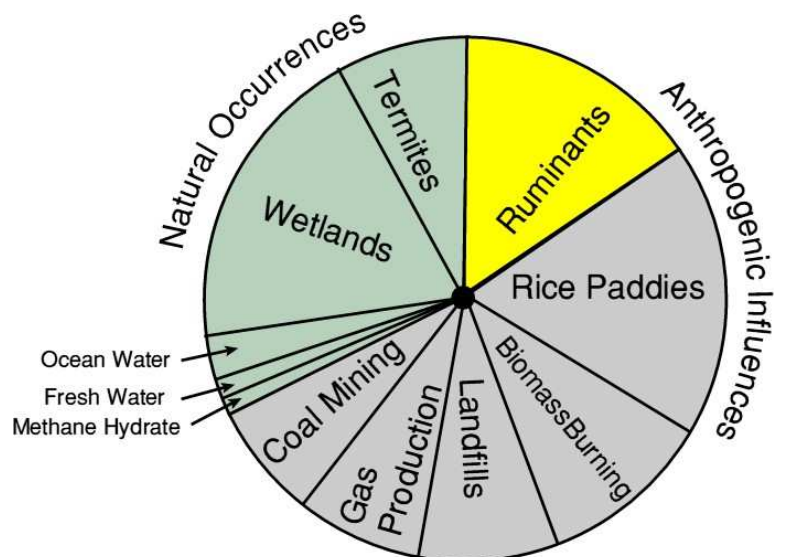
The graph of world methane is not linear, the ten year pause from 1998 coincided with the temperature pause - are they related ? The data also shows annual variation of about 25 ppm - certainly not caused by NZ livestock. Natural events can swamp any human influence. For example the present warmth is almost certainly due to the Hunga tonga Haipai volcano that put millions of tonnes of water into the stratosphere.

## Future Projections Of Methane

The chart gives the rough proportions of methane sources

At present there are some 75 million wild ruminants and 3.5 billion farmed animals. However, 10,000 years ago the proportions were very different with wild animals vastly outnumbering domesticated animals, a time when millions of caribou and bison roamed North America.

The point being that animals, as a source of methane existed long before humans domesticated them. While they are more intensively farmed today, there are also



millions of hectares where grazing animals have been excluded for crops etc.

In that sense their contribution to global methane is probably little different from pre human times.

So are they really an anthropogenic factor ? 20,000 years ago the worlds grassland would have all been grazed by ruminants. How many of them were there then ?

We know that there was a very severe decline in megafauna (animals over 45 kg) in the early holocene attributed to humans. Actual numbers are difficult to quantify but our understanding of biology would suggest that all eco niches were well populated and governed by the age old relationship between predators, prey and the availability of grass.

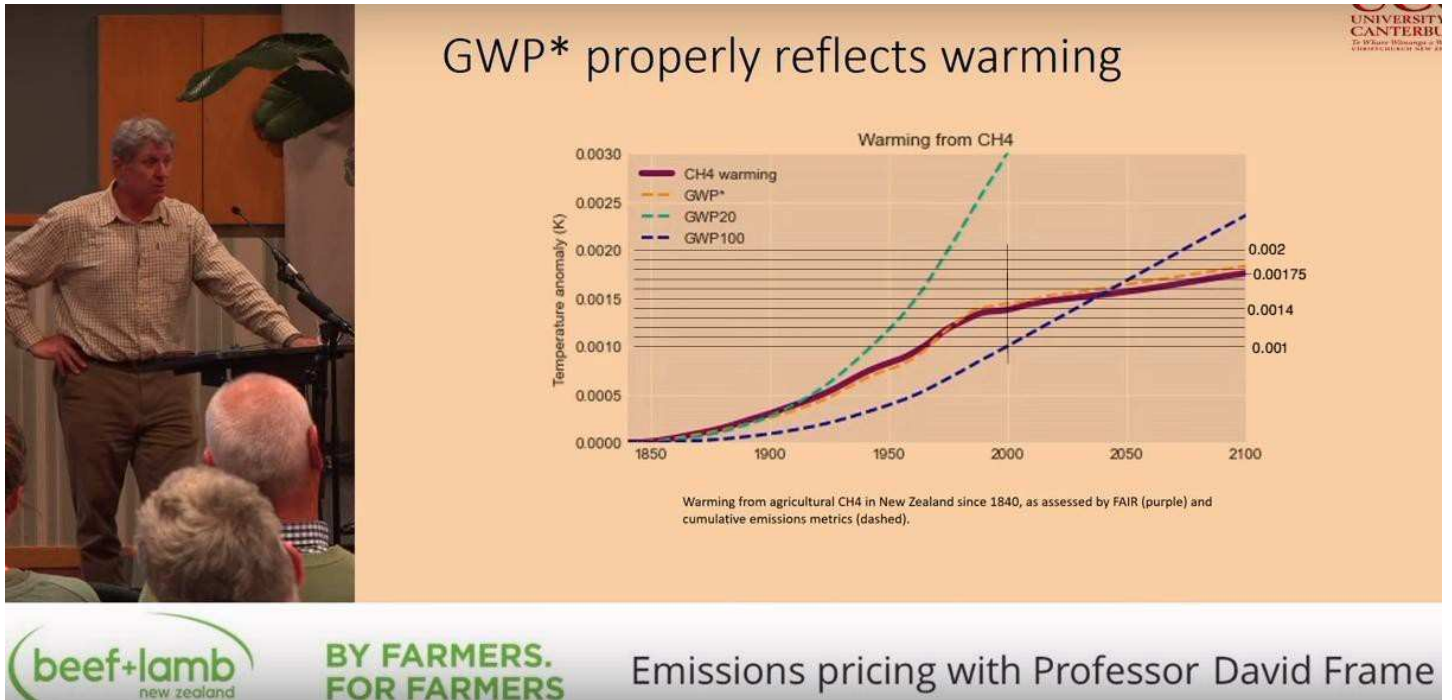
The assumption that you can calculate future methane from todays livestock is farcical.

- The reason for the pause 1998 to 2008 is unknown.
- *Biomass burning emissions of methane decreased by 3.7 ( $\pm 1.4$ ) Tg CH<sub>4</sub> per year from the 2001–2007 to the 2008–2014 time periods using satellite measurements of CO and CH<sub>4</sub>, nearly twice the decrease expected from prior estimates. Reason unknown. They go onto say; However, determining the relative contributions of anthropogenic, biogeochemical, and chemical drivers of methane trends has been extremely challenging and consequently there is effectively no confidence in projections of future atmospheric methane concentrations. [26]*
- A decade-long dataset (2010–2019) of satellite observations of methane showed that tropical terrestrial emissions (rainforests) could explain more than 80% of the observed changes in the global atmospheric methane growth rate over this period [27] (not farmed ruminants)
- The amount of methane from clathrates may change drastically due to plate tectonics or submarine volcanic activity or deep sea methane gas seepage (e.g. off NZ coast above Hikurangi trench and volcanic activity in Tonga Kermadec region)
- Remove farmed ruminants and rotting grass will replace the methane from animals.
- Stop making landfills for rubbish and world methane will drop.
- Will Asia stop planting rice, no it will most likely increase to meet the needs of their population, with a concurrent increase in methane.

# Warming Effect Of Radiation Due To Methane

## David Frame

Presented this graph to a meeting of farmers at Invercargill



It shows the warming caused by NZ livestock from 1850 until the present and then projected to 2100.

By his calculation the warming from 1850 to 2000 was 0.0014 °C. The graph was intended to show how GWP\* better fits the data than the other GWP options.

What it actually shows is how minuscule the warming from NZ livestock actually is, even by the inflated values David was using.

His projected warming from 2000 to 2100 of 0.0004 °C epitomises the stupidity of this whole exercise.

**0.0004 °C over 100 years is 4 millionths of a degree per year.**

This is insignificant, inconsequential it is not measurable, either on a country wide basis, let alone an individual farm basis.

China emits more CO2 in one day than NZ does in one year. their annual increase is greater than NZ's annual contribution and NZ is getting excited about this minuscule contribution from farming.

**Given that Earth is still in an ice age (which account for only 20% of the last 600 million years) and that normal temperatures were 10°C or higher, being worried about 0.0004°C is ridiculous.**

**William van Wijngaarden** in his contribution to the panel on the role of NZ agriculture says that if we slaughtered every ruminant animal in NZ it would only avert a temperature rise of 3 to 6 millionths of a degree per year. which is in accord with David Frames estimate.

**Insignificant, inconsequential, unmeasurable**

## David Coe Et Al [6]

From this data (in his paper) it is concluded that H<sub>2</sub>O is responsible for 29.4K of the 33K warming (89%), with CO<sub>2</sub> contributing 3.3K (10%) and CH<sub>4</sub> and N<sub>2</sub>O combined just 0.3K (0.9%). Climate sensitivity to future increases in CO<sub>2</sub> concentration is calculated to be 0.50K, including the positive feedback effects of H<sub>2</sub>O, while climate sensitivities to **CH<sub>4</sub> and N<sub>2</sub>O are almost undetectable at 0.06K and 0.08K respectively**. This result strongly suggests that increasing levels of CO<sub>2</sub> will not lead to significant changes in earth temperature and that increases in CH<sub>4</sub> and N<sub>2</sub>O will have very little discernible impact.

## Herman Harde [7]

5.4. Absorption of Terrestrial Radiation. The dominant influence of water vapour on the radiation and energy budget in the atmosphere can also be deduced from an analysis of pure absorption spectra. So, under conditions as discussed before with an average global water vapour content of 1.46% at the surface and a temperature of 288 K, the overall absorption of the terrestrial radiation, only caused by water vapour, is already 77.7%. Together with methane and ozone in the atmosphere, the absorption increases to 80.7%. On the other hand, CO<sub>2</sub> alone at a concentration of 380 ppm would contribute to 24.1%, but in the presence of other gases, its influence is repelled to 4.6%, which is due to the strong spectral overlap with the other components, particularly with water vapour, and the total absorption only climbs up to 85.3%.

# Peer review in climate science

Since the mid 90's the climate alarm fraternity has put huge pressure on science journals to not publish papers that opposed the IPCC view of the world. In the late naughties I was aware of 4 journal editors who were removed for publishing such papers. The tactic was to write to the Journal editors and boards threatening to boycott that journal if such an such a paper was not retracted. This practice was still in operation last year with a paper that appeared in Springer publications. The Board capitulated and withdrew the paper.

The leaders of this antisience movement are all top players in the IPCC. Phil Jones, Keith Briffa, Jonathon Overpeck, Michael Mann, Tom Wrigley, Jim Salinger, Kevin Trenberth and a few others, whose dirty deed were available for all to see in the climategate email release 2009.

The effect of this pressure was to make journal editors very cautious about printing anything that challenged the IPCC view. Recently the UNFCCC came to an agreement with Google that on any search to to with climate, only IPCC references would appear. As the head of the UNFCCC said "we own the science". Any self respecting scientist would gag over that statement.

For this reason many papers that challenge the IPCC world view are forced to publish in the lesser journals. That does not detract from the content or implications of the research. e.g. references [1] & [2]

## Will Happer commented:

*As for peer review, it has become a joke in many fields of science. Climate is one of the worst. Have **Frame** point out one thing in the work that Wijngaarden and I have done that is not solid physics. **None of the many peer reviewers could point out any problems**, but demanded that our papers be rejected because they might cast doubt on the religious cult that is masquerading as climate science.*

Best wishes, Will

So when I read that the panel was trolling through the literature and discarding papers on the basis of their perception of the journal quality or on whether it has been peer reviewed or not, then the exercise becomes one of **actively selecting against** any paper that does not support the group think or beliefs of the panel members.

## Your Report

- Must address the bad science that underlies the GWP. Using spectral analyses that excludes the overlapping absorption by water vapour is not acceptable.
- It must accept that absorption of infrared from Earth in the 7-8 micron band is dominated by water.
- It must highlight the insignificance of the temperature increases from NZ livestock

**Dave**, Will Happer has put out a challenge to you - point out one thing in the W&H paper that is not solid physics.

If you cannot do that then you have a moral and scientific obligation to accept the paper and the fact that methane is irrelevant as a GHG.

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# Appendix 1 Calculation Of Feedback.

From first principles

To simplify our discussion in previous e-mails, let's denote the temperature and forcing increments by  $dT \rightarrow T$  and  $dF \rightarrow F$ . We calculated the feedback-free relation between forcing increment and temperature increment

$$T = \alpha F$$

Here the coefficient  $\alpha$  can be thought of as the feedback-free "amplification" by the climate system. The climate system amplifies the forcing increment  $F$  to the temperature increment  $T$ . So the amplification  $\alpha$  has the units of  $C m^2W^{-1}$ .

The idea of feedback is that a portion  $\beta T$  of the temperature increment gets added to the original forcing  $F$  so the amplifier equation becomes

$$T = \alpha (F + \beta T)$$

Here  $\beta$  is the "feedback parameter. If  $\beta > 0$  the feedback is said to be positive, if  $\beta < 0$  the feedback is said to be negative, and if  $\beta = 0$  the system is feedback-free.

Solving the equation above for  $T$  in terms of  $F$  we find

$$T = [\alpha / (1 - \alpha\beta)] F = \alpha' F \quad \color{red} T = \alpha' F$$

The coefficient of  $F$  is the amplification with feedback, which we can denote by  $\alpha'$ , where

$$\alpha' = \alpha / (1 - \alpha\beta)$$

For positive feedbacks, the amplification with feedback will be larger than the feedback-free amplification,

$$\alpha' > \alpha / (1 - \alpha\beta) \quad \text{for} \quad 0 < \beta < 1/\alpha$$

In fact, as the coefficient of  $F$  is the amplification with feedback, which we can denote by  $\alpha'$ , where

$$\alpha' = \alpha / (1 - \alpha\beta)$$

For positive feedbacks, the amplification with feedback will be larger than the feedback-free amplification,

$$\alpha' > \alpha / (1 - \alpha\beta) \quad \text{for} \quad 0 < \beta < 1/\alpha$$

In fact, as

$$\beta \rightarrow 1/\alpha \quad \alpha' \rightarrow \infty$$

The amplification becomes infinite for sufficiently large positive feedback parameters  $\beta$ . For positive feedback values larger than the limit  $1/\alpha$  the amplification is negative, with the physically absurd implication that adding greenhouse gases cools the Earth. But IPCC is not all that far from this absurd limit, a point Dick Lindzen has made for many years.

For negative feedbacks, the amplification with feedback  $\alpha'$  will be less than the feedback-free

amplification  $a$

$$\alpha' < \alpha/(1-\alpha\beta) \quad \text{for } \beta < 0$$

The coefficient of  $F$  is the amplification with feedback, which we can denote by  $a'$ , where

$$\alpha' = \alpha/(1-\alpha\beta)$$

For positive feedbacks, the amplification with feedback will be larger than the feedback-free amplification,

$$\alpha' > \alpha/(1-\alpha\beta) \quad \text{for } 0 < \beta < 1/\alpha$$

In fact, as

$$\beta \rightarrow 1/\alpha \quad \alpha' \rightarrow \infty$$

For negative feedbacks, the amplification with feedback  $a'$  will be less than the feedback-free amplification  $\alpha$

$$\alpha' < \alpha/(1-\alpha\beta) \quad \text{for } \beta < 0$$

For example, if  $\alpha\beta = -1$  then  $\alpha' > \alpha/2$

This equation  $dT = \alpha' dF$  is the inverse of that used by the IPCC and gives the correct relationship between feedback and forcing,

So an increase in feedback increases forcing as would be expected.

## Calculation Of Temperature From Forcing

Letting  $T$  be some hypothetical representative temperature, to good approximation the flux emitted by Earth to space is given by the  $T^4$  law

$$Z = \epsilon \sigma T^4 = 277 \text{ W m}^{-2}$$

Here  $\epsilon$  is the thermal emissivity coefficient of the Stefan Boltzmann law, that we have written above,  $\sigma$  is the Stefan-Boltzmann constant, and  $T$  is some representative, absolute temperature.

Increasing the concentration of greenhouse gases makes the emissivity smaller. We have just calculated that for doubling  $\text{CO}_2$

$$d\epsilon/\epsilon = -1.1\%.$$

$$dT = -(1/4)(d\epsilon/\epsilon) T.$$

Taking  $T = 290 \text{ K}$  this gives a temperature increase from doubling  $\text{CO}_2$  of

$$dT = -(1/4)(-1.1\%)290 \text{ K} = 0.8 \text{ K} = \mathbf{0.8 \text{ }^\circ\text{C}}. \quad \text{for doubling } \text{CO}_2.$$

Doubling methane has no more than  $1/4$  of the forcing from doubling  $\text{CO}_2$  and would take centuries to happen. But it would increase the temperature by

$dT = 0.2 \text{ C}$  for doubling  $\text{CH}_4$ .

To put this discussion into IPCC-speak, from inspection of the arguments above, you will see that we have shown that the feedback-free rate of change of temperature with forcing is

$$a = dT/dF = T/(4\epsilon\sigma T^4) = 290 \text{ K}/(4 \times 239 \text{ Wm}^{-2}) = 0.26 \text{ C m}^2\text{W}^{-1}$$

So a forcing of  $dF = 3 \text{ W m}^{-2}$  from doubling  $\text{CO}_2$  should cause a temperature increase of

$$dT = a dF = 0.8 \text{ }^\circ\text{C},$$

the same number we estimated above with more emphasis on the basic physics

**From:** 9(2)(a)  
**To:** [Methane Panel Secretariat](#)  
**Subject:** Additional paper for consideration  
**Date:** Saturday, 21 September 2024 9:00:06 am

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Glatzle, Albrecht. (2018). Domestic Livestock and Its Alleged Role in Climate Change. 10.5772/intechopen.80389.

**For the paper**

[https://www.researchgate.net/publication/329881192\\_Domestic\\_Livestock\\_and\\_Its\\_Alleged\\_Role\\_in\\_Climate\\_Change](https://www.researchgate.net/publication/329881192_Domestic_Livestock_and_Its_Alleged_Role_in_Climate_Change)

**For a overview of the paper**

<https://climatechangedispatch.com/new-research-methane-emissions-from-livestock-have-no-detectable-effect-on-the-climate/>

9(2)(a)



To whom it may concern.

Based on the letter dated 16 September 2024 from Hon Todd McClay (letter attached) it is evident that the Coalition Government is well able to make a policy decision without the need of a Review panel.

To quote the Minister of Agriculture.

*"The independent panel has been tasked with providing advice on what New Zealand's domestic 2050 biogenic methane target should be, consistent with the principle of no additional warming".*

The Government requires confirmation of the warming due to biogenic methane so they can confirm the target for the reduction of methane.

That statement equates to Target v Warming.

I therefore see no need for the Review Panel to be providing their advice to the Minister. A Review Panel that includes Frame and others who have in the past not shown independence when it comes to discussing or debating the views of other climate scientists and related experts that they have a problem accepting.

I believe the office of Minister Hon Todd McClay is now able to make their own decisions with respect to confirming the best target for the reduction of methane gases in New Zealand.

A common-sense approach is now required please by the Ministry of Agriculture. Plus the Ministry for the Environment.

Hon Todd McClay has confirmed the paper by Professor William van Wijngaarden dated August 20124 has been received and provided to the Review Panel. I must also assume he has read this paper and understood the information provided.

One quote from the summary page (attached) of the Professor van Wijngaarden

**" The warming caused by New Zealand's agriculture is 1% of 0.032 C per century or 0.0003 C per century which equals 0.000003 C per year. Entirely eliminating New Zealand's agricultural sector, i.e. slaughtering every cow and sheep, would avert a temperature rise of 3 millionths of a degree C per year. Even if one doubles global warming to 2 C per century, as projected by the International Panel on Climate Change, the methane produced by New Zealand's farmers causes warming that is too minuscule to detect."**

It can be established from this and other science reports that global warming due to methane is too minuscule to detect. That established the simple target for any reduction must therefore be ZERO. There is no need to have a reduction target in New Zealand on the basis the warming effect is at a low 0.000003°C per year.

Here also is a recent comment from David Coe (MA Oxon) (my underlining) David Coe's paper 9 August 2024, 'The Role of Methane in Climate Change' is also attached for your review.

***"I am David Coe, lead author of the paper by Coe et al.***

***I am a UK industrial physicist, who has collaborated for many years with my two German co-authors, Walter Fabinsky, who has over 100 industrial patents to his name and Gerhard Wiegleb who is Professor at Dortmund University. We have worked on gas analysis for over 30***

***years and have a thorough understanding of the infra-red absorption spectra of gases, including carbon dioxide, methane and water vapour.***

***There is a total misunderstanding about the radiation absorption capabilities of these three gases and their contribution to global warming, now referred to as climate change.***

***Our sole reason for publication of this paper was to demonstrate with clarity the role of these gases using the very accurate data base of gaseous spectra called HITRAN developed over the past twenty years by a veritable army of researchers.***

***Our finding is that water vapour is by far the most powerful greenhouse gas, contributing over 90% of current warming. Fortunately for all of us, that water vapour effect is now saturated and increasing atmospheric water vapour levels will have little further impact on temperatures. Carbon dioxide is also a powerful greenhouse gas, but its impact is limited by the almost complete overlap of its absorption spectra by that of the much higher concentrations of water vapour. Interestingly the IPCC reports completely ignore this impact of water vapour, limiting discussion specifically to possible feedback effects.***

***The calculations offered in our paper infer that the climate sensitivity to a doubling of carbon dioxide in the atmosphere is a mere 0.5 deg C, not the 1.5 to 4.5 deg C claimed by the IPCC, while the sensitivity to a doubling of methane is simply 0.06 deg C, an unmeasurable increase representing no threat whatsoever.***

***Despite sending this paper, on publication, to the IPCC for them to refute it should it be incorrect, we have had no response and no attempts of refutation.***

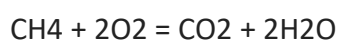
***Please take this information into account before making decisions which could have very negative impacts upon the NZ farming community and consequently the NZ economy.***

*David Coe (MA Oxon)  
July 2024*

Unless you have further independent research to refute the above two statements, it will not be possible to dispute the fact that the warming due to methane (all sources) is so low to be unable to be measured.

Further, without the ability to measure the warming effect of methane the conclusion must be that there needs to be ZERO targets set by Government to manage the methane emissions in New Zealand.

One final point is that you will note on the table provided by David Coe that the prime remover of methane in the atmosphere Oxygen is not mentioned. It is evident that the Hydroxyl Ion (OH<sup>-</sup>) destroys methane emissions, and as the action of oxygen is fast and complete:-



As methane rises in the atmosphere, the Oxygen takes out all the methane, even before it gets to the point of being a GHG. The warming effect of methane is again shown to be NIL.

Methane is therefore unable to cause any warming. (Ref. Dr Jock Allison)

The Review Panel needs to also check and refute this important additional point.

The Panel must advise the Government that a target of zero is acceptable, based on the facts presented for this review. Or provide evidence that disputes the very low warming effects noted above.

The Review Panel may not have the expertise to question the scientists' papers, so I suggest that within the time limits of this review, the Review Panel will not be able to dispute the findings of Professor van Wijngaarden, or any other of the papers made available for this review.

Science is never concluded so the Panel must balance the evidence it now has before them and make a commonsense judgement that is in the best interest of New Zealand.

The consequences of this review will be that many millions of dollars will be saved, and a lot of time made available for our farmers to improve productivity and produce better export returns, for the benefit of us all. Please do what is best for New Zealand.

#### Conclusion.

- Just 0.17% of global methane 'expires' from New Zealand.
- As there is no measurable global warming due to methane then there is no need for any targets.
- **William van Wijngaarden claims 0.000003° C warming per year in New Zealand.**
- The degree of warming is so small the daily variations cannot be accurately recorded by Councils or the farmers or anyone else.
- No targets are required in New Zealand as there is no measurable warming due to methane gas.
- Methane does not need to be reduced as it has a minimal effect on global warming.
- Money and time can now be saved by Government and used on more important projects that will help the productivity of our farmers and other businesses.
- Methane emissions from New Zealand are claimed to be just 0.17% of the global methane quantity. What then is the warming effect of methane in New Zealand?  
**0.17% of 0.006° C or less. That is 0.00001° C warming.**

#### Recommendations:

1. The Minister Hon Todd McClay has the ability and information before him to reduce the methane target to ZERO, without the need for the Review Panel assessment.
2. The Climate Change Response (Zero Carbon) Amendment Act 2019 needs to be amended.  
There is no need to reduce net emissions of all greenhouse gases (except biogenic methane) to zero by 2050. reduce emissions of biogenic methane to 24–47 per cent below 2017 levels by 2050, including to 10 per cent below 2017 levels by 2030, based on the science evidence that shows the warming in New Zealand to be lower than 0.00001°C per year.

3. At best, the Climate Change Response (Zero Carbon) Amendment Act 2019 needs to be repealed. Cancelled.

This Act is now no longer required in New Zealand.

9(2)(a)



E&OE

*“The most basic question is not what is best, but who shall decide what is best”.*

*~ Thomas Sowell*

## *Submission to the Methane Science & Target Review Panel*

by 9(2)(a)

17 September, 2024

On the internet, under [www.measurement.govt.nz](http://www.measurement.govt.nz) / Home / Metrology / SI Units / Kelvin, the third paragraph begins (or began) "The Boltzmann constant turns up in all physical formulae that describe the physical effects caused by temperature." (rubbish) and continues ... "This results from the way temperature is described – as a thermodynamic concept that characterises the average kinetic energy of small particles in thermal equilibrium." (more rubbish)

From a podium of the mid-1960s, as modified by the 1972 Great Lakes Water Quality Agreement and by the nations' rise against the wolves of toxic waste for 18 years thru to 1991, some oldies like me may accuse the resource consent management system (the RMA, 1991) of expanding New Zealand's exposure to things to be deemed necessary evils. Now is the time to reflect about this. Ye may seize upon one "necessary" evil in particular and that is: axiom that the state must deceive the plebiscite, involving a richness of deceit far beyond anything previously deemed decent, going back a long way in the history. (Nor should one exclude the Maori history in this assumption of the age-old decencies.)

It seems that the state's deceit about the greenhouse effect goes back to the beginning of resource consent management, starting with the Al Gore think-tank (he was just a U.S. senator at the time) and colluding New Zealand officials (see *Confessions of a Civil Servant*, by Robert Stone). Whereas it is entirely possible that something has gone wrong with a natural surface cooling system (and that Man can fix it) it is not credible science when we begin by disrupting the language of discourse to impose the language of a dude.

Should someone now be teaching certain university graduates what the real meaning of temperature is and how it invalidates the theory of the greenhouse effect? I could only give a potting at this stage and this is ventured below. It is not *audi alteram partem* to offer a one-way slot through which "submissions" should be directed and leave it at that.

My reference for *audi alteram partem* is the text *Natural Justice: Principles and Practical Applications*, by Geoffrey Flick. The chapter on *audi alteram partem* somewhat aligns with a practice I know as common in engineering and construction teams, the difference being that one expects the process to happen all of a sudden, without delay, when it is necessary, in engineering. One may forgive the law for being a little more ponderous but the basic idea is the same. It is not a one-way affair because questions inevitably arise in the minds of those who are coming to a problem (or to an angle on it) for the first time. It is necessary to put the decent questions to rest in an atmosphere of cooperation. Sometimes it can be quite critical to do this thoroughly.

Quite essential to the idea of temperature is a reference subject matter or a reference temperature. This is something like ice just barely melting that almost everyone can have an experience of. One may compare the reference matter to some other matter with a view to quantifying how much hotter or colder is the latter. It has been want to use the triple point of water as the reference matter because it is very sharply defined and so the quantification of hotter or colder, in relation to it, can be very precise.

In order to construct the scale, we may first note that  $\text{JpdV}$  is denominated in energy units. It is

quite a unique integral because system volume  $V$  is a fundamental property and because  $p$  - the integrand - can only be a gas pressure. (It cannot be a pressure at some orifice. It can only be a pressure, as in a gas, exerted in every direction.) One may think of pressure  $\times$  volume to get the gist. The uniqueness of this integral led to the study of small systems consisting entirely of confined gas. In particular the system associated with a constant volume gas thermometer and the system associated with a Carnot heat engine led to the definition for absolute zero and a scale that became known as the "thermodynamic temperature scale".

In this study, another integral was defined to feature alongside  $\int p dV$  in an enumeration of the energy compartments of a system's internal energy. This is  $\int T dS$  where  $T$  is the absolute temperature (scale as mentioned above) and  $S$  is the system entropy. Various considerations lead to the idea that this compartment - usually called "thermal energy" is a purgatory category for the system internal energy. When energy is said to be "dissipated", it is counted as having wound up in the thermal energy compartment of some system and from there it can only go out into that system's environment or into another system.

An elementary teaching about dissipation is buried in the study of the James Joule paddle apparatus. In this a falling weight is harnessed to a stirring mechanism, sized so that the weight lands as softly as possible. An enquiring mind wants to know what happens to the energy if there is no harness and if the weight simply crashes down onto the floor when it is released. Surely what was arranged to heat the water in a basin through stirring must instead go into the floor; indeed the energy is dissipated and the floor's thermal energy compartment is counted as the beneficiary. If the weight is cold and the floor is hot, then as a result of the weight crashing into the floor, the floor will become colder.

Dissipation does not necessarily make the beneficiary system any warmer. Icy winds like cold weights can have the opposite effect, still pumping energy into a receiving system. In the calculus this is handled by treating  $\int p dV$  and  $\int T dS$  as conforming to a general idea of integration wherein the integrand is cast as rate-of-change with respect to the variable of integration. Thus the absolute temperature  $T$  is the rate-of-change of the system thermal energy with respect to the system entropy, in the toting-up.  $S$  and  $V$  are generally taken as co-extensive system properties.

If we add energy to a system's thermal energy compartment then we can find the temperature at the place of addition doing whatever the evidence suggests by assuming that some entropy change is involved (or not). One may think "energy = entropy  $\times$  temperature" to get the gist.

Central to the problem of global warming: the question of whether the rains have a cooling effect on the Earth's surface. It does not take very long for a raindrop to fall from somewhere that is usually colder than the surface that receives it. Surely raindrop can be likened to the above-mentioned cold weight crashing down. Upon impact, the drop's translational kinetic energy, given from a conversion of gravitational potential, will be dissipated in the surface system and the surface can become cooler from this. The temperature widely drops with altitude from the surface up to the tropopause.

In short, there are cooling processes at work in the interactions between the planet's lower atmosphere and surface. These have the effect of hiding energy in the sense that they completely destroy the dude's naive relation between the planet's "energy budget" and its tendency to equilibrium or otherwise. Of course there are questions pertaining to this energy hiding but an *audi alteram partem* properly enacted should be able to put them all to rest.

Similarly there are questions relating to my thesis that tidal turbines have had a disabling effect on the surface cooling systems that rely on gravitational potential. I have taken some tips from a friendly academic and I have covered most of the detail likely to be of interest to calculus buffs. There are technical documents now available should they be called for in an honourable way.

In my experience of *audi alteram partem*, it is the mind of the boss that matters the most and the questions that occur to him or her are put directly. If the methane science and target review panel is going to act like a responsible boss, I would expect some engagement permitting me to gauge the states of mind of the panel members or at least of boss member.

I do suppose the university professors of the West have been put under pressure to be creative and have somewhat turned science upside-down in response to this. The New Mathematics of 1969 fits this conjecture. I was challenged in 1983 while still a student at Victoria University of Wellington to recall, if I could, how the mathematics around rates of change was put together before the syllabus revolution of 1969. It took some time for this challenge to sink in and for me to ken how it could be worth taking the time. I now understand that the whole of the education process in mathematics, from new entrant level to doctoral graduate level, is lacking in New Zealand. It is likely I would find the panel members lacking in some basic calculus.

My discussions with Peter Barleyman, now retired from his post as vicar at Eltham All Saints, the Church of England, have led me to the view that all of the turning upside-down that has taken place in the wake of New Mathematics can be regarded in part as manifestation of a sick psyche brought on by the effect of tidal turbines since 1966. This was the year that the first industrial-scale tidal electricity project began operating. The method of the turbine is great assuming it diverts energy from dissipation but tidal turbines instead divert energy from potential restoration. Peter saw there could have been a sixth sense about this.

It is perhaps irrelevant that this first was a French electricity station except that in 1974 when the French were challenged by New Zealand and Australia about their bomb testing at Mururoa Atoll, the result was a voluntary French withdrawal. This more or less proved that the French could listen to reason. There are indeed signs that it could be worth doing a proper *audi alteram partem* and then proposing the withdrawal of some offending high canards.

**From:** 9(2)(a)  
**To:** [Methane Panel Secretariat](#)  
**Subject:** Support for Methane Science Accord  
**Date:** Wednesday, 25 September 2024 6:36:36 am

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### **MFE CYBER SECURITY WARNING**

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To whom it may concern

We 10000% support Methane Science Accord .

And we demand the corrupt money making people, (the equivalent of Big Pharma and the harm they have done with the c vid vaccine to humans ) pushing their methane - inhibiting bolas for cattle , be stopped immediately.

AgriZeroNZ , a public -private partnership focused on “helping “farmers cut emissions is a rort .

Another harm to our food cycle.

The Methane Science Accord has consulted with the most esteemed scientific experts in the world. If the panel concludes that biogenic methane causes warming and that targets for its reduction are essential, then it is safe to say that science is now something that can be bought and sold on the open market.

There is no scientific evidence to support biogenic methane reduction. Government policies intent on chasing biogenic methane reductions should be treated as criminal malfeasance.

If you want to do something truthful and really care about NZ , how about looking at all the microfibre coming in here in clothes , and the harm that plastic is doing to our environment. Clothes could easily be made of natural fibres ie cotton and wool . There is plenty of truthful research done , yet not one supposed environmental protection agency has done a thing about microplastics , not one !! Why is that ? Too hard ??

But funnily enough many government agencies chase farmers trying to influence and change our food cycle . To even think about dosing cattle with a synthetic drug , because that's what it is , is absolutely absurd.

And on the other hand organic and regenerative farming are being pushed & encouraged and you're saying it's perfectly alright to medicate cattle ?????

Lunatics have got into science.

We have had a guts full of lies , corruption, false science, fear and propaganda from the last Liebour party , we are not going to take anymore .

Leave nature alone . Carbon neutral is a myth and you well know it .

What you are actually chasing is a money making scheme , you know it , we know it.

Do the right thing and stop this madness.

Regards

9(2)(a)



**From:** [Jessica Bensemann](#)  
**To:** [Methane Panel Secretariat](#)  
**Subject:** FW: The NZ Government and the Parliamentary Commissioner for the Environment have been given false advice on methane science  
**Date:** Wednesday, 21 August 2024 8:39:38 am  
**Attachments:** [image001.png](#)  
[image002.png](#)  
[image003.png](#)  
[image004.png](#)  
[image005.png](#)  
[image006.png](#)  
[image007.jpg](#)

**Jessica Bensemann (she/her)**

Principal Analyst | *Kaitātari Mātāmua*

Market Development – Climate Mitigation

Ministry for the Environment | Manatū Mō Te Taiao

9(2)(a) | [jessica.bensemann@mfe.govt.nz](mailto:jessica.bensemann@mfe.govt.nz) | [environment.govt.nz](http://environment.govt.nz)

Please note I work part-time (20 hours per week) split over Monday to Friday. This means there may be some delay in my response to your email.



**From:** Nicola Shadbolt <N.M.Shadbolt@massey.ac.nz>  
**Sent:** Wednesday, August 21, 2024 1:28 AM  
**To:** Jessica Bensemann <Jessica.Bensemann@mfe.govt.nz>  
**Subject:** FW: The NZ Government and the Parliamentary Commissioner for the Environment have been given false advice on methane science

**MFE CYBER SECURITY WARNING**

This email originated from outside our organisation. Please take extra care when clicking on any links or opening any attachments.

**From:** 9(2)(a)  
**Sent:** Monday, July 8, 2024 9:51 PM  
**To:** 9(2)(a)  
**Cc:** Hon Simon Watts <[Simon.Watts@parliament.govt.nz](mailto:Simon.Watts@parliament.govt.nz)>; Hon Todd McLay <[Todd.McClay@parliament.govt.nz](mailto:Todd.McClay@parliament.govt.nz)>; Hon Simeon Brown <[Simeon.Brown@parliament.govt.nz](mailto:Simeon.Brown@parliament.govt.nz)>; Rt Hon Christopher Luxon <[Christopher.Luxon@parliament.govt.nz](mailto:Christopher.Luxon@parliament.govt.nz)>; Hon David Seymour <[David.Seymour@parliament.govt.nz](mailto:David.Seymour@parliament.govt.nz)>; Rt Hon Winston Peters <[W.Peters@ministers.govt.nz](mailto:W.Peters@ministers.govt.nz)>; Hon Shane Jones <[Shane.Jones@nzfirst.nz](mailto:Shane.Jones@nzfirst.nz)>; Maureen Pugh <[Maureen.Pugh@parliament.govt.nz](mailto:Maureen.Pugh@parliament.govt.nz)>; Simon Upton <[pce@pce.parliament.nz](mailto:pce@pce.parliament.nz)>; Geoff Simmons <9(2)(a)>; Sam King <[Sam.King@climatecommission.govt.nz](mailto:Sam.King@climatecommission.govt.nz)>; Dr Judy Lawrence <[Judy.Lawrence@vuw.ac.nz](mailto:Judy.Lawrence@vuw.ac.nz)>; Prof. Steven Ratuva <[Steven.Ratuva@canterbury.ac.nz](mailto:Steven.Ratuva@canterbury.ac.nz)>; Dr Roderick Carr <[Rod.Carr@climatecommission.govt.nz](mailto:Rod.Carr@climatecommission.govt.nz)>; Jo Hendy <[Hello@climatecommission.govt.nz](mailto>Hello@climatecommission.govt.nz)>; Prof. James Renwick <[James.Renwick@vuw.ac.nz](mailto:James.Renwick@vuw.ac.nz)>; Lisa Tumahai <[Lisa.Tumahai@climatecommission.govt.nz](mailto:Lisa.Tumahai@climatecommission.govt.nz)>; 9(2)(a)

Catherine Leining <[Catherine.Leining@motu.org.nz](mailto:Catherine.Leining@motu.org.nz)>; 9(2)(a)

9(2)(a)

**Subject:** Re: The NZ Government and the Parliamentary Commissioner for the Environment have been given false advice on methane science

You don't often get email from 9(2)(a) . [Learn why this is important](#)

Dear Recipients,

I am 9(2)(a) lead author of the paper by 9(2)(a) et al referred to by 9(2)(a) in his recent email to you. I am a UK industrial physicist, who has collaborated for many years with my two German co-authors, Walter Fabinsky, who has over 100 industrial patents to his name and Gerhard Wiegleb who is Professor at Dortmund University. We have worked on gas analysis for over 30 years and have a thorough understanding of the infra-red absorption spectra of gases, including carbon dioxide, methane and water vapour. There is a total misunderstanding about the radiation absorption capabilities of these three gases and their contribution to global warming, now referred to as climate change. Our sole reason for publication of this paper was to demonstrate with clarity the role of these gases using the very accurate data base of gaseous spectra called HITRAN developed over the past twenty years by a veritable army of researchers. Our finding is that water vapour is by far the most powerful greenhouse gas, contributing over 90% of current warming. Fortunately for all of us, that water vapour effect is now saturated and increasing atmospheric water vapour levels will have little further impact on temperatures. Carbon dioxide is also a powerful greenhouse gas but its impact is limited by the almost complete overlap of its absorption spectra by that of the much higher concentrations of water vapour. Interestingly the IPCC reports completely ignore this impact of water vapour, limiting discussion specifically to possible feedback effects. The calculations offered in our paper infer that the climate sensitivity to a doubling of carbon dioxide in the atmosphere is a mere 0.5 degC, not the 1.5 to 4.5 degC claimed by the IPCC, while the sensitivity to a doubling of methane is simply 0.06 degC, an unmeasurable increase representing no threat whatsoever.. Despite sending this paper, on publication, to the IPCC for them to refute it should it be incorrect, we have had no response and no attempts of refutation. Please take this information into account before making decisions which could have very negative impacts upon the NZ farming community and consequently the NZ economy.

9(2)(a)

On 8 Jul 2024, at 05:30, 9(2)(a) > wrote:

<image.png>

8 July 2024

Dear recipients of this email

**Below is proof that NZ Government Ministers and the Parliamentary Commissioner for the Environment have been given false and misleading advice on methane science, causing the waste of billions of dollars, costing not just the NZ Government, but also NZ farmers.**

In her 8 April 2024 article for RNZ, “**Methane science already settled, watchdog says**” journalist Eloise Gibson reported

“Parliament's environment watchdog says [the science of methane](#) is already settled – and the only remaining questions are political. Its chief economist says the government could save money by using "comprehensive" research that has already been done – twice.”

Eloise Gibson added

“On Saturday, the government [announced an independent panel would review the science on agricultural methane](#) and report back by the end of the year. The independent Climate Change Commission was already in line to report back on methane, so the announcement adds a second layer of expert review. Parliamentary Commissioner for the Environment chief economist Geoff Simmons said the research on methane was already done. He said the real debate was not the science but what was fair for farmers to do – and that was a question for politicians to solve.”

On 2 July 2024, in a subsequent article for RNZ – “**The government's methane review – Nine questions with Climate Minister Simon Watts**” – Ms Gibson wrote, in Question 5:

“(Note: Both the Climate Change Commission and parliamentary commissioner have said there have been no major developments in methane science since the methane target was set in 2019.)”

When I emailed Ms Gibson and queried her sources for this statement, she promptly quoted from the Climate Change Commission's discussion document on the 2050 target as follows:

“The most recent report from the IPCC is the *AR6 Synthesis Report: Climate Change 2023*<sup>[39]</sup>, released in March 2023 and the three working group Assessment Reports upon which it is based. We also considered a number of other relevant reports including: the *Global Methane Assessment (2021)*,<sup>[40]</sup> the UN's *Emissions Gap Report (2023)*,<sup>[41]</sup> *United in Science 2022 Report (2022)*,<sup>[42]</sup> the *State of Climate 2022 report (2023)*,<sup>[43]</sup> the Food and Agriculture Organization (FAO) of

the UN's *Methane emissions in livestock and rice systems (2023)*,<sup>[44]</sup> and the *Global Stocktake Report (2023)*.<sup>[45]</sup>

From analysing these reports, our initial findings are:

- Since 2019, there have been advances in the scientific understanding of climate change across the first six topics listed above – including the understanding of the physical science of methane and how it warms the atmosphere. However, these have largely added nuance and precision to the existing state of knowledge and are not consequential or notable.
- Understanding of the physical science of greenhouse gases is improving all the time. However, there has not been an important or notable change in the understanding of the physical science of methane and how it warms the atmosphere.

Ms Gibson also provided the URL for an RNZ article:

<https://www.rnz.co.nz/news/political/513695/methane-science-already-settled-watchdog-says>

I found Ms Gibson's response to be enlightening and most helpful. It prompted me to refer back to two emails I had previously sent, the first having been to **Ms Jo Hendy**, the CEO of the Climate Change Commission, and the second to the Parliamentary Commissioner for the Environment, Mr Simon Upton.

Over two years ago, on 1 June 2022, I had sent an email addressed to Mr John Morgan, CEO of NIWA, Ms Vicky Robertson, Secretary of the Ministry for the Environment, and **Ms Jo Hendy**, CEO of the Climate Change Commission, with text as follows:

“Dear Mr Morgan, Ms Robertson and Ms Hendy, as CEOs of NIWA, the Ministry for the Environment and the Climate Change Commission respectively

Attached is the Trust's eighth Open Letter to the New Zealand Prime Minister and the Minister for Climate Change.

It contains a hyperlink to the peer reviewed paper by Coe et al., published on 23 August 2021 in the International Journal of Atmospheric and Oceanic Sciences. As yet, it has not been refuted, but at least two climate scientists have attempted to do so.

Unless at least one of the three of you – the addressees of this email -- can provide a proper scientific refutation of the Coe et al. paper, then, in accordance with the most important convention in all of science (*as detailed in italics in the*

*attached Open Letter*), you must advise the Prime Minister and the Minister for Climate Change that you have been fed dis-information by the IPCC and because of it, what you previously advised them about the cause of climate change is not true, and advise them to repeal all laws and regulations pertaining to climate change.

Your erroneous advice has so far caused them to waste billions of dollars of taxpayers' money in their quest to reduce New Zealand's emissions of carbon dioxide and methane in the mistaken belief that doing so will reduce global warming, because they believe that the best estimate of the climate sensitivity of carbon dioxide is 3 Celsius degrees and that methane is a much more potent greenhouse gas than is carbon dioxide.

In stark contrast, the Coe et al. paper shows that the climate sensitivity (i.e., the rise in mean global temperature for every doubling of the atmospheric concentration) of carbon dioxide is a miniscule 0.5 Celsius degrees, and that of methane is an even more miniscule 0.06 Celsius degrees.

We now know that the climate effects of carbon dioxide and methane are actually so insignificant as to not warrant any actions or expenditure by anybody! Wasted expenditure worldwide now runs into the trillions of US dollars.

There is no climate emergency, and mankind need take no action whatsoever to "fight climate change".

The Coe et al. paper shows that the climate has always changed due to natural causes, outside the control of mankind.

Your response is awaited with great interest.

Sincerely

9(2)(a)

”

For readers' information, the pdf file dated 1 June 2022 that was attached to that email is also attached to today's email. Its filename is **220601 - How mistakes caused by ignorance and incompetence led to the mis-information now known as the "climate emergency"**. That pdf file contains the URL of the Coe et al. paper, in which Coe et al. announced a major advance in methane science, namely that they had **calculated** that the climate sensitivity of methane is **0.06°C**, a value later proven to be lower than the IPCC's "best estimate" by a factor of **58**, thus showing that

methane in the atmosphere has an immeasurably insignificant effect on global temperatures.

In that pdf file, I had written:

“The finding of Coe et al. that the climate sensitivity of methane is only 0.06 Celsius degrees contrasts with the IPCC’s claim that methane is 25 times more effective as CO<sub>2</sub>, which was adopted without question by the NZ Government and its Climate Change Commission – showing that the NZ Government and its Climate Change Commission have been led astray by the IPCC’s blatant mis-information.”

In the penultimate paragraph of that pdf file, I had written:

“It is now up to our politicians – of both central government and local government – and our business leaders, to face up to their moral, ethical and fiduciary responsibilities, and desist forthwith from promulgating their climate emergency ‘nonscience’ and mis-information. Many in business would do well to take a very careful look at Section 11 of New Zealand’s Fair Trading Act 1986, which spells out that “No person shall, in trade, engage in conduct that is liable to mislead the public as to the nature, characteristics, suitability for a purpose, or quantity of services.” This particularly applies to the directors – and possibly the employees – of some of New Zealand’s biggest consulting firms.”

Thus, I have shown unequivocally that the claim by the Climate Change Commission, “Since 2019 ..... there has not been an important or notable change in the understanding of the physical science of methane and how it warms the atmosphere”, was false and misleading. Whether it was deliberately false and misleading, or mistakenly false and misleading, or simply one more example of incompetence, is not for me to say.

I address now the claim by the Parliamentary Commissioner for the Environment, Mr Simon Upton, as elucidated by Ms Eloise Gibson, that “Since 2019 ..... there has not been an important or notable change in the understanding of the physical science of methane and how it warms the atmosphere”.

Mr Upton and/or one or more of his staff ought to have been aware that on 24 October 2023 I had sent an email to him, with text as follows:

“Dear Mr Upton

Attached is an Open Letter to you, written as a result of reading your letter of 11 October 2023 to Mr Jim van der Poel, Ms Kate Acland and Mr Wayne Langford, in their respective

capacities as chairs of DairyNZ and Beef+Lamb NZ and president of Federated Farmers, and realising that you have been ill-informed by your advisers, who have evidently failed to keep up with unrefuted advances in climate physics over the past three or so years.

I look forward to your response.”

For readers’ information, in the pdf file referred to in the previous paragraph (filename 231024 - **Open Letter to the Parliamentary Commissioner for the Environment, Mr Simon Upton**), following the Open Letter, in the same pdf file, is my article entitled ‘**Climate Change**’ – **the good news**, in which I explained the findings of physicists Schildknecht and Coe et al., that the UN IPCC had overestimated the climate sensitivity of carbon dioxide by a factor of **6** and the finding of Coe et al. that the UN IPCC had overestimated the climate sensitivity of methane by a factor of **58**, values so tiny as to be insignificant. I also wrote, “Thus Net Zero is completely unnecessary, and so is any restraint on carbon dioxide and/or methane emissions. David Coe, the lead author of the Coe et al. paper, has written “The urge for net zero is not only plain stupid but is arguably criminal.”” For readers’ information, that pdf file is also attached to today’s email.

I received an acknowledgement of receipt, dated 20 November 2023, with text as follows:

“Kia ora Peter

I am replying on behalf of Mr Simon Upton, Parliamentary Commissioner for the Environment, to acknowledge receipt of your email on 24/10/2023.

Thank you for the information you provided it will be forwarded to the relevant staff for their consideration.

Thank you for taking the time to write to us to bring this to our attention.

Nāku noa, nā

Briony Dyson

Receptionist

**Parliamentary Commissioner for the Environment”**

Evidently, no IPCC scientist has ever been able to calculate the climate sensitivity of either carbon dioxide or methane, which is why the IPCC has resorted to making what it calls “best estimates”, that in reality are merely **best guesses**. Also in their paper, Coe et al. calculated the climate sensitivity of CO<sub>2</sub> as being 0.5°C, (which is identical to the figure that Schildknecht had calculated in his paper, published just over a year before the Coe et al. paper) which is lower than today’s **best estimate** (in reality, **best guess**) by the

IPCC by a factor of **6**.

Thus, I have shown unequivocally that the claim by the Parliamentary Commissioner for the Environment that “Since 2019 ..... there has not been an important or notable change in the understanding of the physical science of methane and how it warms the atmosphere”, was false and misleading. Whether it was deliberately false and misleading, or mistakenly false and misleading, or simply one more example of incompetence, is not for me to say. Readers may care to note that Geoff Simmons, reported as having given scientific advice to the Parliamentary Commissioner to the Environment, is an economist with no formal physics study at a tertiary level. Readers may also care to note that Mr Upton himself has no formal physics study at a tertiary level, although he has degrees in English literature, music and law from the University of Auckland, and an MLitt in political philosophy from Oxford University. In my sincerely held and humble opinion, stating these facts about their lack of study of physics is not a criticism of Messrs Simmons and Upton per se, it is merely an observation. It is my sincerely and honestly held opinion that both of them are clearly out of their depth when dealing with matters of physics, and should have recused themselves from offering advice to the NZ Government on matters of physics.

My referring back to my two aforementioned emails led to my writing today’s email to the Parliamentary Commissioner for the Environment, the CEO of the Climate Change Commission, the Secretary for the Environment, the appropriate Ministers, and the other recipients of this email.

For your further information, also attached to today’s email is a pdf file of my latest article, filename **240708 - The UN IPCC overstates the efficacy of carbon dioxide as a greenhouse gas by a factor of 6 and the efficacy of methane by a factor of 58.**

With the greatest of respect, recipients of this email are asked to abide by one of the long-established conventions of physics, that if a scientific paper cannot be refuted, it must be tentatively accepted, until such time as a consensus is arrived at that it has been so long since it was published and nobody has been able to refute it, that it must be accepted as the ‘new truth’. With the greatest of respect, I suggest that for the Schildknecht paper, published on 6 August 2020, and the Coe et al. paper, published on 23 August 2021, three years is plenty long enough.

The climate sensitivity of carbon dioxide calculated by Schildknecht and also by Coe et al. as being 0.5 Celsius degrees is so low that it is insignificant, as is also the climate sensitivity of methane,

calculated by Coe et al. as being 0.06 Celsius degrees. There is thus no climate emergency and no problem from methane emissions, whether from thawing tundra or from ruminant animals.

I therefore call upon the New Zealand Government to give its officials until 23 August 2024 to provide a proper scientific refutation of the Coe et al. paper, or on that date set about removing from NZ law and regulations all reference to reducing atmospheric concentrations of carbon dioxide and methane, and immediately end not only all subsidies for doing so, but also end all employment contracts paying people for researching how to reduce, or actually attempting to reduce, those gases' atmospheric concentrations, regardless of whether they have been successful or not. This of course would include abandonment of the newly-appointed independent panel to review the science on agricultural methane.

The New Zealand Government should also call upon all other nations' governments to also remove from their laws and regulations all reference to reducing atmospheric concentrations of carbon dioxide and methane, and immediately end not only all subsidies for doing so, but also end all employment contracts paying people for researching how to reduce, or actually attempting to reduce, those gases' atmospheric concentrations, regardless of whether they have been successful or not.

***There is no climate crisis*** and it's time that mankind ceased taking action to fight a non-existing problem, and focussed on remedying actual problems such as real environmental pollution and real child poverty.

Attachments:

A 220601 - How mistakes caused by ignorance and incompetence led to the mis-information now known as the "climate emergency"

B 231024 - Open Letter to the Parliamentary Commissioner for the Environment, Mr Simon Upton

C 240708 - The UN IPCC overstates the efficacy of carbon dioxide as a greenhouse gas by a factor of 6 and the efficacy of methane by a factor of 58

Recipients' feedback would be most welcome.

Sincerely

9(2)(a)



<220601 - How mistakes caused by ignorance and incompetence led to the mis-information now known as the "climate emergency".pdf><231024 - Open Letter

to the Parliamentary Commissioner for the Environment.pdf><240708 - The UN IPCC overstates the efficacy of carbon dioxide as a greenhouse gas by a factor of 6 and the efficacy of methane by a factor of 58.pdf>



## Methane Review Ministerial Advisory Panel

c/- Ministry for the Environment

1 October 2024

Dear panel members,

Thank you for the opportunity to contribute to the body of scientific evidence the Methane Review Ministerial Advisory Panel is required to review. The Parliamentary Commissioner for the Environment (PCE) has been conducting research into biogenic methane and its warming effects since 2018.

The first publication was a note on New Zealand's emissions from livestock based on modelling by Dr Andy Reisinger.<sup>1</sup> The focus of this note was on the contribution to warming from 2016 livestock methane emissions if these followed either a business-as-usual trajectory or a trajectory of no additional warming.

The headline results were that if emissions of livestock methane were held steady at 2016 levels, atmospheric methane concentrations from this source would level off within about ten years, however the warming effect would continue rising to 10–20% above current levels by 2050 and 25–40% by 2100. To achieve no additional warming beyond the 2016 level emissions would need to be reduced by at least 10–22% below 2016 levels by 2050, and 20–27% by 2100.

More recently a comparable piece of research was commissioned by DairyNZ, Beef + Lamb New Zealand and Federated Farmers, which found reductions in agricultural methane in the range of 15–27% by 2050 relative to the 2020 level would be required to achieve no additional warming from livestock methane emissions above the 2020 level in 2050.<sup>2</sup> This is similar to PCE's finding that reductions of livestock methane emissions of 10–22% below 2016 levels by 2050 would be required to achieve no additional warming above the 2016 level in 2050. The reasons behind the small discrepancies between the two studies have been outlined in PCE's letter to DairyNZ, Beef + Lamb New Zealand and Federated Farmers, which stated:<sup>3</sup>

"This is not 'new science' and it leaves us exactly as I had previously stated the position to be – namely, that the sustained contribution to atmospheric warming that New Zealand makes through the emission of agricultural methane is a matter of choice, and choosing to maintain this warming at the current level is to claim a 'right' to a certain level of warming from agriculture indefinitely."

It pointed out that focus on the *scientific* debate around no additional warming has distracted us from the relevant *political* debate around the nature of an *acceptable* target for biogenic methane. This debate should consider the availability of techniques and technologies for reducing biogenic methane emissions, and whether a target of no additional warming would represent a fair contribution both domestically and under the Paris Agreement.

Under the Paris Agreement, New Zealand has an international obligation to do as much as it can to keep the 1.5 °C global goal within reach. Thus, if technologies become available that can readily achieve methane reductions greater than no additional warming these should be utilised.

Research in 2019 showed that biogenic methane emissions in New Zealand, the majority of which come from agriculture, contributed around 0.0015 °C of warming to total observed global warming.<sup>4</sup> To put this into context, New Zealand's *total* gross greenhouse gas emissions were estimated to have contributed a little over 0.0028 °C to observed global warming. In other words, methane was about 55% of New Zealand's warming contribution. This same research found that despite its relatively short lifespan, methane will remain New Zealand's largest single contributor to global warming for the next six decades if gross emissions of biogenic methane, carbon dioxide and nitrous oxide were to continue at observed rates.

The contribution to global warming in general, but specifically from agriculture, is relatively large for a country of our size. Research commissioned by DairyNZ, Beef + Lamb New Zealand and Federated Farmers noted that the reduction of agricultural methane emissions represents the greatest opportunity to reduce New Zealand's contribution to warming.

Any process for setting a target should consider a wider range of factors than the precise boundaries of what science defines as "no additional warming". It should take into account a fair contribution to the 1.5 °C global goal (assuming that is still in fact the Government's goal), New Zealand's domestic ambitions, and the ability of farmers to mitigate biogenic methane emissions.

Another consideration in achieving any ambition for emissions reduction is the availability of offsets. PCE has argued that when considering short-lived climate pollutants, such as biogenic methane, the use of forestry *would* be acceptable for offsetting emissions. Offsetting biogenic methane emissions using forestry makes more sense than using forestry to offset long-lived carbon dioxide emissions. This is because of the broad commensurability between the lifetime of the cooling effect of a pine production forest and the lifetime of the warming effect of the biogenic methane from a herd of ruminants. Thus, in 2022 PCE commissioned a report from Professor Dave Frame and Dr Nathanael Melia which investigated the potential to offset methane emissions using afforestation.<sup>5</sup> PCE published a report based on this work, and a summary of the key findings.<sup>6</sup>

Headline findings were that a *one-off* planting of around 770,000 hectares of new commercial pine forest by 2050 would have a similar effect on warming as reducing gross methane emissions by 10%. (The area scales in proportion to the percentage of offsetting required). Importantly, any such offsetting would not represent a permanent loss of option value on the land in question since a decision to reduce stock numbers, or the application of some as yet unforeseen technology that reduces ruminant emissions, would allow forest to be removed. This is in sharp contrast to the permanent loss of options for land planted to offset carbon dioxide emissions.

PCE's latest work is on methane emissions at the global level.<sup>7</sup> This recent study was commissioned from Dr Andy Reisinger and peer reviewed by Professor William Collins. The report breaks down the contribution to global warming from biogenic methane and fossil methane, alongside a more detailed disaggregation of the warming from agriculture, waste, biomass burning, and the additional carbon dioxide that is added to the atmosphere when fossil methane is emitted. PCE also produced a summary of Dr Reisinger's report.<sup>8</sup>

Finally, PCE has published a short piece that summarises our published work into a coherent narrative tying together the main findings.<sup>9</sup>

With kind regards,



Simon Upton

**Parliamentary Commissioner for the Environment**  
**Te Kaitiaki Taiao a Te Whare Pāremata**

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<sup>1</sup> PCE, 2018. *A note on New Zealand's methane emissions from livestock.*

<https://pce.parliament.nz/publications/a-note-on-new-zealand-s-methane-emissions-from-livestock>.

<sup>2</sup> See <https://www.dairynz.co.nz/media/qu1lwtgu/joint-evidence-submission-for-target-review-final-14-sept-2023.pdf>.

<sup>3</sup> See <https://pce.parliament.nz/publications/letter-to-dairynz-beef-plus-lamb-nz-and-federated-farmers-about-submission-on-agricultural-emissions>.

<sup>4</sup> <https://staging.nzagrc.org.nz/assets/Publications/NZAGRC-Report-Scientific-aspects-of-2050-methane-targets.pdf>.

<sup>5</sup> Frame and Melia, 2022. *Offsetting livestock methane with trees: Balancing warming from ruminant methane emissions with cooling from carbon sequestration by forestry.*

<https://pce.parliament.nz/publications/how-much-forestry-would-be-needed-to-offset-warming-from-agricultural-methane>.

<sup>6</sup> PCE, 2022. *How much forestry would be needed to offset warming from agricultural methane?; How much forestry would be needed to offset warming from agricultural methane? Summary document.*

<https://pce.parliament.nz/publications/how-much-forestry-would-be-needed-to-offset-warming-from-agricultural-methane>.

<sup>7</sup> Reisinger, 2024. *The contribution of historical methane emissions to present-day warming.*

<https://pce.parliament.nz/publications/contribution-of-historical-methane-emissions-to-present-day-warming>.

<sup>8</sup> PCE, 2024a. *The contribution of historical methane emissions to present-day warming: Summary document.*

<https://pce.parliament.nz/publications/contribution-of-historical-methane-emissions-to-present-day-warming>.

<sup>9</sup> PCE, 2024b. *Offsetting livestock methane emissions using forestry: Summary of main findings.*

<https://pce.parliament.nz/publications/how-much-forestry-would-be-needed-to-offset-warming-from-agricultural-methane>.