

A photograph of a herd of cows in a lush green field. In the foreground, a black and white cow is standing, facing left. The background shows many other cows scattered across the field, some lying down and some standing. The sky is a clear, pale blue. The overall scene is a typical pastoral landscape.

# — AGRICULTURAL EMISSIONS OF NEW ZEALAND

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for Engineers and Scientists (and Susan)

# WHY CARE ABOUT EMISSIONS?

- Isn't NZ too small to make an impact
- (yes and no)

## Carbon Emissions PER-CAPITA BY COUNTRY

Measuring the total carbon emissions doesn't always paint the most accurate picture of a country's contribution, if their population isn't considered.

For example, even though China is the highest emitter of CO<sub>2</sub>, the average American is responsible for producing **14.4** tonnes of CO<sub>2</sub> per person, compared to **7.1** tonnes for a Chinese citizen.

Here's a look at the biggest per-capita carbon emitters in the world:

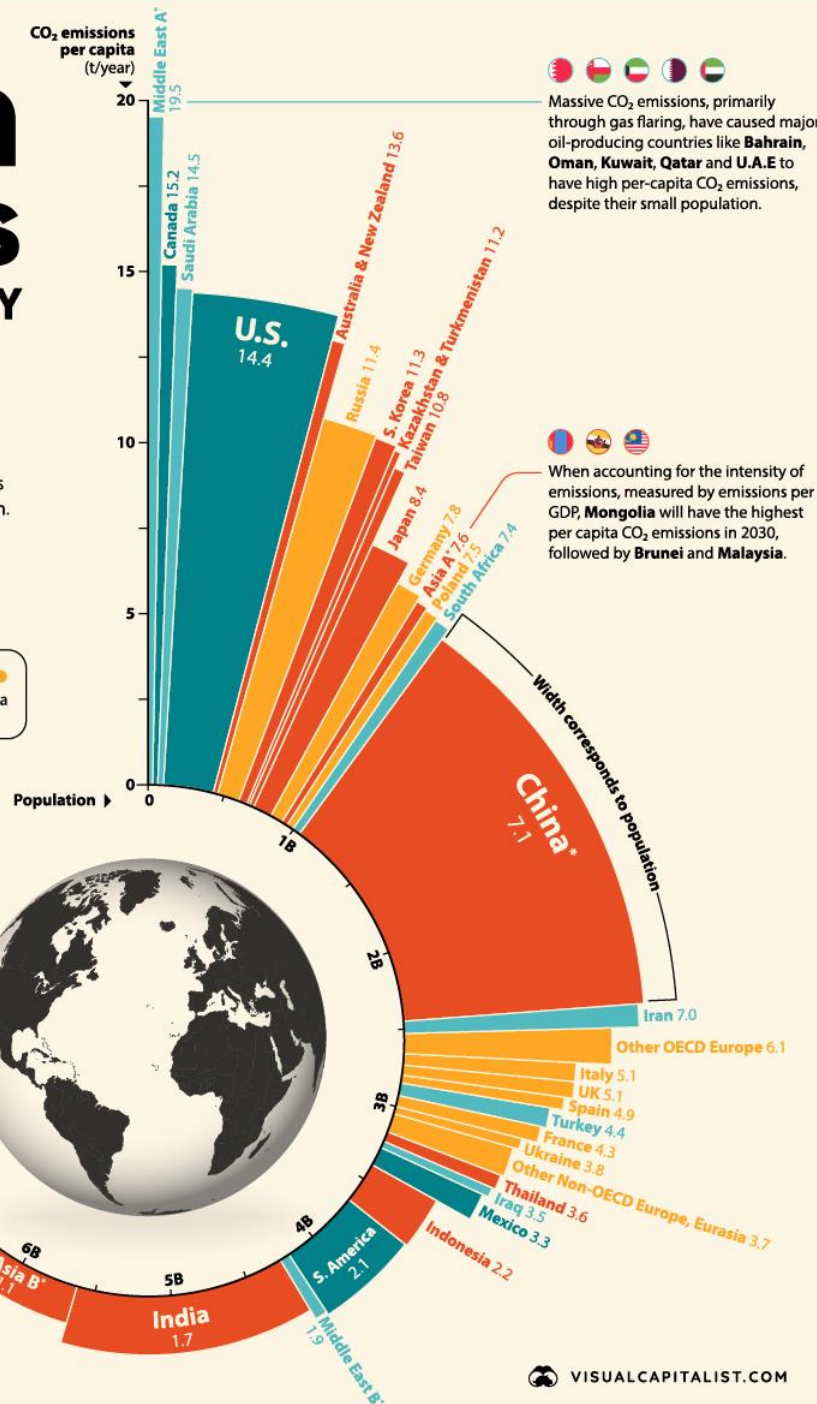


Unequal global distribution of wealth plays a factor in carbon emissions. Developed countries like **Qatar** emit **31t** CO<sub>2</sub>/yr, while that of developing countries in **Africa** can be as low as **0.7t** CO<sub>2</sub>/yr.

- \*1 Middle East A  
Bahrain, Oman, Kuwait, Qatar, United Arab Emirates
- \*2 Middle East B  
Israel, Jordan, Lebanon, Syria, Yemen
- \*3 Asia A  
Brunei, Malaysia, Mongolia, Singapore
- \*4 Asia B  
Asia without Asia A, China, India, Thailand, Taiwan, Indonesia, S. Korea or Japan
- \*5 China  
China, Hong Kong

The CO<sub>2</sub> emission values are based on estimates of the source chart. There may be a negligible difference between the ones provided here and the source data.

SOURCE: AQAL GROUP, IEA (2021)

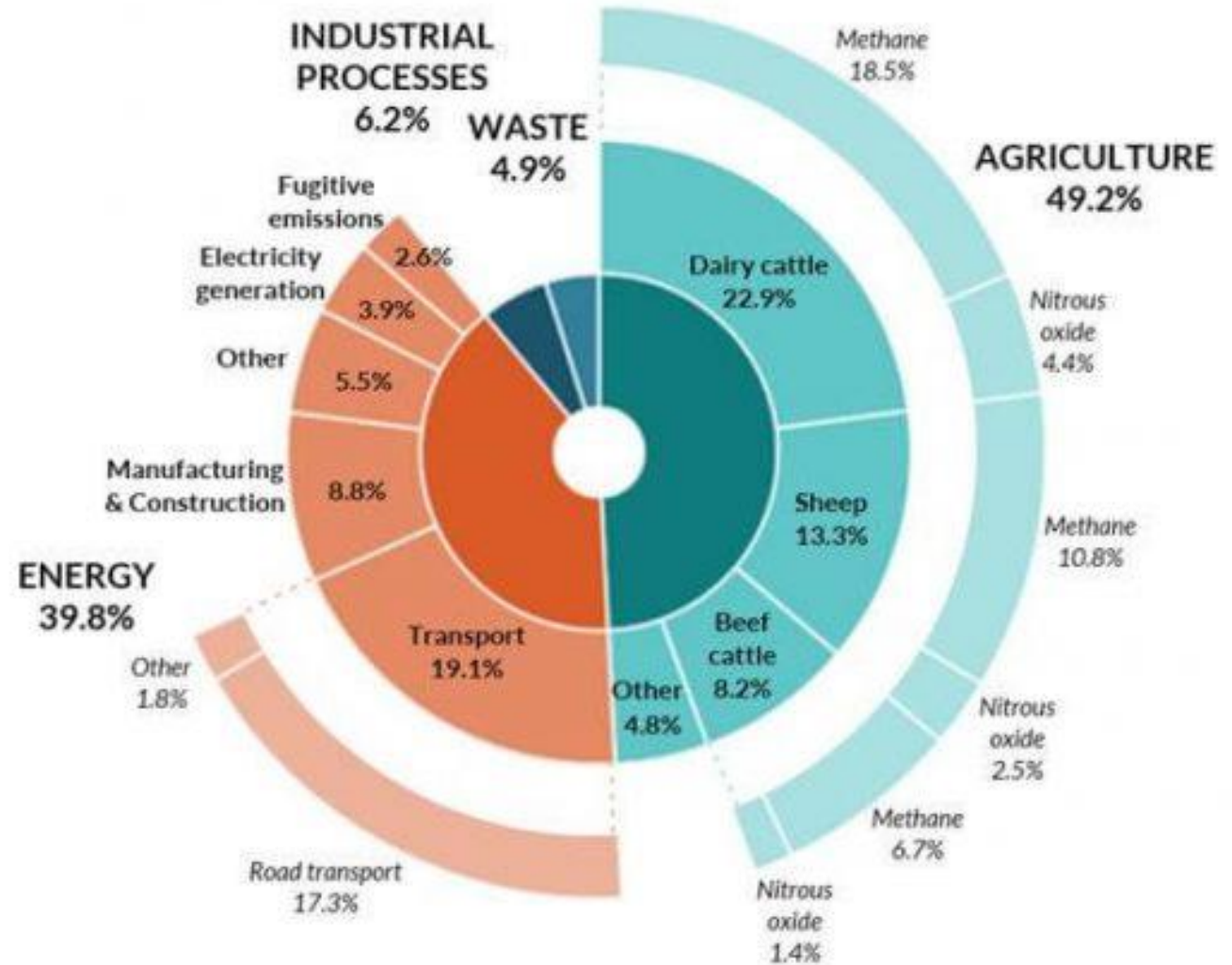


# New Zealand's Total Emissions

## What is the problem?

Almost half of NZ's emissions come from agriculture either through belching or fertilizer. These emissions are troublesome for achieving net zero carbon as well as other sustainability goals

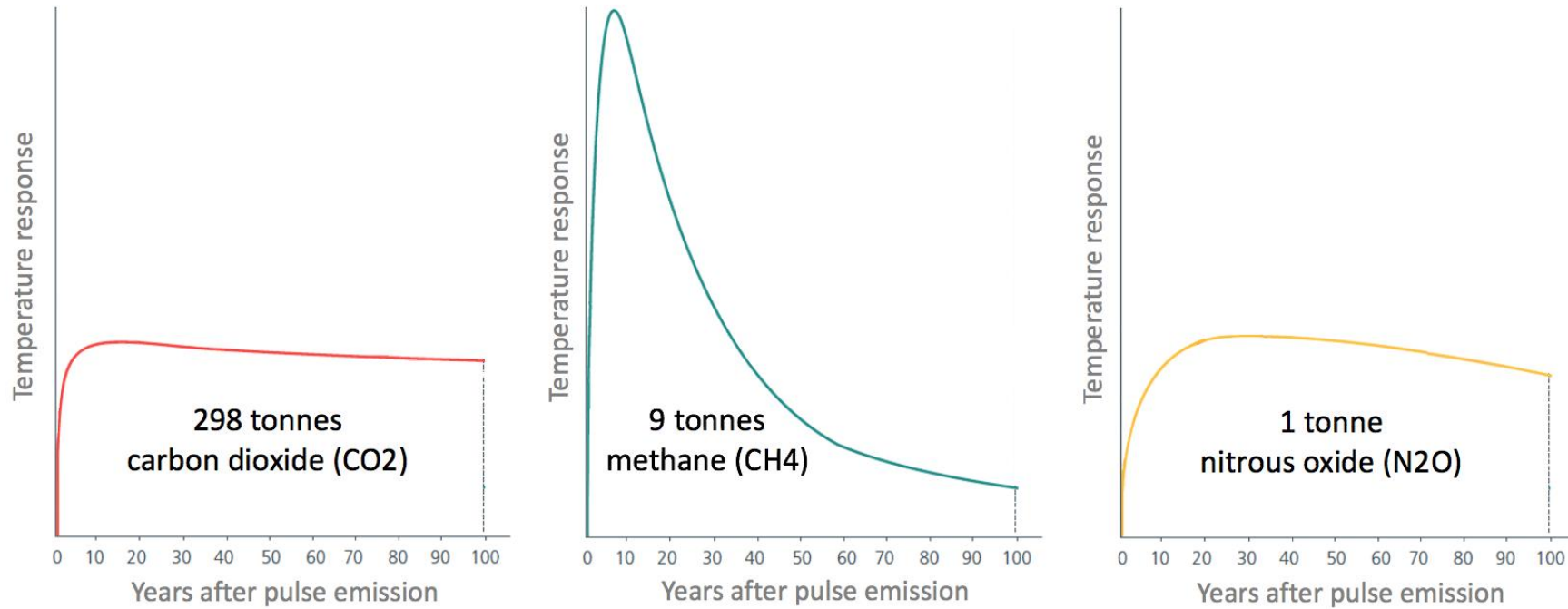
## NEW ZEALAND'S Greenhouse Gas Emissions



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.

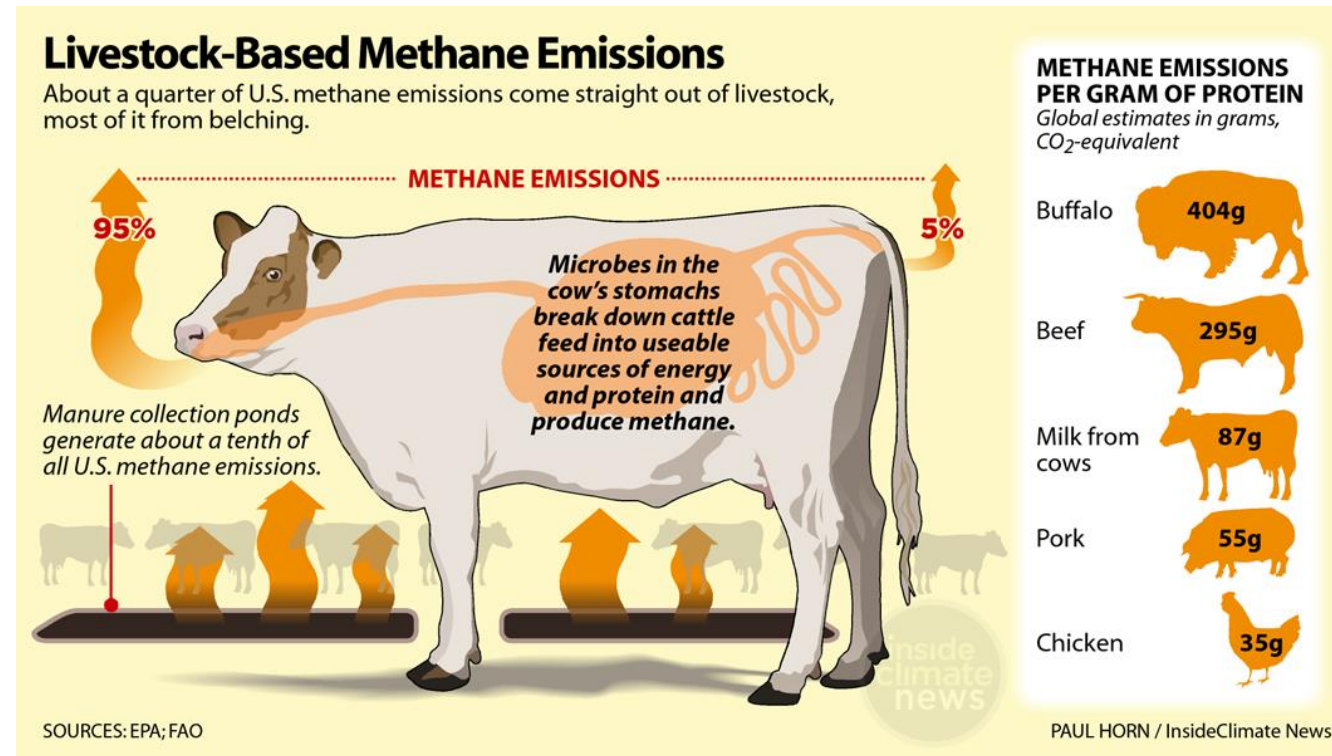
# What's *really* so bad ?



Warming Potentials of CO<sub>2</sub>, methane and nitrous oxide

# Where do these gasses come from within the farm?

- Cows, sheep, goats, moose, camels, deer, giraffes, and buffalo are ruminant animals (meaning they have four stomachs)
  - Methane is belched after the microbes in the stomachs break down their food
- Nitrogen comes from animal dung, urine and fertilizer
  - Fertilizer nitrogen has increased sharply in the last few years

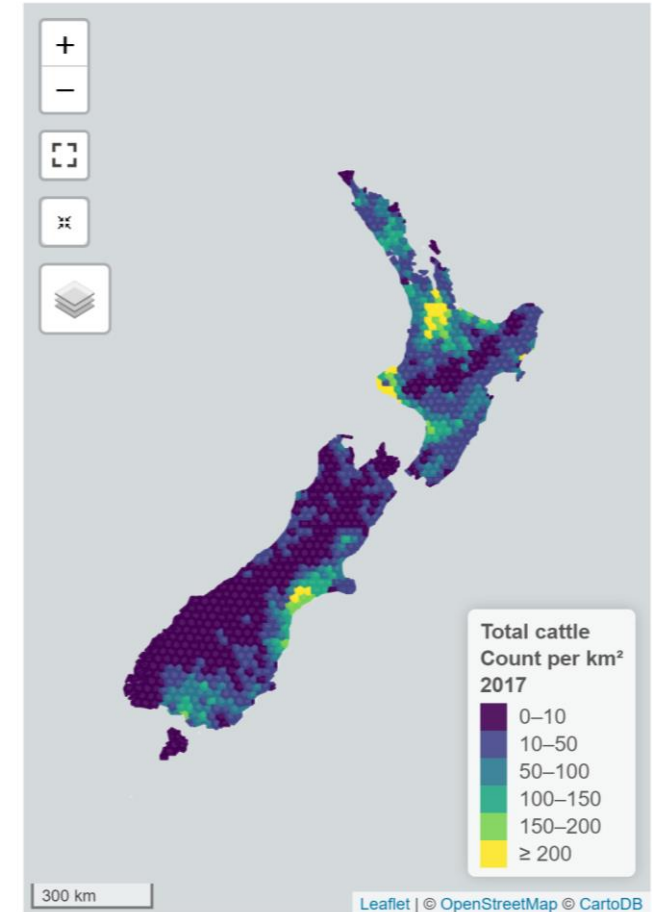
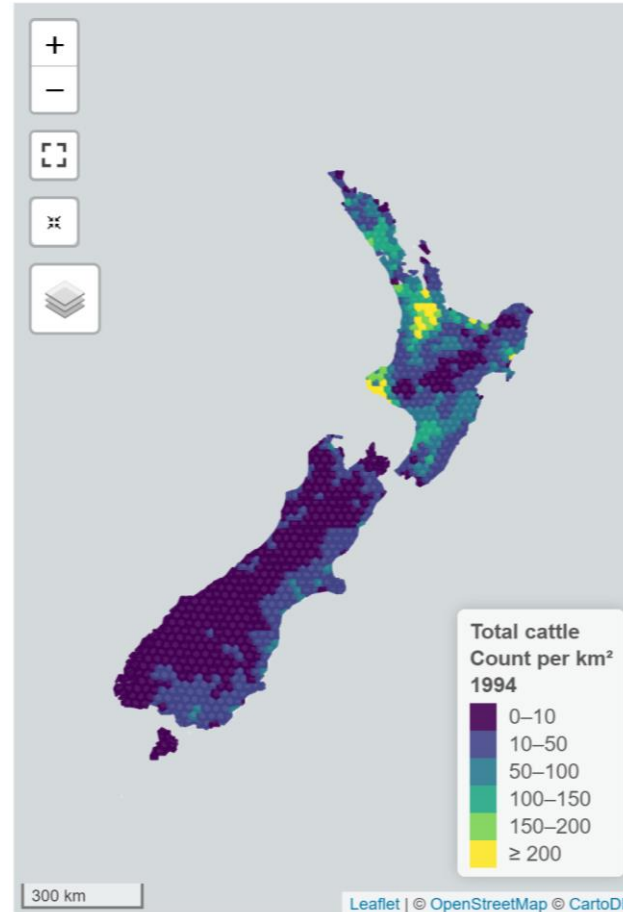


# Increases in Livestock

Ranking Of Countries With The Most Cattle Per Capita

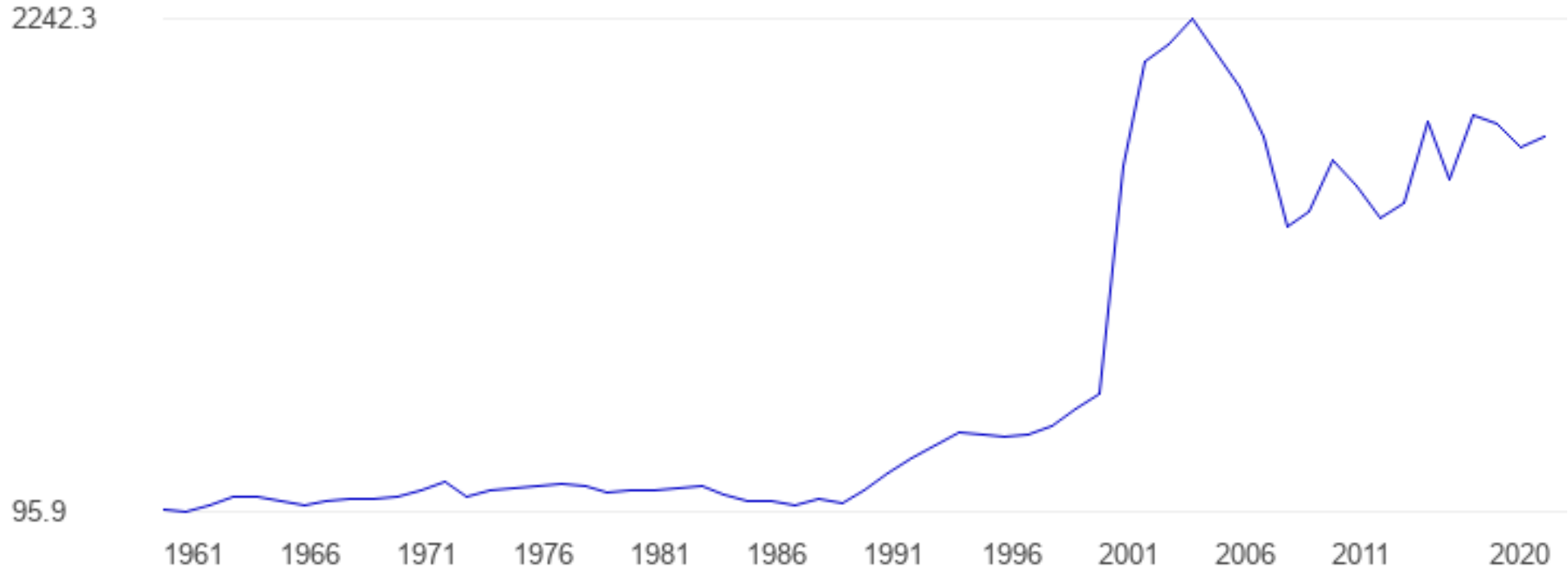
Rank	Country	Cattle	Population	Per Capita
	World	1,000,967,000	7,713,468,100	0.13
1	Uruguay	11,946,000	3,461,734	3.45
2	New Zealand	10,063,000	4,783,063	2.10
3	Argentina	53,831,000	44,780,677	1.20
4	Brazil	252,700,000	211,049,527	1.20
5	Australia	23,217,000	25,203,198	0.92
6	Belarus	4,300,000	9,452,411	0.45
7	Canada	11,150,000	37,411,047	0.30
8	United States	93,595,000	329,064,917	0.28
9	India	305,500,000	1,366,417,754	0.22
10	European Union	85,545,000	447,700,000	0.19
11	Mexico	17,000,000	127,575,529	0.13
12	Russia	17,953,000	145,872,256	0.12
13	Egypt	7,850,000	100,388,073	0.08
14	South Korea	3,774,000	51,225,308	0.07
15	Ukraine	3,001,000	43,993,638	0.07
16	China	95,620,000	1,433,783,686	0.07
17	Japan	3,922,000	126,860,301	0.03

Source: FAS/USDA (head/people)



Cow density of NZ in 1994 and 2017

# Increases in fertilizer



# AIR PODS BREAK

Please check your surroundings and make sure that your air pods are accounted for





# — WHAT IS BEING DONE?

How is NZ dealing with their agricultural emissions?

# New Zealand's One Billion Trees

- Trees convert carbon dioxide to oxygen, allowing for something called emissions offsets
- Basically, more trees = less CO2
- This is great but it does not impact other greenhouse gasses

## One Billion Trees Progress Chart



Te Uru Rākau  
Forestry New Zealand



**Trees planted**  
since the One Billion Trees Programme was announced\*



**110,000,000**

 Government has directly funded

**24,681,000**

 **Tree seedlings**  
expected to be planted in 2019\*\*

**83,100,000**

**12%** are native species  \* estimated  
**88%** are exotic species  \*\* surveyed

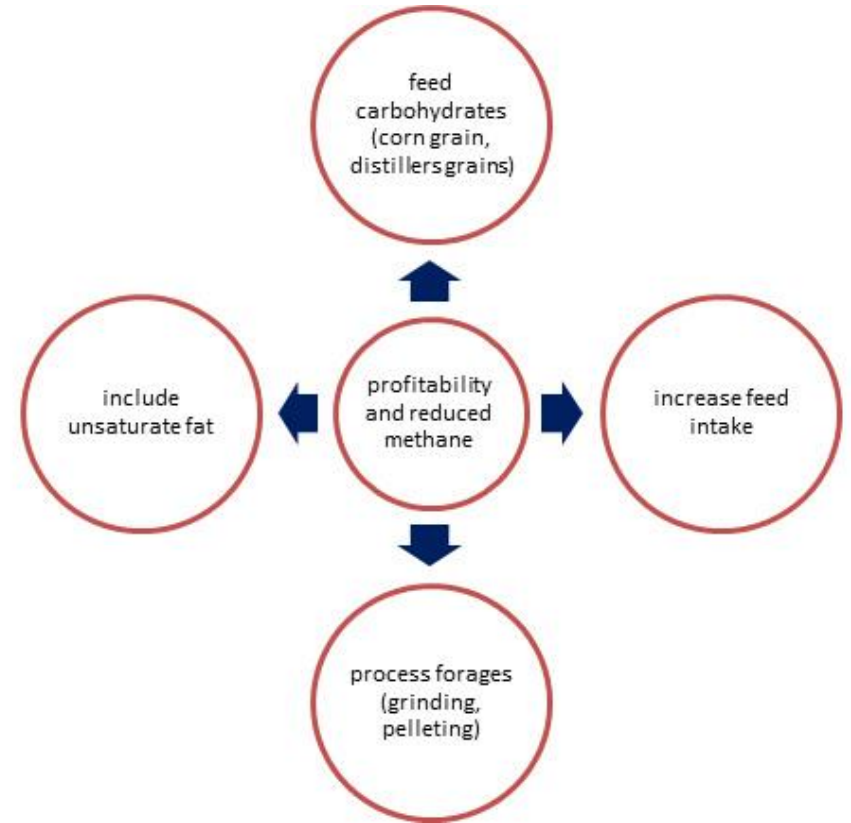
The background of the slide features several rolled-up architectural blueprints. The blueprints are white with black lines and text, showing various technical drawings, dimensions, and annotations. The blueprints are arranged in a way that they appear to be unrolling or are partially unrolled, creating a sense of depth and focus on the technical nature of the subject. The overall color palette is a soft, light blue, which complements the white and black of the blueprints.

# DOES NZ REALLY CARE ABOUT THIS ISSUE?

YES, it is in their emissions reduction plan and New Zealand plans to tax emissions as soon as 2035

# Ways to reduce emissions

- Use less fertilizer
- Have less cows (probably not an option)
- Change food feedstocks to seaweed and corn
- Other methods are still being researched
  - Vaccines, experimental feeds, microbial balances and more
- More research is needed to properly address this issue



# Source Dump

- <https://www.livekindly.com/livestock-dairy-50-new-zealand-greenhouse-gases/>
- <https://www.mpi.govt.nz/funding-rural-support/environment-and-natural-resources/emissions-trading-scheme/agriculture-and-greenhouse-gases/>
- [https://www.theglobaleconomy.com/New-Zealand/fertilizer\\_use/](https://www.theglobaleconomy.com/New-Zealand/fertilizer_use/)
- [https://www.usdairy.com/news-articles/farmers-reducing-methane-gas-from-cows?gclid=CjwKCAjw0N6hBhAUEiwAXab-TVA29Z4q60eyuiKQXFji6l1YgBPEB6SNSDyqlbH9OC7JwXNNKB2diRoC6dMQAvD\\_BwE](https://www.usdairy.com/news-articles/farmers-reducing-methane-gas-from-cows?gclid=CjwKCAjw0N6hBhAUEiwAXab-TVA29Z4q60eyuiKQXFji6l1YgBPEB6SNSDyqlbH9OC7JwXNNKB2diRoC6dMQAvD_BwE)