What on Earth is Climate Change?

Jenny Easton
Environmental Scientist
Tasman District Library, 3 Sept 2019

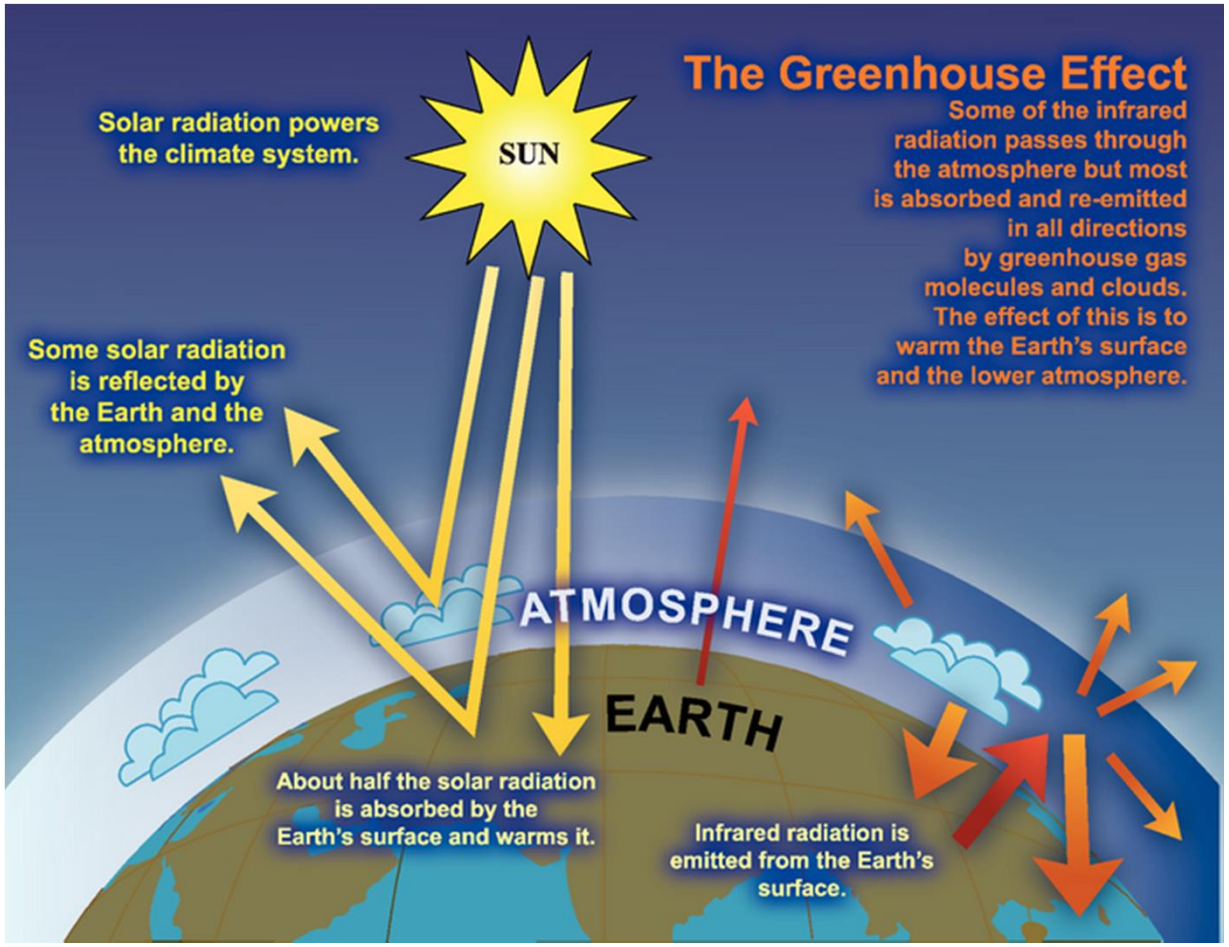
How do greenhouse gases heat the Earth?

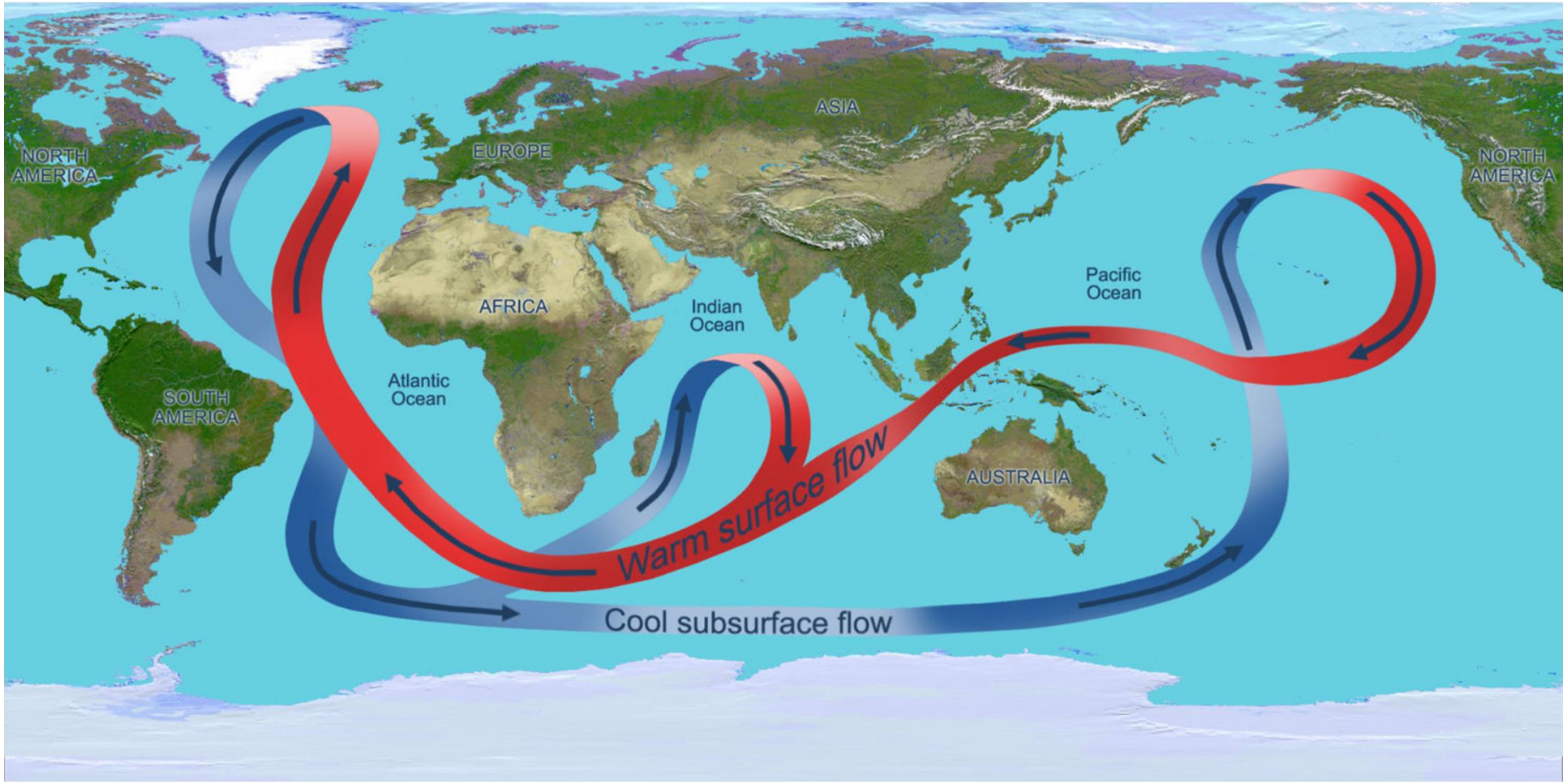
Why does the extra heat matter?

What can we do about it?

Low carbon future


THE FUTURE IS HERE
MOVIE
LIBRARY
SCHOOL
ZERO FOSSIL FUELS
杂货店
SIERRA CLUB BC
sambradd


The Greenhouse Effect
Some of the infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere.
Solar radiation powers the climate system.
SUN
Some solar radiation is reflected by the Earth and the atmosphere.
ATMOSPHERE
EARTH
About half the solar radiation is absorbed by the Earth's surface and warms it.
Infrared radiation is emitted from the Earth's surface.


NORTH AMERICA
EUROPE
ASIA
NORTH AMERICA
AFRICA
Indian Ocean
Pacific Ocean
Atlantic Ocean
SOUTH AMERICA
AUSTRALIA
Warm surface flow
Cool subsurface flow

Greenhouse gases

Carbon Dioxide from burning coal, petrol, diesel, and deforestation

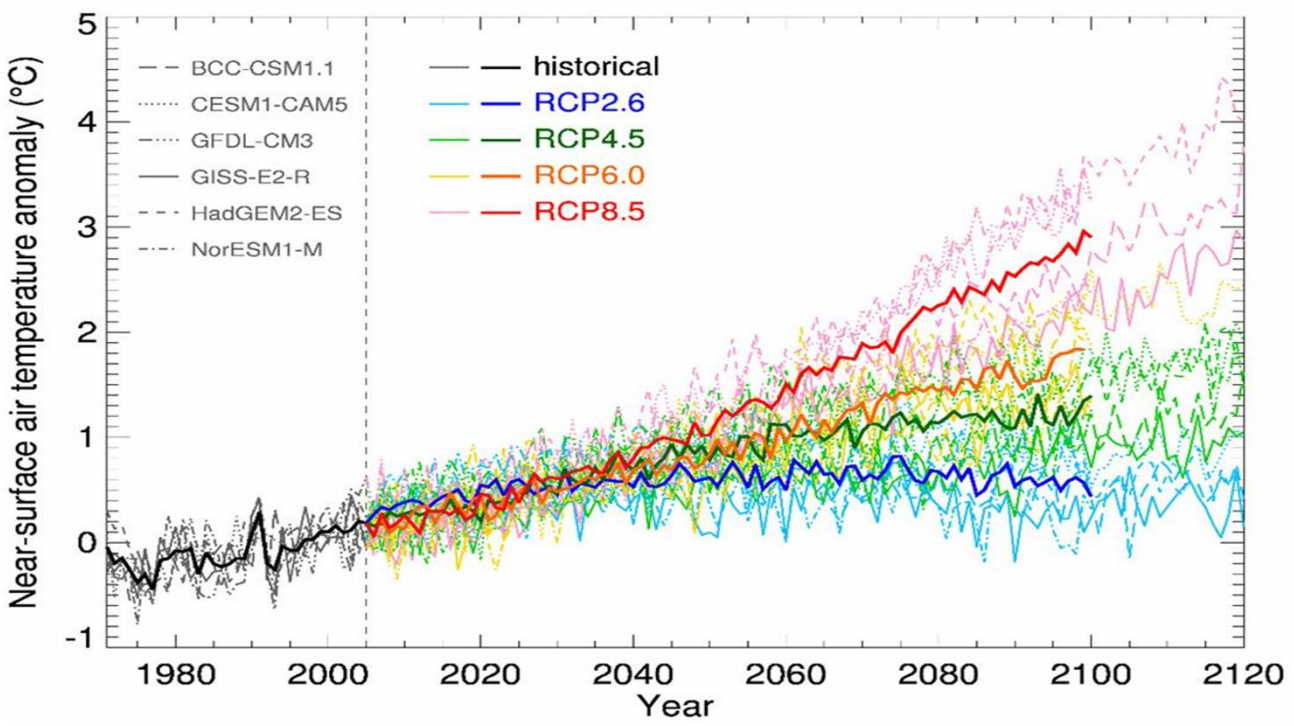
Methane from cows, sheep, buried organic waste, rice paddies, swamps

Nitrous oxide from nitrate fertiliser and animal urine

Water vapour in the atmosphere and in clouds

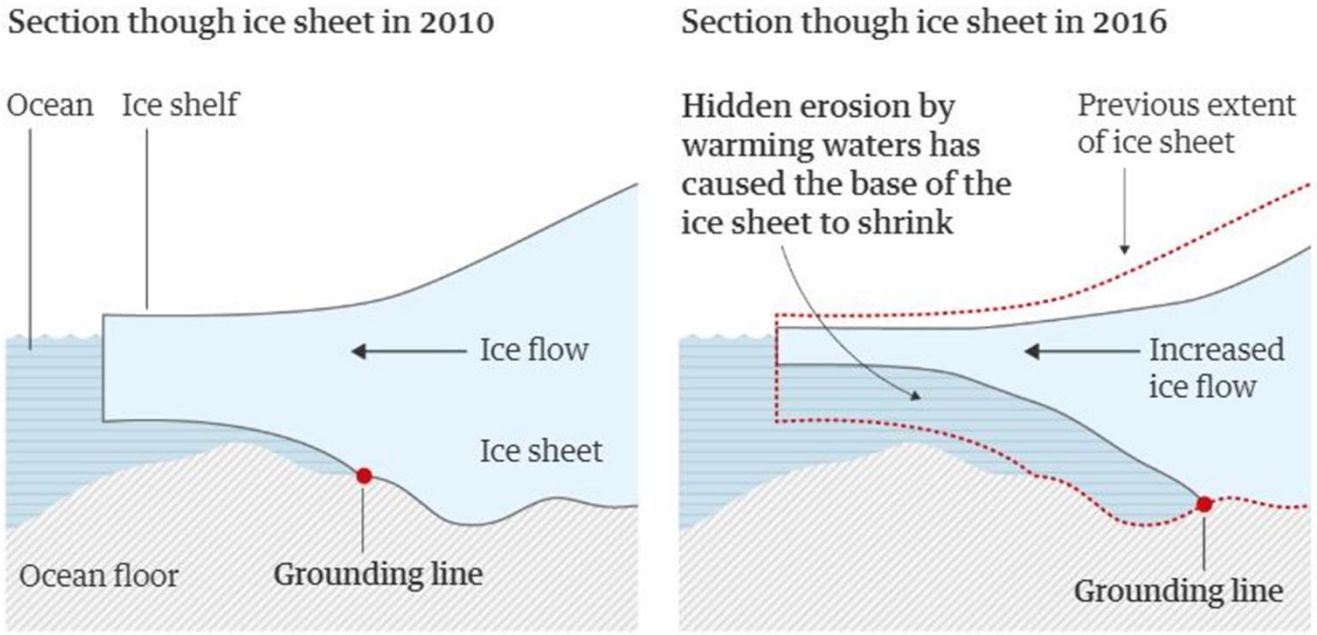
Refrigerant & anaesthetic gases - if they are not disposed of correctly

Temperature predictions



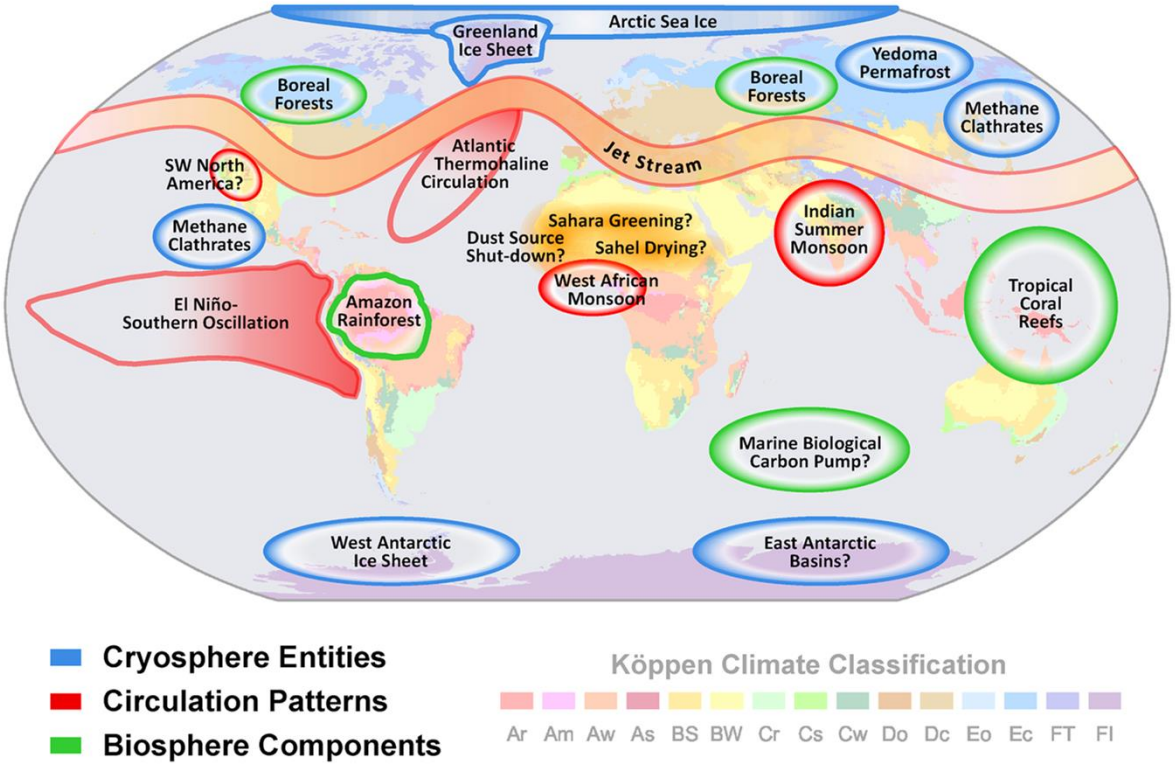
NIWA
Taihoro Nukurangi

Erosion by warming waters has caused the submarine ice around Antarctica to shrink by 1,463 sq km in six years



Guardian graphic. Source: Nature

Tipping points

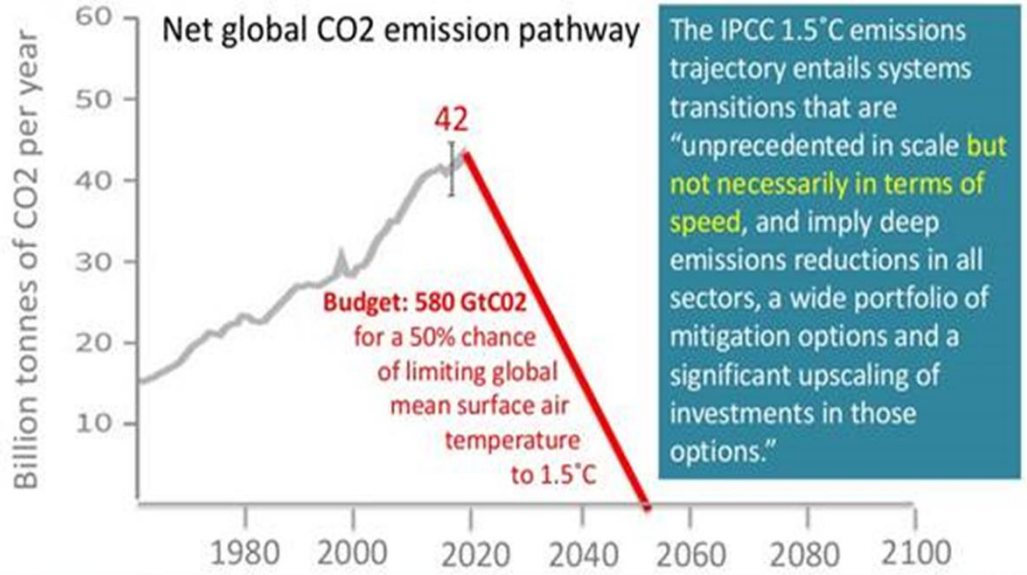


Source: https://www.pik-potsdam.de/services/infodesk/tipping-elements/kippelemente

IPCC 1.5 report

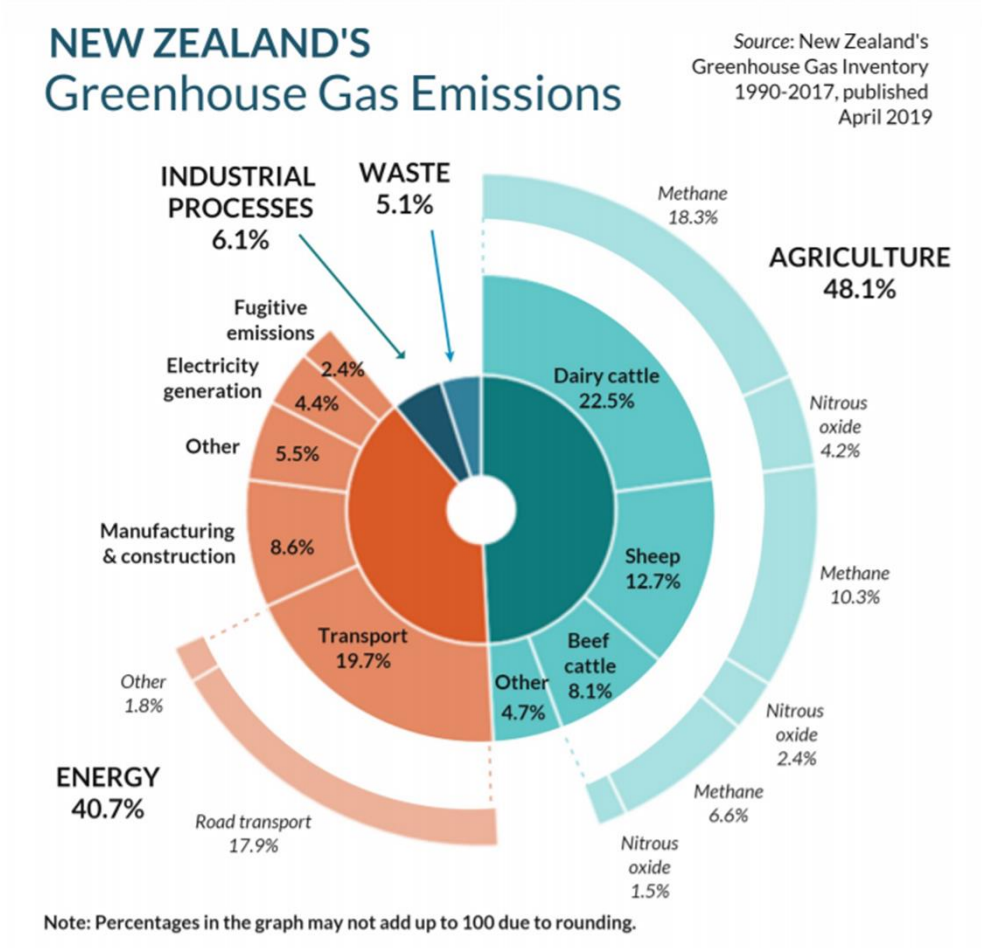
7th Oct 2018

Landmark UN scientists' report confirms ruinous contrast between 1.5˚C & 2˚C global warming



The IPCC 1.5˚C emissions trajectory entails systems transitions that are "unprecedented in scale but not necessarily in terms of speed, and imply deep emissions reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options."

IPCC concludes that for 1.5˚C limit, emissions must be cut from 2010 levels by 45% by 2030, and to net zero by 2050 (20% and 2075 for 2˚C).


NEW ZEALAND'S
Greenhouse Gas Emissions
Source: New Zealand's Greenhouse Gas Inventory 1990-2017, published April 2019
INDUSTRIAL PROCESSES 6.1%
WASTE 5.1%
Fugitive emissions 2.4%
Electricity generation 4.4%
Other 5.5%
Manufacturing & construction 8.6%
Transport 19.7%
Other 1.8%
ENERGY 40.7%
Road transport 17.9%
Dairy cattle 22.5%
Sheep 12.7%
Beef cattle 8.1%
Other 4.7%
AGRICULTURE 48.1%
Methane 18.3%
Nitrous oxide 4.2%
Methane 10.3%
Nitrous oxide 2.4%
Methane 6.6%
Nitrous oxide 1.5%
Note: Percentages in the graph may not add up to 100 due to rounding.

Ways NZ can reduce our emissions

Currently NZ emits 57 million tonnes of carbon dioxide equivalent.

We need 31mt of net reductions by 2030.

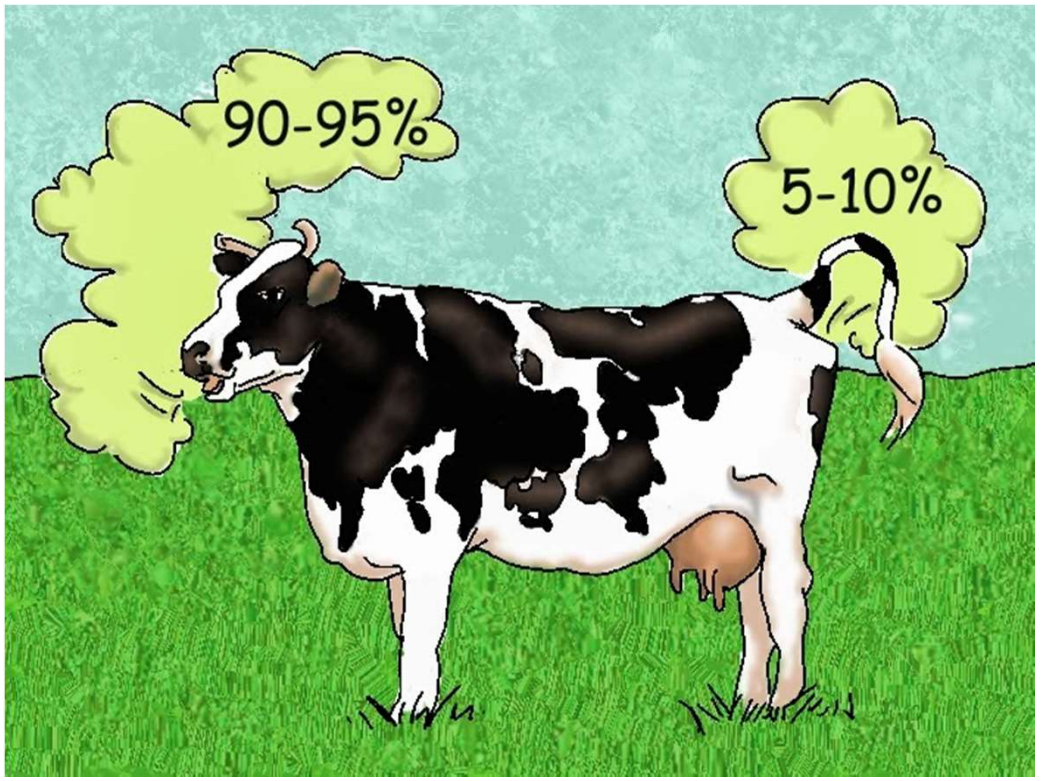
An estimate of how to do that by a NZ Investment Consultant (Paul Winton):

Agriculture 4mt, Electricity 3mt, Factories 4mt, Waste and leaky gas pipes 4mt, Transport 11mt, and Trees soak up 5mt.

Transport reductions

1. Increase car occupancy from 1.5 to 2 people per car takes 20% of cars off the road.
2. Decrease the tailpipe emissions from the vehicles by a third with the new standard.
3. Increase the number of EVs for another 20%.

Cows and methane



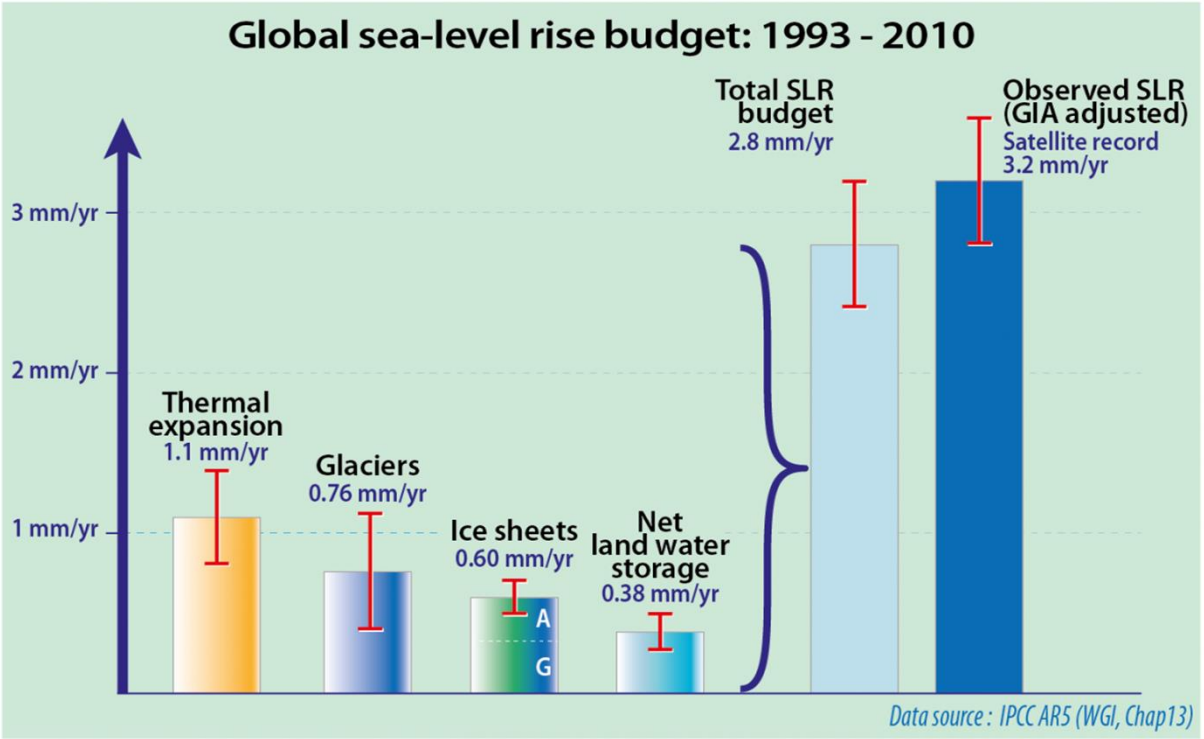
Methane

Photograph by Mark Thiessen, Nat Geo Image Collection

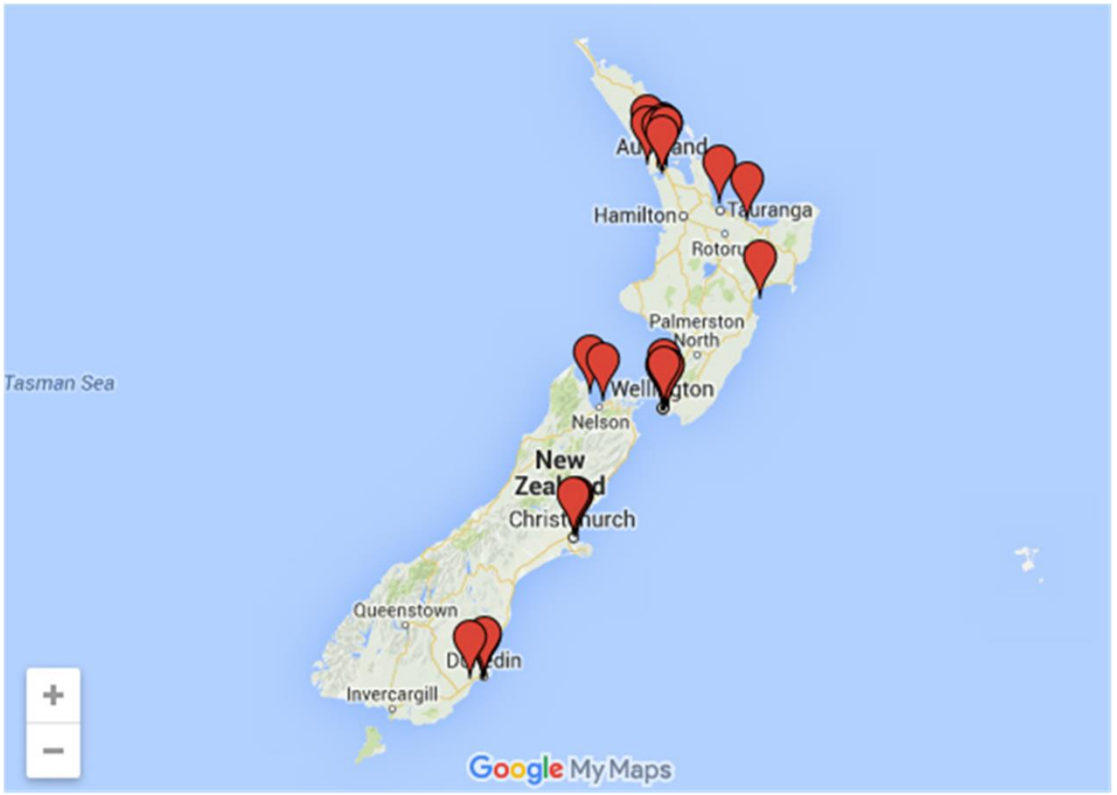
Methane behaves differently from carbon dioxide

- In the first 20 years methane is 86 times more powerful than carbon dioxide as a greenhouse gas, and averaged over 100 years it is 25 times.
- Methane stays in the atmosphere for 100 years or so, and breaks down to carbon dioxide and water.
- **Carbon dioxide stays in the atmosphere for 1000s of years.**
- **Nitrous oxide is 300 times more powerful than carbon dioxide, and stays in the atmosphere a long time.**

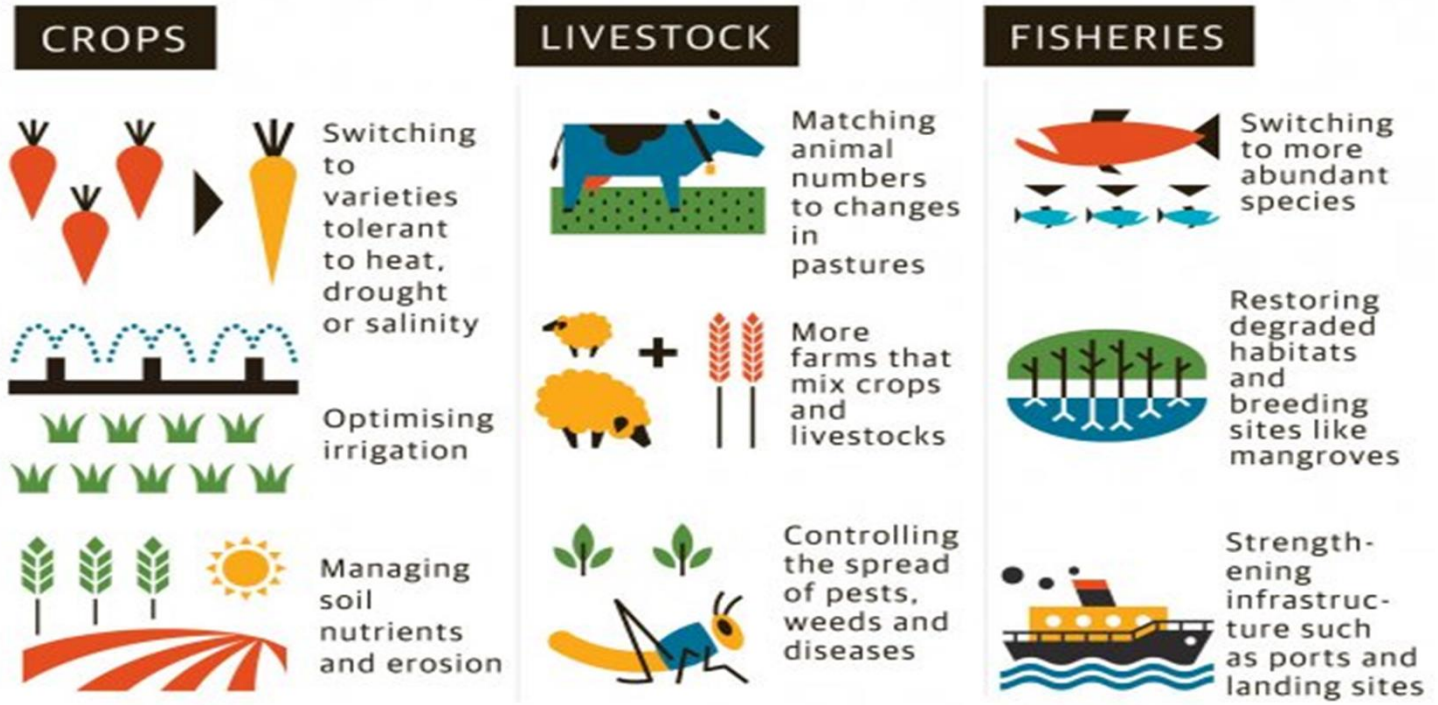
Sea level rise



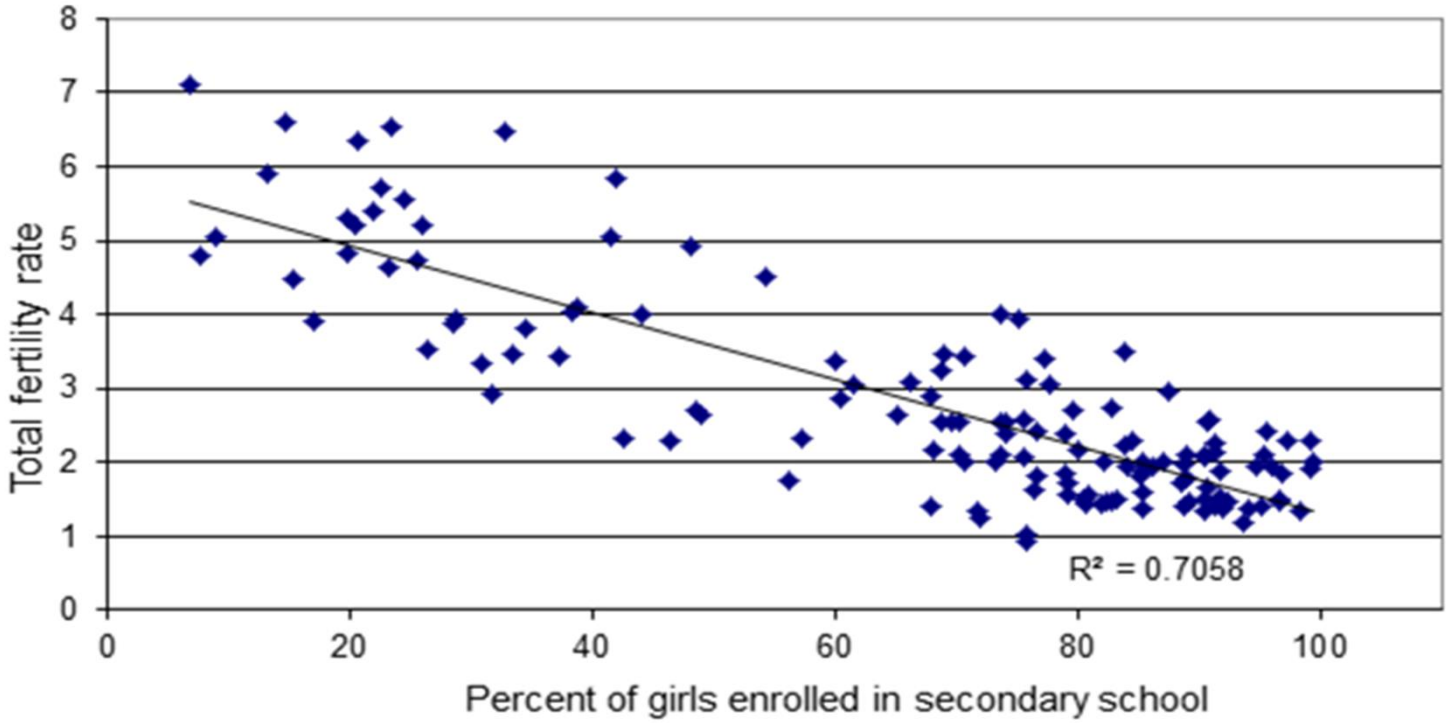
Areas in NZ at risk of rising sea levels



Food


CROPS
Switching to varieties tolerant to heat, drought or salinity
Optimising irrigation
Managing soil nutrients and erosion
LIVESTOCK
Matching animal numbers to changes in pastures
More farms that mix crops and livestocks
Controlling the spread of pests, weeds and diseases
FISHERIES
Switching to more abundant species
Restoring degraded habitats and breeding sites like mangroves
Strengthening infrastructure such as ports and landing sites

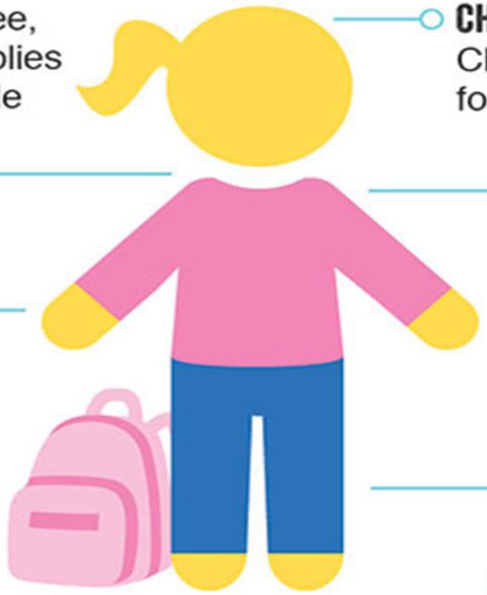
Educating girls reduces global population



6 BARRIERS TO GIRLS' EDUCATION:

POVERTY: Even if education is free, the cost of uniforms and or supplies can make education inaccessible

CHILD MARRIAGE & EARLY PREGNANCY: Child brides are almost always forced to drop out of school



LACK OF SAFE, PRIVATE GIRLS-ONLY LATRINES: Stigma and other factors mean 1 in 10 girls in Africa miss school during their periods

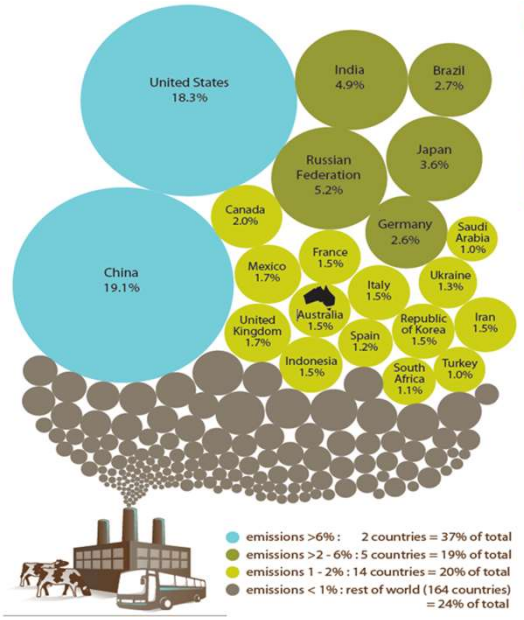
VIOLENCE : Once arriving to school, girls may face various forms of violence at the hands of teachers, peers and other people in the school environment. If parents find out school isn't safe for their daughters, they may remove them from school

GENDER INEQUALITY : Girls are often kept home from school to help with family care & housework

LONG DISTANCE TO SCHOOL: Girls are at an increased risk of experiencing violence or harassment

What can we do about climate change?

- Countries with <1% of global emissions make up 30% of total emissions
  - NZ can lead by example!
- Individual **decision making**
  - Transport
  - Food
  - Energy
  - Talk about it, engage and learn
- Government **action**
  - reducing emissions
  - regulatory schemes, incentives
  - renewable energy sources



NIWA
Taihoro Nukurangi


Thank you
Any questions?
There are two handouts:
What you can do & lists of groups.