Public Interest Law and Science Initiative Inc.

Submission of the Public Interest Law and Science Initiative inc.[1], by Sean Rush[2], President, on:

Inquiry into climate adaptation- 16 June 2024

Thank you for the opportunity to make this submission.

This submission makes two key points:

1. Observational evidence discloses very little changes of significance to the climate system, and in New Zealand's case, this is to be expected;
2. The best indicator of the future is the past. To assess what climate changes may arise over the next 10 to 50 years, then model forward the trends that have emerged in the last 30 to 50 years.

   If the Government is more minded to adopt an IPCC climate model, then choose a more plausible one such as SSP2-4.5 or SSP4-6.0. Do not use SSP5-8.5.

Background to The Public Interest Law and Science Initiative inc

The Public Interest Law and Science Initiative inc ("PILSI") is a not-for-profit organisation with members made up from the legal and scientific community, including planners, economists, sea level experts, statisticians and other academics, as well as members of communities and community groups concerned with the honest and robust application of science in law and policy making.

We are concerned about the use of false narratives, supposedly underpinned by science, to win support for what would be otherwise, unpopular policies.

Our mission is to be an honest broker and simply let science speak to power.

The good news

The modern subscribers to Malthusian futures have been making claims of imminent catastrophe since Ehrlich's *the Population Bomb*[3] in the late 1960s. Early 1970s books, *'Limits to Growth'* by the Club of Rome,[4] *The Genesis Strategy*,[5] by Intergovernmental Panel on Climate Change ("IPCC") scientist (now deceased) Dr Stephen Schneider, which predicted famine throughout the 1980s and 1990s – have all been proved wrong.

Newsroom's Marc Daalder, a history graduate with no scientific qualifications, claimed that "*today's youth will live out their lives in a world fundamentally different from that enjoyed by older generations*."

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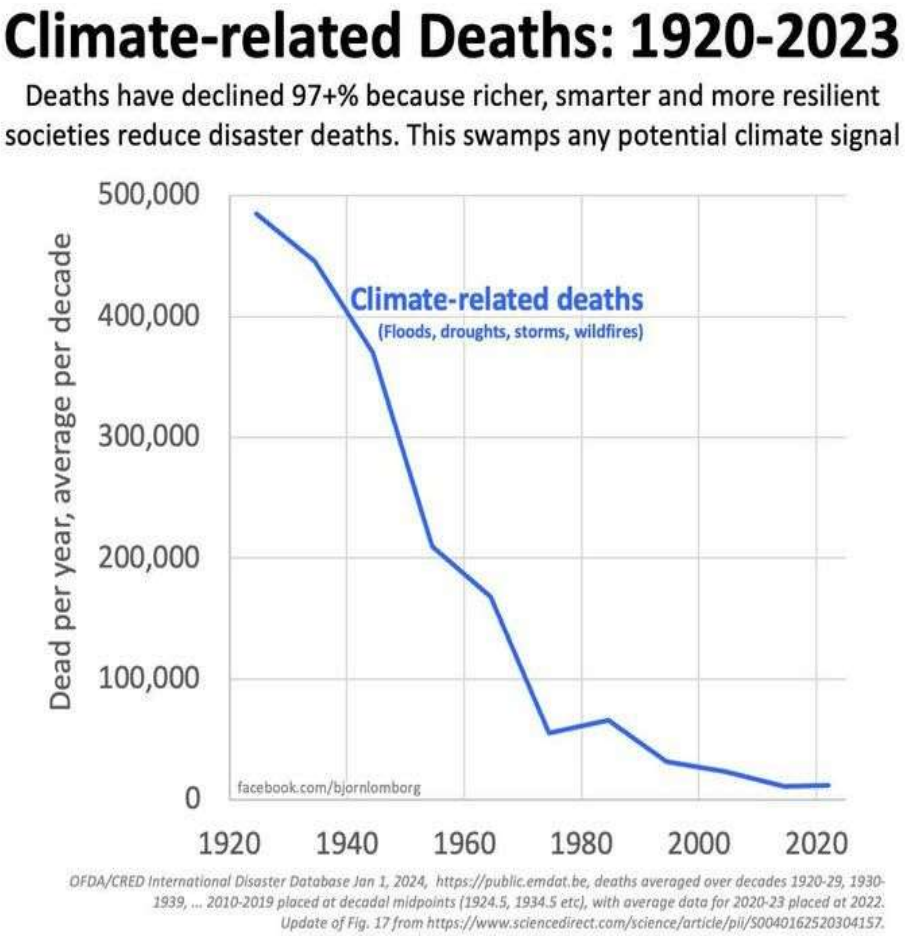
[1] Public Interest Law and Science Initiative Inc. (pilsi.org.nz)
[2] Sean has a Masters in Climate Change Science and Policy and was an Expert Reviewer for the Intergovernmental Panel on Climate Change;'s Sixcth Assessment Report, Working Group 1, The Physical Science Basis.
[3] See "The Book That Incited a Worldwide Fear of Overpopulation" https://www.smithsonianmag.com/innovation/book-incited-worldwide-fear-overpopulation-180967499/.
[4] See https://www.clubofrome.org/publication/the-limits-to-growth/.
[5] See NY times review at https://www.nytimes.com/1976/07/18/archives/the-genesis-strategy-a-chilling-prospect.html.

He's right – here's a few truths about the world today with italicised quotes mainly from UN sources:

- No Cold war - the reality of an ever-threatening nuclear war is no longer part of the daily discourse. Millions that lived behind the Iron Curtain are comparatively free. Unlike those of us of a certain generation, our children do not worry about nuclear missiles pointed at Wellington.
- The biggest food surpluses ever. A world where famine "*has diminished significantly and abruptly as compared to earlier eras*."[6]
- The UN's latest Report on Global Food Markets[7] discloses resilience in the agri-food sector, despite the challenges resulting from Covid – 19. "Climate change" is a non-problem. It is mentioned once on page 108 as a factor that the Philippines will build resilience to, rather than as a global problem.
- Amongst all the good news of surplus food, obesity, caused by an imbalance of energy digested and expended, is now the bigger issue, being linked to 4.7 million annual premature deaths.[8]
- "*The incidence of polio worldwide has been reduced by 99%, since 1988 from an estimated 350 000 cases then, to 6 reported cases in 2021*".[9] "*The world stands on the threshold of eradicating a human disease globally for only the second time in history, after smallpox in 1980*".[10]
- "*Between 2000 and 2020, the maternal mortality ratio (MMR, number of maternal deaths per 100 000 live births) dropped by about 34% worldwide*".[11] Childbirth survival is exponentially better for Mothers and children.
- "*Gender inequality is declining in virtually all major domains*".[12]
- "*The absolute number of war deaths has been declining since 1946. In some years in the early post-war era, around half a million people died through direct violence in wars. In recent years, the annual death toll tends to be less than 100,000*".[13]
- Mortality from extreme weather events has declined by more than 90% since 1920, despite a four-fold increase in population:
    - Deaths and death rates from droughts, which were responsible for approximately 60% of cumulative deaths due to extreme weather events from 1900-2010, are more than 99.9% lower than in the 1920s.
    - Deaths and death rates for floods, responsible for over 30% of cumulative extreme weather deaths, have declined by over 98% since the 1930s.

[6] See https://ourworldindata.org/famines.
[7] See https://www.fao.org/3/ca9509en/ca9509en.pdf.
[8] Source: https://ourworldindata.org/obesity.
[9] Source: https://unfoundation.org/blog/post/the-big-catch-up-the-race-to-get-childhood-vaccinations-back-on-track/.
[10] Source: the World Health Organisation https://www.who.int/news-room/fact-sheets/detail/poliomyelitis.
[11] Source: https://www.who.int/news-room/fact-sheets/detail/maternal-mortality.
[12] 14 Source: Dorius SF, Firebaugh G. Trends in Global Gender Inequality (Forthcoming, Social Forces). Soc Forces. 2010 Jul 1;88(5):1941-1968. doi 10.1353/sof.2010.0040. PMID: 21643494; PMCID: PMC310754.
[13] Source: https://ourworldindata.org/war-and-peace.

- Deaths and death rates for storms (i.e. hurricanes, cyclones, tornados, typhoons), responsible for around 7% of extreme weather deaths from 1900-2008, declined by more than 55% since the 1970s.
- To put the public health impact of extreme weather events into context, cumulatively they now contribute only 0.07% to global mortality.[14]



- Democracy has grown across the world over the past four decades.[15]

In every measurement of the human condition, our kids have it better. Their kids will too. The future is bright.

The nature of the climate adaptation problem New Zealand faces

An inquiry term of reference (2)(a) requires the consideration of the nature of the climate adaptation problem New Zealand faces.

This is a great place to start – the observational record in New Zealand, which is pretty good with some data sets going back well over 100 years.

[14] Source: Deschenes and Moretti "EXTREME WEATHER EVENTS, MORTALITY, AND MIGRATION "The Review of Economics and Statistics Vol. 91, No. 4 (November 2009), pp. 659-681 (23 pages) Published By: The MIT Press.
[15] Source: https://www.pewresearch.org/short-reads/2019/05/14/more-than-half-of-countries-are-democratic/ft_19-05-02_democracyupdate_map/.

Pilsi was concerned to see that paragraph 1 of the Executive Summary for the Expert Working Group on Managed Retreat [16] states:

> "Climate change presents a significant – and unprecedented – challenge for Aotearoa New Zealand. Rising temperatures are causing sea levels to rise and increasing the incidence and severity of extreme weather events, such as flooding, landslips and wildfire. These changes pose threats to the safety and well-being of communities around the country, as well as to infrastructure and sites of cultural significance. Aotearoa New Zealand must begin adapting to these risks."

This opening statement is simply incorrect. As set out below not much is changing in the climate and similarly most climate indicators in New Zealand show very little changes. Some, such as a reduction in frost days, are beneficial.

The Stats NZ Data

- Stats NZ makes climate indicator observations available by webpage. Here's what they say:
    - The annual average of the daily maximum wind gust (windiness) likely or very likely decreased at 12 of 14 sites across New Zealand between 1980 and 2019 Extreme wind | Stats NZ.
    - Maximum rainfall in a single day decreased at 10 and increased at 12 sites with no change at the remaining 8 Extreme rainfall | Stats NZ.
    - Between 1997 and 2019 very high and extreme fire danger days likely or very likely increased at 12 and decreased at 8 of 28 sites across New Zealand, with no trend at 8. Wildfire risk | Stats NZ.
    - Warm days likely or very likely increased at 24 and frost days decreased at 18 of 30 sites across New Zealand between 1972 and 2019 Frost and warm days | Stats NZ.
- Victoria University's Professor Renwick, the head scientist with the Climate Change Commission, oversaw the input to the Intergovernmental Panel on Climate Change's ("IPCC") 5th Assessment Report (2014) ("AR5") of the New Zealand situation. Under his supervision, with former NIWA head, Dr David Wratt as Review Editor, the IPCC included this statement in the concluding paragraph to Chapter 14 of AR5:

    > "*It is very likely that temperatures will continue to rise over New Zealand. Precipitation is likely to increase in western regions in winter and spring, but the magnitude of change is likely to remain comparable to that of natural climate variability through the rest of the century. In summer and autumn, it is as likely as not that precipitation amounts will change*".[17]

This is not an optimistic take on climate, but what science actually says - that whilst the 'thermal' response will continue i.e. "*that temperatures will continue to rise*", the 'dynamic' response will not be measurably different to normal weather.

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[16] Expert Working Group on Managed Retreat. 2023. Report of the Expert Working Group on Managed Retreat: A Proposed System for Te Hekenga Rauora/Planned Relocation. Wellington: Expert Working Group on Managed Retreat.
[17] AR5, chapter 14, page 1275.

But note there is no prospect of a 'runaway hothouse.' Scientists dismissed this possibility as long ago as 1971[18] due to the logarithmically diminishing ability of carbon dioxide to warm. This means that for every doubling of carbon dioxide, we get half the warming.

Professor Renwick's statement was reinforced by a peer reviewed paper, with Professor Renwick as a co-author in 2020, where it was concluded that the "large natural multi-decadal variability" "likely dominates any responses associated with anthropogenic warming."[19]

This conclusion is evident in Professor Renwick's publication for the NZ Royal Society reporting that "*flood statistics do not show an increase in floods through time so far, across New Zealand as a whole, but that increased flood losses are due to increased development in flood prone areas."*[20]

Regarding sea-level rise, the most recent up to date scientific study on sea level rise in New Zealand (Denys et al 2020[21]) shows a somewhat pedestrian trend of rising seas at around 2.00 mm/year which is influenced heavily by oceanic effects, such as the Pacific Inter-Decadal Oscillation as well as atmospheric conditions, such as the ENSO.

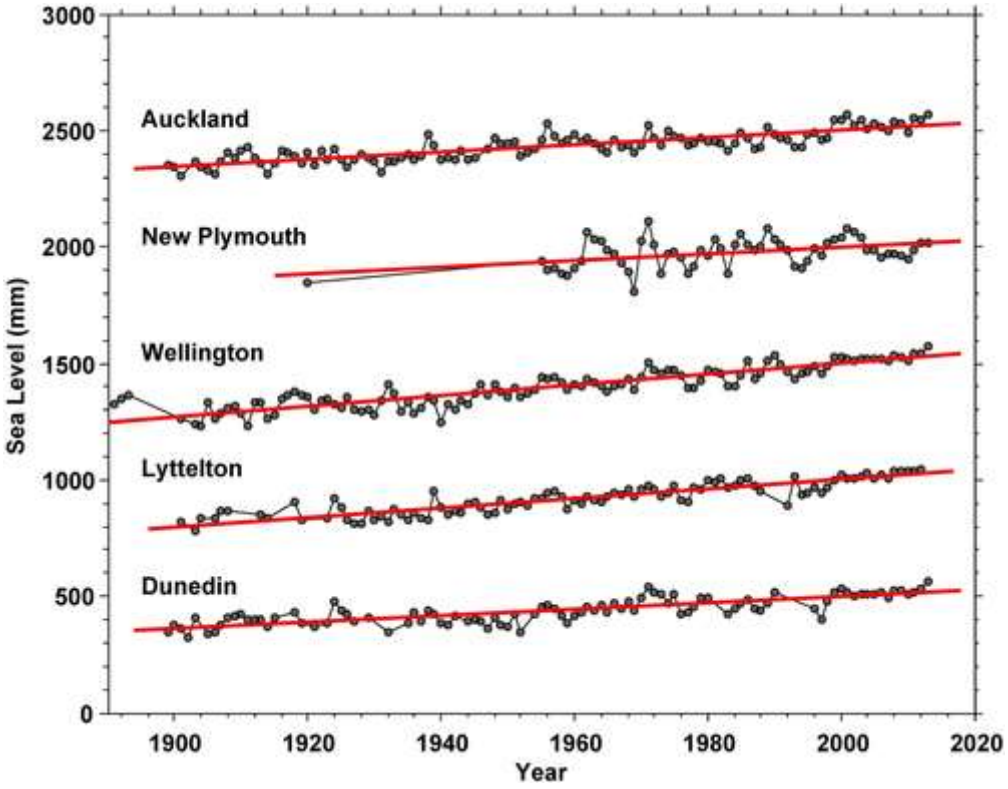

Figure 1: From Denys et al 2020

Of more relevance is the impact of earthquakes – the Kaikoura earthquake raised the coastal land by over 2 metres on the Kaikoura coast and affected the Wellington area with an overall

[18] 27 Rasool SI, Schneider SH. Atmospheric carbon dioxide and aerosols: effects of large increases on global climate. Science. 1971;173(3992):138-141. doi:10.1126/science.173.3992.138.
[19] See Brown et al 2020 "South Pacific Convergence Zone dynamics, variability and impacts in a changing climate" August 2020, Nature Reviews Earth & Environment DOI: 10.1038/s43017-020-0078-2
[20] Climate change implications for New Zealand | 2016. The Royal Society of New Zealand, April 2016. Citing Smart G.M. & McKerchar A.I. (2010). More flood disasters in New Zealand. Journal of Hydrology (NZ) 49(2): 69–78.
[21] Denys et al (2020) "*Sea Level Rise in New Zealand: The Effect of Vertical Land Motion on Century-Long Tide Gauge Records in a Tectonically Active Region.*"

uplift of 40 mm. As can be seen, sea level measured by the Wellington Harbour Tide gauge remains below the pre-Kaikoura earthquake peak in 2016.

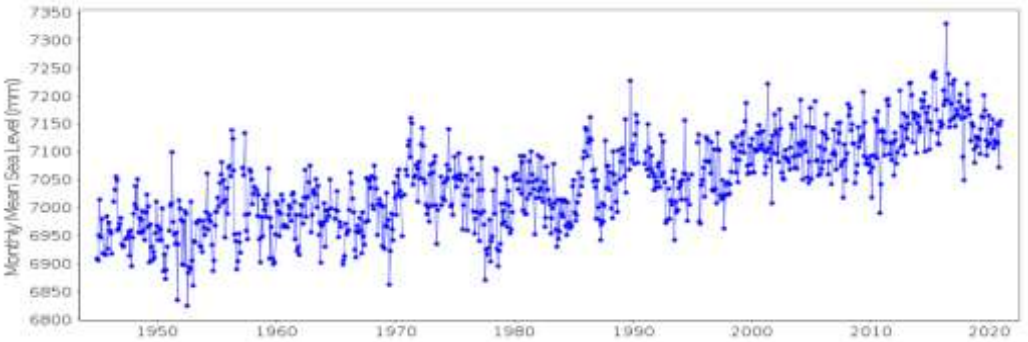

Figure 2: Relative Sea Level measured by the Queen's Wharf tidal gauge with current (May 2022) level extended back in time. *Source: PMSL web data* - 221_high.png (900×360) (psmsl.org)

Global Indicators

IPCC AR6 is much more measured about observed climate change than the popular narrative. Below is a breakdown of what it says about climate extremes:

- The IPCC, as do pretty much all credible climate scientists, acknowledges there has been an increase in global average temperatures since the 19th century: "*Warming of mean annual temperatures has already emerged in all land regions, as obtained from past observation*s.

- But here are some direct quotes from AR6 Working Group 1's Chapter 12, page 1852, related to other specific phenomena:

    - There is *low confidence* in the emergence of heavy precipitation and pluvial and river flood frequency in observations, despite trends that have been found in a few regions;
    - There is *low confidence* in the emergence of drought frequency in observations, for any type of drought, in all regions;
    - Observed mean surface wind speed trends are present in many areas, but the emergence of these trends from the interannual natural variability and their attribution to human-induced climate change remains of *low confidence* due to various factors such as changes in the type and exposure of recording instruments, and their relation to climate change is not established. The same limitation also holds for wind extremes (severe storms, tropical cyclones, sand and dust storms).

- The Summary for Policy Makers[22] says: "*There is low confidence in long-term (multi-decadal to centennial) trends in the frequency of all-category tropical cyclones… data limitations inhibit clear detection of past trends on the global scale*".

Later they address changes to heavy precipitation in New Zealand saying there is *low confidence* due to a lack of agreement on the evidence of trends. They go on to note: "*In New Zealand between 1960 and 2019 in both summer and winter, rainfall increased in some*

[22] SPM (A.3.4). https://report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf. The final text of the SPM is drafted and agreed by politicians and bureaucrats – whilst scientists are involved the text can be amplified beyond the original text provided by the scientists.

stations in the South Island and decreased at many stations in the North Island, however most station trends are not statistically significant".[23]

The IPCC AR6 helpfully tabulated the various climate indicators and identified which ones have altered and by how much. The white squares are where there is low confidence in any change – this represents most of the table:

Table 12.12 | Emergence of CIDs in different time periods, as assessed in this section. The colour corresponds to the confidence of the region with the highest confidence: white cells indicate where evidence is lacking or the signal is not present, leading to overall *low confidence* of an emerging signal.

Climatic Impact-driver Type	Climatic Impact-driver Category	Already Emerged in Historical Period	Emerging by 2050 at Least for RCP8.5/SSP5-8.5	Emerging Between 2050 and 2100 for at Least RC8.5/SSP5-8.5
Heat and Cold	Mean air temperature	1		
	Extreme heat	2	3	
	Cold spell	4	5	
	Frost			
Wet and Dry	Mean precipitation		6 / 7	
	River flood			
	Heavy precipitation and pluvial flood			8
	Landslide			
	Aridity			
	Hydrological drought			
	Agricultural and ecological drought			
	Fire weather			
Wind	Mean wind speed			
	Severe wind storm			
	Tropical cyclone			
	Sand and dust storm			
Snow and Ice	Snow, glacier and ice sheet		9	10
	Permafrost			
	Lake, river and sea ice	11		
	Heavy snowfall and ice storm			
	Hail			
	Snow avalanche			
Coastal	Relative sea level		12	
	Coastal flood			
	Coastal erosion			
Open Ocean	Mean ocean temperature			
	Marine heatwave			
	Ocean acidity			
	Ocean salinity	13		
	Dissolved oxygen	14		
Other	Air pollution weather			
	Atmospheric CO_2 at surface			
	Radiation at surface			

1. *High confidence* except over a few regions (CNA and NWS) where there is *low agreement* across observation datasets.
2. *High confidence* in tropical regions where observations allow trend estimation and in most regions in the mid-latitudes, *medium confidence* elsewhere.
3. *High confidence* in all land regions.
4. Emergence in Australia, Africa and most of Northern South America where observations allow trend estimation.
5. Emergence in other regions.
6. Increase in most northern mid-latitudes, Siberia, Arctic regions by mid-century, others later in the century.
7. Decrease in the Mediterranean area, Southern Africa, South-west Australia.
8. Northern Europe, Northern Asia and East Asia under RCP8.5 and not in low-end scenarios.
9. Europe, Eastern and Western North America (snow).
10. Arctic (snow).
11. Arctic sea ice only.
12. Everywhere except WAN under RCP8.5.
13. With varying area fraction depending on basin.
14. Pacific and Southern oceans then many other regions by 2050.

High confidence of decrease | Medium confidence of decrease | Low confidence in direction of change | Medium confidence of increase | High confidence of increase

[23] AR6 wg 1, Atlas 6.2, page 1987 https://report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf.

Source: IPCC AR6 WG1 Chapter 12 Table 12.12

What is apparent is that the climate indicators that have changed refer to those affected by the 'thermal' response. This is the well-known and understood effect of adding greenhouse gases to the atmosphere which induces a warming trend. With the earth's average surface temperature being 15°C and estimated to be -18°C without any greenhouse gases, the estimated ~1°C increase above pre-industrial temperatures represents a 1/33rd increase in the greenhouse effect – less cold spells; warmer atmosphere; more CO2 at the surface. It is unclear how this change could significantly alter major climate patterns that are dependent on the diurnal and seasonal variation in solar intensity, the Earth's angular momentum, latitude and, especially for New Zealand, any atmospheric or oceanic changes that tend to dominate over the anthropogenic warming signal.

The IPCC has concluded that a signal of climate change has *not yet emerged* beyond natural variability for the following phenomena:

- River floods
- Heavy precipitation and pluvial floods
- Landslides
- Drought (all types)
- Severe wind storms
- Tropical cyclones
- Sand and dust storms
- Heavy snowfall and ice storms
- Hail
- Snow avalanche
- Coastal flooding
- Marine heat waves

It is entirely reasonable for the New Zealand Government to continue to prepare for the emergence of these climate change indicators but there does not appear to be an immediate need to adapt to them.

In reality, the emergence of a climate change signal is not expected by 2100 even under the extreme (and implausible – see below) RCP8.5 scenario for any of these phenomena, except heavy precipitation and pluvial floods and that with only medium confidence. The RCP8.5 pathway is regarded as extreme and implausible, meaning that there would even less confidence in emergence under a more plausible upper bound, like RCP3.4, as suggested by climate expert, Professor Roger Pielke jr.[24]

Cyclone Gabrielle

[24] Pielke Jr et al 2022 Environ. Res. Lett. 17 024027 have identified the RCP3.4 or SSP2-3.4 as median plausible emissions scenarios.

For those who think Cyclone Gabrielle signals the emergence of climate change then it is worthwhile recalling what NIWA said in the October prior to its landing in its annual forecast for the 2022/23 tropical cyclone season.

Their Southwest Pacific Tropical Cyclone Outlook[25] is a collaboration with the MetService. It was issued in the prior October predicting that 6 to 10 named cyclones could occur. The report described an expected "near normal" season based on the average since 1969. In line with the IPCC conclusions, they saw no evidence of a changing climate that would put the expected weather outside what has been 'normal' since 1969.

Professor Renwick[26] said, it "may be a sign of things to come" but for now tropical cyclone Gabrielle is a nasty "weather" that unluckily landed near a major urban centre. But it is an event that is consistent with predictions, not "climate change".

Nevertheless, NIWA cautioned that New Zealand should remain "vigilant" due to the possibility of at least one ex- tropical cyclone passing within 550 km of the country. NIWA were right – both Hale and Gabrielle came close to New Zealand.

Curiously, some scientists changed their view *after* Gabrielle hit, stating that climate change affected the amount of rain that fell (although could not accurately say by how much).[27] However, many of the automated weather stations lost power during the cyclone and only six stations recorded observations of rainfall during the cyclone. Of the six stations that were active during the cyclone, the earliest records begin in 1990, 2 years after Cyclone Bola, meaning comparisons to the most recent significant weather event in the area cannot be made.[28]

Building resilient weather stations would be a good first step in any adaptation plan.

We would expect more rain and associated damage in the Hawke's Bay and Gisborne areas from Gabrielle, as opposed to Bola, due to the relative proximity of Gabrielle's storm track to both areas. Despite it being the most costly, tropical cyclone season, 2022-23 was a 'below average' cyclone season.[29] In fact most of the tropical cyclone seasons recorded over the last 10 years have been below average in terms of storms achieving tropical cyclone status with the record high being in 1997-98.[30]

What is clear from the below storm tracks is that the effect a tropical cyclone has is not dependent on greenhouse gases but how close it comes to a major urban area, such as Napier/Hastings – a seemingly random walk dictates how strong the impacts are felt.

[25] https://niwa.co.nz/climate/southwest-pacific-tropical-cyclone-outlook/southwest-pacific-tropical-cyclone-outlook-october-2022.
[26] Professor James Renwick "Sunday" 19 February 2023.
[27] This might be contrasted with a NIWA scientists after the event claim https://www.rnz.co.nz/news/national/485990/niwa-scientist-in-no-doubt-climate-change-behind-cyclone-gabrielle-s-intensity.
[28] Source: https://www.carbonbrief.org/heavy-rainfall-from-new-zealands-cyclone-gabrielle-more-common-on-warmer-planet/.
[29] Sourced: https://en.wikipedia.org/wiki/2022%E2%80%9323_South_Pacific_cyclone_season
[30] Source::BOM's Seasonal Outlooks for Tropical Cyclones available at https://en.wikipedia.org/wiki/2023%E2%80%9324_South_Pacific_cyclone_season

Storm tracks for Tropical Cyclone Bola (left) and Gabrielle (source: Wikipedia)

Adaptation planning needs to focus strongly on predicting when a storm track will pass close to New Zealand's coast and warnings from Niwa should be taken seriously.

Sea level inundation will not occur because of the ~2 mm/yr rise in sea level. Sea level rises and subsides with the tide by metres each day. Sometimes the planets align, literally, to enhance the standard gravitational tug and produce a King tide. These above-normal tides can trigger high tide flooding, disrupting coastal communities. This flooding is exacerbated if high tides coincide with low pressure systems that release pressure on the sea surface and allow it to rise tens of centimetres for a short period.[31] This is known as the inverted barometer effect. When wind set up, which is where wind blows the sea towards the coast causing it to pile up, is added then the sea level rise is significantly greater than the 2 mm/yr increase we sea annually.

We can plan for King tides – we know when the Moon will be full. These days should be embedded on the calendar of every coastal homeowner. We should then develop a sound system to rapidly warn communities of an inverted barometer effect and wind set up should they develop.

Coastal dwellers should know what the result in their community is should such events coincide, with or without, a King tide.

Global warming in New Zealand

New Zealand has been in the vanguard of global warming for decades. Most people don't realise that much of the Southern Hemisphere warmed rapidly from the 1930s onwards, whilst the Northern Hemisphere cooled after world war II through to the mid-1970s. In one decade, Scott Base warmed by over 5°C. New Zealand's own Jim Salinger published his observations in the prestigious *Nature* journal back in 1975.

> "New Zealand was cooling in the period 1880--1900, and had its coldest period during 1900-1935 when the Northern Hemisphere was experiencing some of the warmest years on record. Conversely, in the past three decades the New Zealand area has warmed up while northern continents have been cooling rapidly. The five year running means of Scott Base, Antarctica, show a rise from -21°C in 1960 to -15.9°C in 1969 (ref. 5). Of eight main Australian urban centres examined from statistical publications for individual Australian states, seven show at least a 0.5°C rise since 1945. Orcadas Island at latitude 60 ° 45'S near South America, similarly has warmed' by 0.5°C since 1940. So

[31] See https://www.linz.govt.nz/guidance/marine-information/tides/meteorological-effects-tides

it seems that the warming in the New Zealand region is common to a wider range in the Southern Hemisphere."[32]

And yet, weather patterns, to the extent they were affected, did not cause widespread disruption or concern. In fact, the 1950s and 1960s have been described as "The golden years" being especially buoyant for farmers.[33]

It is furthermore important to note that the majority of the global average rise in temperature is occurring in the Arctic, at night and with shorter winters. The Antarctic surface temperature shows no trends. Global averages are useful but they sometimes mask what is actually happening at a regional level where weather patterns emerge, operate and impact people.

Climate risk and response information-sharing

Term of reference (2)(d) requires the inquiry to consider the identification of the climate risk and response information-sharing

With climate being the average of weather across a minimum of 30 years, a simple method to predict what's coming is to extrapolate out trends that are emerging over the last 30 – 50 years as a reasonable steer towards what is likely to arise in the next 10 or more years.

We can do this with the Wellington Harbour Tide Gauge (figure 3 below) where we can extrapolate forward from 2005 to 2030 based on the prior trends:

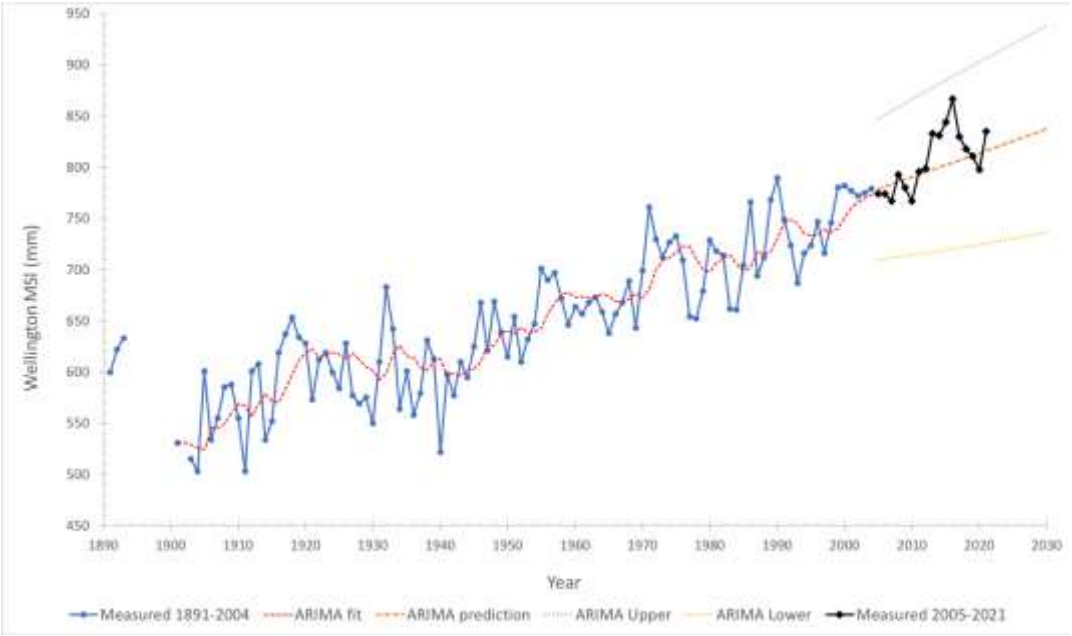

Figure 3 – Annual mean relative sea level at Wellington from 1891 to 2021 using data from Bell & Hannah (2012) updated with data from the Permanent Service for Mean Sea Level (PSMSL) and LINZ tide gauge site WLGT sensors 40 & 41. An ARIMA model was fitted using R functions *auto.arima* and *forecast* provided by the package *forecast*. The upper and lower bounds for the forecast correspond to 95% confidence limits.

Were we to take the Wellington region rain gauges, we would find no trend in rainfall changes. Niwa report "there are no obvious consistent temporal trends within or between the sites."[34]

[32] Salinger and Gunn, Nature Vol. 256 July 31 1975.
[33] Source: https://teara.govt.nz/en/farming-in-the-economy/page-7
[34] NIWA CLIENT REPORT No: 2020089AK "Historic climate extremes analysis for the Wellington Region" December 2020.

The approach of using the past as a guide to the future, for the identification of likely effects of future climate change, is different to that advocated for by the Ministry for the Environment ("MfE").

The MfE advocates for the use of high-end models that the IPCC modelling community now categorise as part the 'The Emissions World Avoided.'

This submission proposes that the Government (including MfE) use the SSP4-6.0 model that is consistent with current trajectories.

However, RCP 8.5/SSP5-8.5 has been embedded into the National Climate Change Assessment (NCCA) and it needs to be pulled out for the following reasons.

1. The NCCA is meant to inform the development of the National Adaptation Plan (Ministry for the Environment. 2022.Aotearoa New Zealand's first national adaptation plan. Wellington. Ministry for the Environment. ("NAP") for use by Councils.

   The embrace of RCP8.5 / SSP5-8.5 was premature and its ongoing presence is unfortunate. Section 5ZQ(3)(f) of the Climate Change Response Act 2002 requires the Minister to take into account the "current effects and likely future effects of climate change." (emphasis added).

   But the IPCC Working Group 1 in its Sixth Assessment Report ("AR6") stated in respect to high emission scenarios:

   a. *"… However, the likelihood of high emission scenarios such as ... SSP5-8.5 is considered low in light of recent developments in the energy sector …"* [IPCC AR6 WG1 Section 1.6.1.4]

   b. *"The high-end scenarios RCP8.5 or SSP5-8.5 have recently been argued to be implausible to unfold (e.g., Hausfather and Peters, 2020; see Chapter 3 of the AR6 WGIII).* [IPCC AR6 WG1 Section 4.2.2]

2. The Hausfather and Peters (2020) paper, cited by the IPCC, is entitled: "Emissions – the 'business as usual' story is misleading". Its sub-heading says, conclusively:

   > "**Stop using the worst-case scenario for climate warming as the most likely outcome — more-realistic baselines make for better policy**." (emphasis added)

   I set out some extracts that are relevant to the statutory test:

   a. "RCP8.5 was intended to explore an unlikely high-risk future. But it has been widely used by some experts, policymakers and the media as something else entirely: as a likely 'business as usual' outcome."

   b. "Happily — and that's a word we climatologists rarely get to use — the world imagined in RCP8.5 is one that, in our view, becomes increasingly implausible with every passing year."

c. “Emission pathways to get to RCP8.5 generally require an unprecedented fivefold increase in coal use by the end of the century, an amount larger than some estimates of recoverable coal reserves. It is thought that global coal use peaked in 2013, and although increases are still possible, many energy forecasts expect it to flatline over the next few decades. Furthermore, the falling cost of clean energy sources is a trend that is unlikely to reverse, even in the absence of new climate policies.”

d. “we suggest that climate-impact studies using models developed for AR6 should include scenarios that reflect more-plausible outcomes, such as SSP2-4.5, SSP4-6.0 and SSP3-7.0 (see ’Possible futures’). When RCP8.5 or its successor SSP5-8.5 are deployed, they should be clearly labelled as unlikely worst cases rather than as business as usual.”

e. They include the below diagram with references showing how the high end scenarios are now deemed “highly unlikely’ and “unlikely.” An unlikely scenario will fail the statutory test here in New Zealand.

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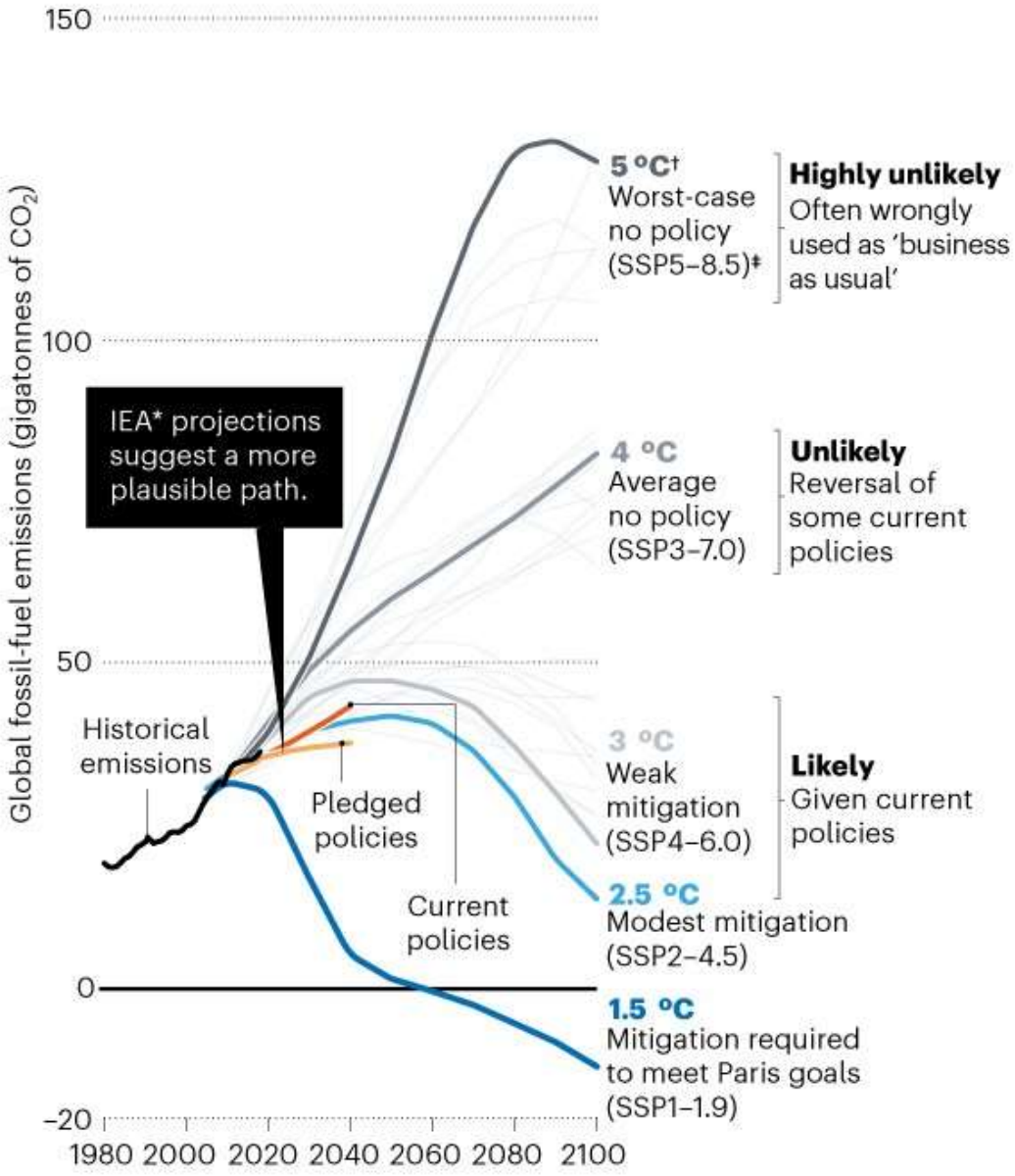
POSSIBLE FUTURES

The Intergovernmental Panel on Climate Change (IPCC) uses scenarios called pathways to explore possible changes in future energy use, greenhouse-gas emissions and temperature. These depend on which policies are enacted, where and when. In the upcoming IPCC Sixth Assessment Report, the new pathways (SSPs) must not be misused as previous pathways (RCPs) were. Business-as-usual emissions are unlikely to result in the worst-case scenario. More-plausible trajectories make better baselines for the huge policy push needed to keep global temperature rise below 1.5 °C.



*The International Energy Agency (IEA) maps out different energy-policy and investment choices. Estimated emissions are shown for its Current Policies Scenario and for its Stated Policies Scenario (includes countries' current policy pledges and targets). To be comparable with scenarios for the Shared Socioeconomic Pathways (SSPs), IEA scenarios were modified to include constant non-fossil-fuel emissions from industry in 2018.
†Approximate global mean temperature rise by 2100 relative to pre-industrial levels.
‡SSP5–8.5 replaces Representative Concentration Pathway (RCP) 8.5.

Sources: Historical data: Global Carbon Budget (2019); SSP data: ref. 19/J. Rogelj *et al. Nature Clim. Change 8*, 325–332 (2018)/SSP Database (v2); IEA data: Ref. 7

3. Hausfather and Peters are not alone in declaring RCP8.5/SSP5-8.5 'implausible.' Others come to similar conclusions:
    a. Pielke and Ritchie (2021),

    "The original basis for the scenarios supporting RCP8.5 are extreme: they project a future that is characterized by high population, little technological advancement, extremely high carbon dioxide emissions and apocalyptic levels of climate change."

    "The influence of this implausible scenario on public and policy discussion of climate change is pervasive and consequential."

    b. Burgess et al (2021)

    "Our analysis supports the conclusions drawn by previous studies (Hausfather and Peters 2020, Pielke and Ritchie 2020) that high-emission AR5 (RCP8.5) and high-emission AR6 (i.e. SSP3-7.0 and SSP5-8.5) baselines should not be utilized as reference scenarios in climate research."

    c. Huard et al (2022): "the high-emission scenario SSP5-8.5 becomes unlikely as we reach the second half of the century.

4. IPCC Professor Dave Frame, at Canterbury University, was reported by Newsroom saying in regard to Auckland planning decisions based on RCP 8.5:

    "If they build in a safety margin that's actually contingent on a scenario that nobody really believes, then it's bad policy practice. **And I also think it opens the door to legal challenge**." (emphasis added).

5. Meinshausen et al 2023, - resulted from the IPCC Expert Workshop held in Bangkok, April 2023. The paper involves 41 co-authors from the IPCC climate modelling community and addresses the next generation of framing pathways for use in IPCC AR7.

    The coauthors similarly ruled out the plausibility of the high-end scenarios. Their Table 1 (below) shows that the high-end scenarios (red circle) are now consigned to "The Emissions World Avoided" with the more likely scenarios based on current trends circled green.

    The authors state that the higher end warming pathway category could be mistaken as a 'business as-usual' scenario and they consider it would be beneficial to separate high forcing pathways for scientific purposes, from the more policy-oriented framing pathway categories.

Table 1 - Overview of suggested pathway categories to inform the design of specific representative emission pathways for Earth system model runs. Categories of emission pathways identified in the IPCC AR6 WGIII (compare Table SPM.1) and selected WGI core SSP-RCP scenarios are provided for comparison. For each category, we provide an indicative 'priority' suggestion, recognizing that there are limited resources to run a large set of scenarios across all ESMs.

Category to be represented	Key characteristics of the representative pathway	Advantages	Potential drawbacks	Closest category (and selected pathways) in IPCC AR6[a]
High emissions: "TEWA" - The emission world avoided	• High end emissions • Departing from historical emissions in the past, i.e., 2015. • Three main options are SSP5-8.5, SSP3-7.0 or a new pathway that retrospectively reflects 'no-further climate action' (NFA) starting in, e.g., 1992, 2010 or 2015, each with their respective advantages and challenges (aerosols, comparability to CMIP6 and possibly CMIP5, representativeness of previous reference scenarios, etc.) • Lower priority	• Allows depiction of the world that could have unfolded without climate policies. • Allows to learn about high tail warming possibilities of lower scenarios. • Allows direct comparison of new generation of ESMs with previous ones, if a CMIP6 high end pathway is repeated (SSP5-8.5 or SSP3-7.0). • High signal-to-noise for projected changes in climate	• Could be mistaken as a reference case pathway. • Could lead to the false impression that the difference with this avoided scenario is the exclusive result of successful climate policies, and therefore that we have already achieved the biggest part of the challenge and what is left requires a smaller effort in comparison.	AR6 WGIII category C7-C8 SSP3-7.0 or SSP5-8.5 or RCP8.5.
"Medium" or "No further action (NFA)"	• A medium-high category that approximately reflects the median of "current policies as of 2023" or "current trends" estimates. • Approximately flat global GHG emissions from 2025 towards the end of century. • Approximately resulting in a 2.5-3.0°C world by the end of the	• An approximate depiction of future emissions in the absence of further climate policy action and assuming continuation of "current trends" as of the early 2020s. • Reflective of 2°C crossing up to approximately 2.5-3°C warming by 2100.	• The longer-term evolution of emissions under current policies is highly uncertain. Together with the DASMT this category spans the range of future policy outcomes (as of 2023)	AR6 WGIII category C6 SSP2-4.5, RCP4.5.

6. Professor Roger Pielke Jr, an expert in this area, restated the Fuss et al 2014 diagram that appears as Figure 8 in MfE's "A guide to local climate change risk assessments" as below, to account for Table 1 above from Meinshausen.

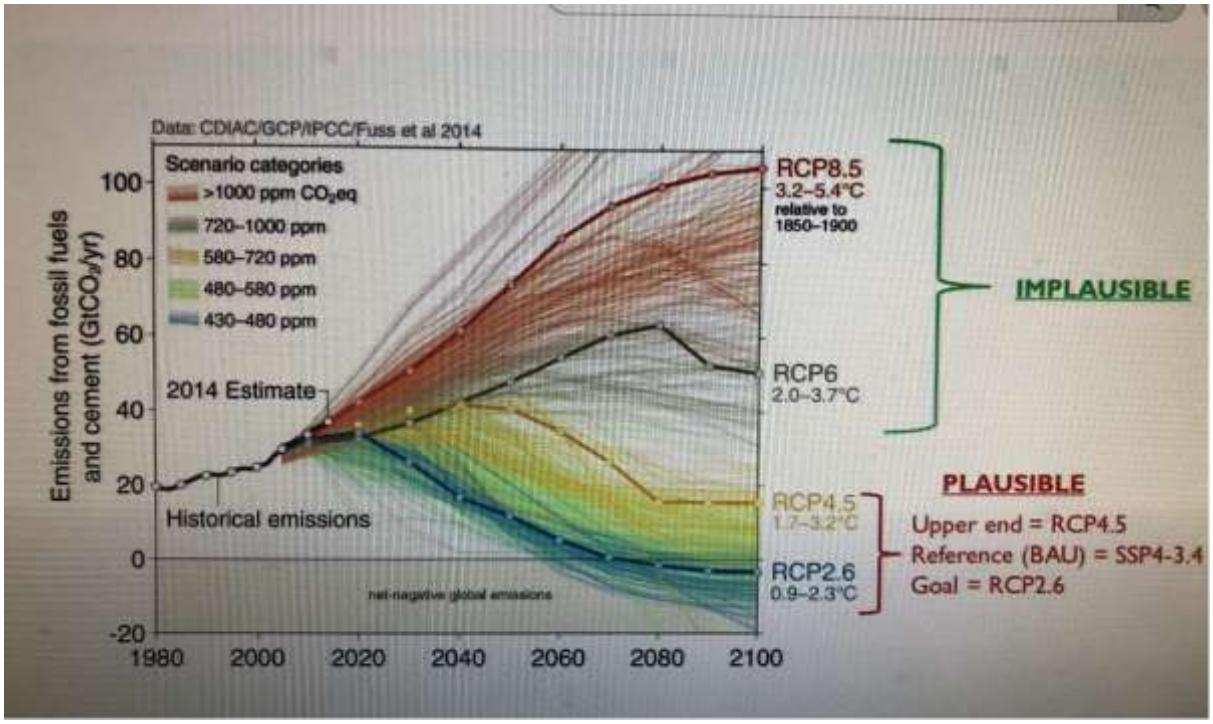


Figure 4 - Source: Roger Pielke Jr – used with permission

SeaRise

For coastal adaptation the MfE relies heavily on a sea level study from a group known as the "SeaRise Project."

The team used novel satellite technology over a short six to seven-year period that showed large areas of coastal New Zealand subject to subsidence. This, they said, exacerbated the sea level rising trend assessed by the IPCC – doubling it in some parts of New Zealand. The study has been criticised by numerous academics at Victoria, Canterbury and Waikato Universities as well as GNS and independent scientists.

The short-term data set used is inadequate to make long term projections of vertical land movement. This is well understood in the geoscience community and two papers have been published by the Geoscience Society of New Zealand on the subject: one by the author Is Wellington Sinking? and one by long-standing geoscientist, Bruce Hayward, Is Auckland Sinking? Both ask questions of the SeaRise analysis that have never been addressed.

The forward projections of relative sea level rise, starting in 2005, show an overestimate of sea level rise of some 550% when compared to the Wellington tide gauge. The study's output should never have been fast-tracked into policy for decision makers in MfE's Coastal hazards and climate change guidance nor should it have been referred to in the NAP for the same reasons.

It is not 'best available' science. The best measurements of sea level come from long term tide gauges. New Zealand has four that have been the cornerstone of coastal planning since at least the 1950s. A far better option to assess coastal sea level changes would be to installan array of tide gauges at multiple, strategic points around the coast. After a relatively short operiod e.g.

5-years, the measurements could be matched to the long term tide gauge records (and cGPS and paleo records) to extend the new tide gauge trends back in time. With the SeaRise project allocated $20 million of funding from MBIE's Endeavour fund, those funds could be better deployed in funding the array's installation.

Why use high end scenarios?

A famous IPCC scientist (Dr Stephen Schneider, author of *The Genesis Strategy* noted earlier), in justifying his alarmist pronouncements, said:

> "*On the one hand, as scientists we are ethically bound to the scientific method, in effect promising to tell the truth, the whole truth, and nothing but – which means that we must include all doubts, the caveats, the ifs, ands and buts. On the other hand, we are not just scientists but human beings as well. And like most people we'd like to see the world a better place, which in this context translates into our working to reduce the risk of potentially disastrous climate change. To do that we need to get some broad based support, to capture the public's imagination. That, of course, means getting loads of media coverage. So we have to offer up scary scenarios, make simplified, dramatic statements, and make little mention of any doubts we might have. This "double ethical bind" we frequently find ourselves in cannot be solved by any formula. Each of us has to decide what the right balance is between being effective and being honest. I hope that means being both.*

Scientists these days use RCP 8.5/SSP5-8.5 to deliver the scary stories. As shown above it is an implausible scenario and should only be for academic use, and not for policy making.

Response to specific questions

This section responds to the additional questions asked by the inquiry team

What would be a durable, affordable, and fair approach to adaptation for the existing built environment (i.e., where people live and work) in the future? How could that approach be phased in over time?

For one off unanticipated emergency events insurance should be available to homes and businesses. Pilsi sees no need for additional costs to be met by the taxpayer where a decision of a local authority determines that individuals are no longer 'safe' in their own homes. Individuals make all sorts of decisions each day about their own safety without the need for a local authority to help.

The idea that coordinated action, in advance, will somehow be cheaper needs to be thoroughly examined. We do not support forcing families to relocate. Individuals have their own priorities and solutions and a more efficient process will be to enable those on the ground at the time to take the best action they consider available to them.

We have read the 'working group's report on Managed Retreat and disagree with its opening premise that climate changes is increasing the incidence and severity of extreme weather events, such as flooding, landslips and wildfire – there is no evidence from the observational record held by Stats NZ for that comment.

In their 'Outcomes and principles' section, nowhere is it mentioned that private property rights should be respected and that individuals have the right to their own homes and to exercise that right even if it creates a safety issue that they are prepared to live with.

What outcomes should such an approach to adaptation lead to? What are the highest priorities to achieve?

There needs to be a problem to adapt to. As shown in this submission, storm events, sea level rise other climate events, are not getting worse or more frequent. For now the action is to be vigilant – to install that array of tide gauges; ensure weather stations are resilient.

In areas with an accretion trend, look for signs of that slowing or reversing before developing scary stories of relocating folks from the coast.

We also note the location of the sub-station in a flood plain in Taradale as a major factor in how Napier recovered when compared to Hastings that remained connected to the grid. Transpower knew the substation was vulnerable. The Government should draw up a list of its 100 - 200 most important pieces of infrastructure and test for resilience.

What do you think the costs will be? How should these various costs be distributed (eg amongst property owners, widely across New Zealanders, ratepayers, now and in future)? Should this distribution change over time?

Each home and business owner is primarily responsible for their own safety and risk mitigation. A government programme that interferes with that will likely result in maladaptation, where vulnerable communities know the government will step in and so do nothing to help themselves.

What do you think is the critical information that will inform people and help them understand future risks, costs, and impacts?
Better information on what they can do to help themselves – for example, unblocking drains outside the home had an extraordinary impact on how rainfall pooled and flooded in recent heavy rain events in Wellington. Warning systems like that developed between NIWA and South Coastal Wellington residents about heavy swells should be socialised nation-wide. Information about upstream river flooding should be online and resilient to bad weather (i.e. many people would have been saved in Eskdale had the various systems been working and online).

Non-online communications, a 'plan B', also needs to be considered.

What are the particular issues facing Māori, especially sites, assets, and land vulnerable to climate-driven natural hazards?
Māori land and taonga could be considered national taonga and therefore be considered a responsibility for the Crown to provide protection and support. Urupa in danger of inundation should be treated in a manner consistent with the wishes of the descendants.

What are the problems with New Zealand's approach to managing climate-related natural hazards? What are the underlying drivers of these problems?
New Zealand has a disparate approach to climate related emergencies. It appears inconsistent in approach and resources. There needs to be better coordination between regions.

What adaptation-related costs are you facing now? How are you planning on addressing these costs?

Th biggest anxiety is more with climate policy interfering with property rights. We know of insurance being refused due to a Council installed warning on a LIM report about a potential coastal inundation problem at a beach (Otaki) which has a known accretion trend (i.e. the sea shore is receding towards Australia, and has been doing so for 6,000 years).

Many properties on the Kapiti coast have had these warnings out on their LIM reports based on poor science and the implausible high emissions scenarios. There is concern that consents for renovations or new developments will be declined because of the output from an implausible climate model.

One property that was recently surveyed is 6 metres above sea level with the accretion trend now making the beach a further 150 metres further away. A second story is needed because the beach cannot actually be seen anymore due to the sand dunes being so high, but this is in jeopardy due to potential plan changes limiting redevelopment.

What adaptation related risks are you facing now and how are you planning to address these risks?
This submission is on behalf of a group although none of us consider we have any new adaptation problems to deal with. In fact we seem to have more issues with local authorities interfering with property rights, based on tenuous science, than with the climate doing so.

Conclusion

This submission concludes:

1. The world of the 21st century is flourishing. All human welfare indicators are improved. It is the best time to be alive.

2. The observational evidence for dramatic climate changes in New Zealand, that are above and beyond what we have previously experienced, is limited. This is consistent with IPCC analysis. Whilst this is expected to continue, vigilance is recommended.

3. Modern technological advancements should be employed to ensure early warning systems are robust to bad weather and effects on sea level, and their observations can be readily communicated to vulnerable communities.

4. Funding dedicated to the SeaRise project should be redirected to the installation of an array of tide gauges, deployed around the New Zealand coastline to give real time data on relative sea level changes.

5. It is clear the scientific community has now moved well away from the high-end scenarios, as signalled in AR6, and since then by the modelling community itself. The ongoing use of these scenarios for planning will add cost to developers and unnecessarily constrain private property rights. They do not provide policy relevant data.

   It shifts the balance between considerations of people and their property rights and the "likely effects of climate change" towards a conservative, environment protecting, regime described in the literature instead as "apocalyptic levels of climate change." This is inconsistent with the purpose of the Climate Change Response Act 2002 which states

(relevantly) to: “allow New Zealand to prepare for, and adapt to, the effects of climate change.”

As noted above, by adopting the high-end scenarios New Zealanders will be preparing for a dystopian future that will never happen. This will prove costly both financially and politically.

I would like to present my submission orally.

Kind Regards

Sean Rush
President
Public Interest Law and Science Initiative inc.