

Ministry for the Environment Zero Carbon Bill Discussion Document

Submission by Climate Justice Taranaki Inc., 18 July 2018

Introduction

1. Climate Justice Taranaki Inc. (CJT) is a community group dedicated to environmental sustainability and social justice. This includes issues of inter-generational equity, notably in relation to climate change, which will impact future generations' inalienable rights to safe water, food and shelter, crucial to sustaining livelihoods and quality of life. CJT became an incorporated society on 26 February 2015.

Key points of submission

2. CJT strongly support the immediate introduction of a Zero Carbon Act.
3. We call for net zero emissions by 2040, with a mid-term target for 2030 which reflects big cuts at the very start.
4. We need to include all greenhouse gases, both long-lived and short-lived, in our emission reduction and net zero targets.
5. Reductions should be solely of domestic emissions without relying on international carbon units or creative accounting.
6. Five-yearly emissions budgets need to be well designed, audited carefully and reported transparently.
7. The Zero Carbon Act would only be effective if it is well supported by concrete plans, actions and fiscal inputs, and other legislative and policy alignment.

Objectives

8. Page 20 of the discussion document lists three objectives:

Sustainable and productive economy

9. While we fully support the need to diversify the economy and limit greenhouse gas (GHG) emissions, we also need to acknowledge that the current global and national economies are not 'sustainable' or 'productive' economies. The growth-economy and our current monetary systems rely heavily on speculations, debts¹, extractions of finite resources (e.g. mining of fossil fuels) and overexploitation of renewable resources and the marginalised sections of the society.
10. A major reform of the monetary system, starting with a Bill which gives the Reserve Bank of New Zealand the exclusive right to issue all NZ money (cash and electronic) and stops all commercial banks from issuing any new money, would be the first step to shifting NZ's money supply "*from a largely privately-created money supply where most money is supplied as a profit-making debt for the benefit of commercial institutions, to a fully publicly-created money supply... free of any debt, in accordance with the needs of the country's economy as a whole,*" Draft Reserve Bank of New Zealand (Creation of Currency) Bill 2012².

Global and local leadership

11. While it is most admirable to aim to be "*leading at home and internationally*", it is equally important to provide an enabling and supportive environment for domestic (district and regional) and

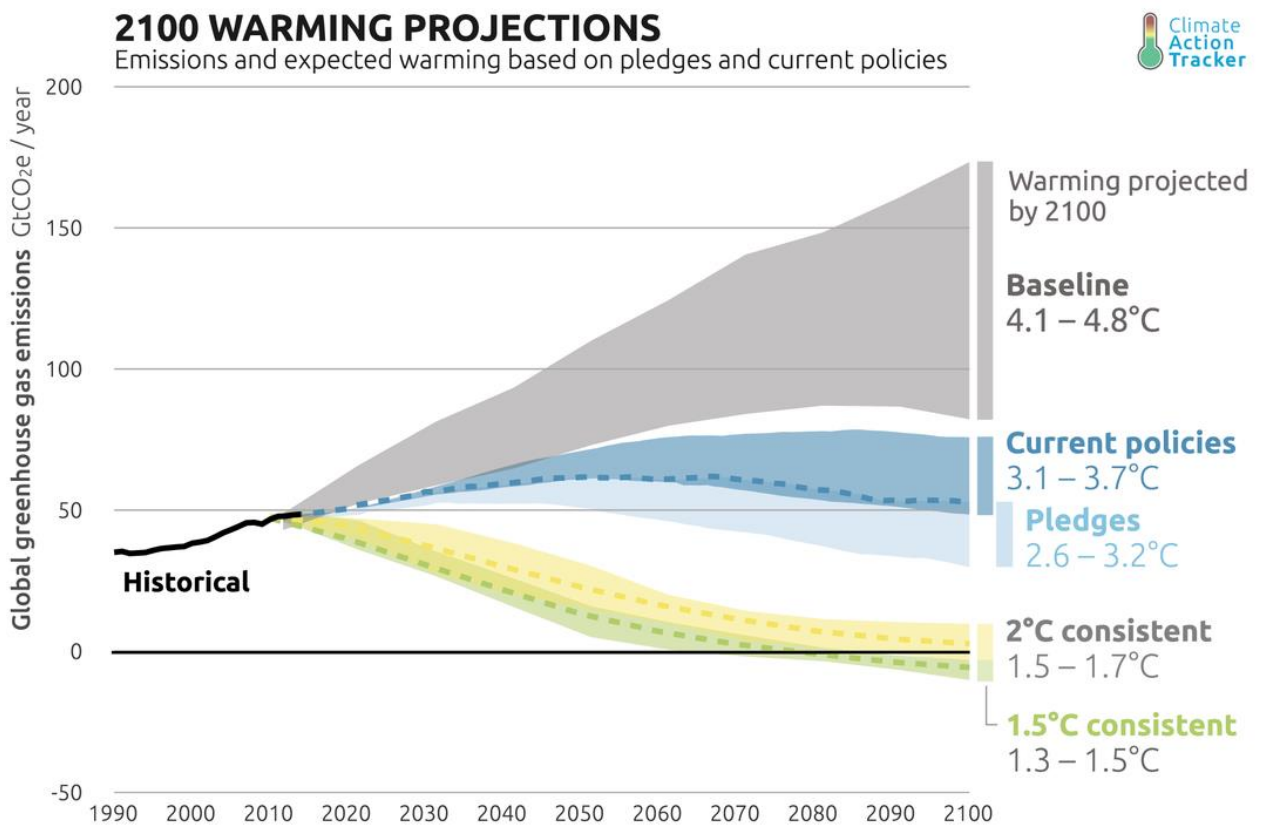
international (e.g. Pacific Island nations) governments, research institutions, businesses and civil societies so that they can implement the innovations sparked by New Zealand’s leadership.

Creating a just and inclusive society

- 12. This objective is very much dependent on the success or failure of a major monetary system reform into a positive money system that is stable, sustainable, productive and fair³. Of critical importance to the ‘just and inclusive society’ that we envisage is resilience – resilience to climate disruptions and the socio-economic turmoil that comes with them.

What target we should set?

- 13. A 2050 target is a long way away and does not reflect the need to act urgently. It does not take into account the fact that New Zealand’s National Determined Contribution (NDC) in the Paris climate agreement is insufficient⁴. It fails to acknowledge that current policies globally are nowhere close to the target of keeping temperature rise below 2°C, let alone 1.5°C. Even if all the pledges made in the Paris agreement are implemented, temperature rise is estimated at over 3°C by 2050 or 2.6-3.2°C by 2100 (See graph below from Carbon Action Tracker)⁵. This means that we need more ambitious and nearer targets to drive emissions reduction and transition to a zero-carbon economy.



- 14. The Westpac Climate Change Impact Report (2018)⁶ concluded that, “Taking earlier, planned action on climate change under the central scenario is modelled to save NZ\$30 billion in GDP growth by 2050 compared with the shock scenario... a key component of this being the phased introduction of agriculture into the NZ ETS from 2020 through 2030.”

Net zero emissions by 2040, with a mid-term target for 2030

15. We support the call for net zero emissions by 2040 by Forest and Bird and Taranaki Energy Watch, considering the urgency for action.
16. We need deep cuts in emissions at the very start i.e. from now.
17. We propose a mid-term target for 2030 which reflects substantial increase in commitment from our 'insufficient' National Determined Contribution of 30% reduction from 2005 levels by 2030.
18. The 2030 target will help guide us towards the net zero target by 2040. The exact numerical target will need to be science based and determined by the Climate Change Commission using local, national and global data.
19. As an example, in 2017, a team of scientists published an eye-opening paper in *Science* magazine, plotting a roadmap for rapid decarbonization (Rockstrom, et al, 2017)⁷. The roadmap includes clear, strong targets:
 - Global CO₂ emissions have to decline by half each decade from 2020...
 - Net emissions from land use (agriculture and deforestation) have to fall to zero by 2050...
 - Technologies to suck CO₂ out of the atmosphere have to start scaling up massively, until we're pulling 5 gigatons of CO₂ per year out of the atmosphere by 2050 – nearly double what all the world's trees and soils already do (Plumer, 2017)⁸.

Targets backed by concrete actions

20. The roadmap goes onto more specific targets and actions to be achieved either globally or by certain countries; e.g. By 2020, all countries would have laid down policy to cancel the \$500 billion per year of global fossil fuel subsidies; By 2030, coal power is phased out in rich countries which also no longer sell new combustion engine cars; By 2040, leading countries like Denmark and Sweden should have completely carbon-free grids and have electrified virtually all of their transport, heating and industry; By 2050, we'd need to be removing more than 5 gigatons of CO₂ per year from the atmosphere, etc. (Rockstrom, et al, 2017).
21. Such a roadmap, if adapted for NZ, could inform our own carbon budgets and more importantly, the concrete plans and actions that are needed to stay within budget and on target. We recommend starting with the following policy changes and concrete actions:
 - End all fossil fuel subsidies (between 2009 and 2016, the level of subsidies increased from \$40.5 million to \$87.7 million, a more than 100% increase)⁹
 - Stop issuing any new prospecting, exploratory and mining licenses for coal, oil and gas. Ban fracking because of the climatic, environmental and social harm.
 - Stop issuing new or extending expired consents for coal or gas-fired power stations¹⁰ and coal boilers (e.g. Fonterra's)¹¹.
 - Divert government research and development funding from petroleum¹² including methane hydrates¹³ to renewable energies, waste to energy, transport electrification¹⁴, sustainable agriculture and agro-forestry¹⁵ and other sustainable innovations. This should include fast-tracking development and processing of renewable energy generation proposals and projects.
 - Introduce a carbon tax on emissions and sources of emissions (e.g. petrochemical industries, products and derivatives), and subsidies for sustainable alternatives. This will aid the transition.

Other legislative and policy reform

22. The Crown Minerals Act, Resource Management Act and Exclusive Economic Zone and Continental Shelf Act will require critical amendments or reform to bring them in alignment with the Zero Carbon Act, so that they support rather than contradict or compromise each other.
23. There are significant risks from the Investor State Dispute Settlement and other clauses in so-called 'free trade agreements' (e.g. the Trans Pacific Partnerships), and these need to be considered in respect of the Zero Carbon Act and others.
24. Emissions from the military and their climate impacts have traditionally been ignored in all UN climate talks because of pressure from "*military generals and foreign policy hawks opposed to any potential restrictions on US military power... The military is not just a prolific user of oil, it is one of the central pillars of the global fossil-fuel economy*" (Buxton, 2015)¹⁶. We are strongly opposed to the new government's decision to purchase four Boeing Poseidon military aircrafts¹⁷. The \$2.3 billion earmarked for these 'submarine-killers' would be far better spent on transitioning NZ to a zero carbon, socially just society, and enabling us to reach out to Pacific Islands and other nations stricken by climate disruptions.

Options for a new climate change target for 2040 (not 2050)

25. We support net zero emissions of all gases (long and short-lived) by 2040, with ambitious mid-term reduction targets for short-lived gases (notably methane) by 2030.
26. The discussion document gives heavy emphasis on the relatively rapid degradation of methane but fails to acknowledge its very high global warming potential (GWP). Critically methane has a 20-year GWP of 84-87¹⁸; i.e. it absorbs far more energy (heat) than CO₂ over its lifetime. Although methane (CH₄) lasts about a decade in the atmosphere, it gradually breaks down, via several steps, into CO₂ and water vapor, both of which are GHG themselves. Water vapor is the most abundant GHG in the atmosphere involved in a feedback loop which is critically important although not well understood¹⁹. For as long as we allow methane emissions, even stabilised at a reduced level, there will be continuous climate impact from an especially potent GHG and the longterm effects from the CO₂ resulting from the breakdown of CH₄.
27. The document also fails to consider the various positive climate feedbacks associated with methane emission. For example, the more methane there is in the atmosphere, the more hydroxyl (OH) radical is used up and the longer the methane lasts²⁰. Another positive feedback relates to the dissociation of gas hydrates²¹ as the climate warms, releasing yet more climate-warming methane. Furthermore, the melting of the permafrost has been shown to release more methane than previously thought and drive another feedback loop not taken into account by most climate models^{22, 23, 24}.

Cut short-lived gases fast now and aim for net zero emissions of all gases

28. It is therefore of critical importance that we substantially reduce short-lived gases, especially methane, to a minimum as soon as possible, with a goal of net zero emission. This is what we must do, if we truly want New Zealand to be a leader, stimulate innovation and influence global climate actions.
29. Methane emissions from the fossil fuel industry must be properly monitored and cut to zero (see points 21, 33 and 34)^{25, 26}.
30. In terms of long-lived gases, nitrous oxide N₂O stays in the atmosphere for an average of 114 years and has a GWP of 300. It must be included as a key target for emission reduction which is achievable

through using less urea and improving soil and livestock management, as well as cutting stock numbers.

31. Since both methane and nitrous oxide emissions in NZ are largely coming from unsustainable, industrial agriculture under poor management, strong reductions of these gases would have far-reaching co-benefits in terms of improving water quality, protecting soil integrity, fostering animal welfare and supporting farmers in low-input yet profitable and sustainable livelihoods.
32. There are significant environmental, social and economic opportunities for NZ to expand and diversify our organic and biological farming practices, with health benefits to people nationally and internationally. This should be incentivised, in association with the Billion Trees program which requires careful planning and implementation to avoid the spread of weed species²⁷, take into account climate vulnerability²⁸ and promote ecological benefits.

What does 'net' mean?

33. In the description of 'gross emissions' (p.23 of document), it is important to acknowledge all major emitters of GHG, including burning of fossil fuels for air, land and maritime transport, animal agriculture, industrial heat production from burning of coal, and the oil and gas and petrochemical industries, etc. A reference to the annual Energy in New Zealand report (MBIE, 2017)²⁹ would be useful.
34. In regards to the oil and gas industry, the amounts of intentional and fugitive methane and other gases^{30, 31} emitted into the atmosphere from upstream to downstream processes, are largely unaccounted for and under-estimated³². This raises questioning³³ demonstrating that the argument that gas is a clean, bridge or transition fuel obsolete³⁴. In NZ's last three GHG inventory reports³⁵ for the UNFCCC, the Expert Review Team pointed out that there were transparency and confidentiality issues concerning reporting by the mineral, chemical (e.g. Methanex) and metal industries. There needs to be a critical review and improvements in the reporting and analysis of GHG emissions for any emissions budgets and targets to be meaningful.

Carbon offsets and creative accounting

35. The term 'net emissions', while widely used to take into account forms of landuse that sequester carbon and international carbon credits, is fraught with confusion and open to undesirable, 'creative accounting'.
36. The Parliamentary Commissioner for the Environment (2018)³⁶ recently warned that *"Relying heavily on forest sequestration is risky... New Zealand has a long tradition of using substantial volumes of international credits and forestry offsets to meet its emission reduction targets. While this has helped to minimise the short-run cost of climate action, it has also masked an increase in gross emissions – which in 2016 were almost 20% above 1990 levels.³⁷... there has been international scepticism about relying heavily on carbon offsets from afforestation. The European Union... excluded such offsets in the EU ETS, and cited New Zealand's use of forestry offsets as a reason why they would not consider linking with our own ETS."*
37. The Commissioner pointed out two key risks in relying too heavily on forest sinks:
 - The carbon stored in the forests can be released back into the atmosphere, either through intentional clearing without replanting, or through fire, pests, disease and storms, some of which will be aggravated by climate change itself.
 - Each tonne of emissions offset by forestry is a tonne not reduced at source.

Serious efforts in reducing gross emissions

38. We therefore advocate putting serious efforts on actually reducing gross emissions, guided by gross emissions targets and budgets, and substantially increasing carbon sequestration, rather than focussing on net emissions.

Beware of techno-fixes

39. While new technologies certainly have a role to play in reducing GHG emissions and mitigating climate change, techno-fix³⁸ must be treated with caution and as a last resort, because of the inherent risks, costs, the hidden agendas of some of those pushing for them and the lack of regulatory capacity.
40. For example, GNS has been researching the development of carbon capture and storage (CCS)³⁹: *"...retro-fitting capture of CO₂ is expensive and so far we have not tried to do this in New Zealand. If large new industrial sources are planned then it would be advisable to consider including carbon capture technology."* This technology is costly, uncertain and dangerous⁴⁰, with serious human health and safety risks to neighbours. NZ has abundant renewable energy sources and livestock is the major source of GHG. It does not make environmental, social or economic sense to invest in CCS, if we are truly committed to reducing emissions and building a zero carbon and sustainable economy.
41. We also have serious concerns over the New Energy Centre and Hydrogen projects in Taranaki that are being supported by the new government⁴¹. The Tapuae Roa Make Way for Taranaki Action Plan (April 2018)⁴² describes the so-called 'Energy Future' as this: *"The vision for the future is to have strong, secure and sustainable energy and petrochemical industries... At the heart is a New Energy Development Centre promoting development in clean energy technology and practice... the development of Taranaki as a hydrogen centre. Hydrogen is a clean energy carrier and storage medium for renewably generated electricity, and can be used for zero emission transport."*
42. But hydrogen H₂ is only as clean as the energy source and methods used to produce it. We would support electrolysis⁴³ which uses renewable energy to split water into hydrogen and oxygen, but not thermochemical processes such as natural gas reforming⁴⁴ or coal gasification. It is our understanding that H₂ is commonly created through natural gas reforming or 'cracking' which involves splitting up the methane molecule (CH₄) found in natural gas⁴⁵. In the case of Taranaki, the production of the gas and energy needed for hydrogen production would most likely involve hydraulic fracturing (fracking). We fear that Taranaki's 'Energy Future' projects with hydrogen focus may have been designed to prolong fossil fuel mining, with known environmental and social harm^{46, 47, 48}. Any follow-up implementation would require hugely expensive and risky investments, when there are already other proven technologies for low-emission transportation and renewable energy alternatives. We reiterate our call for actions to end all fossil fuel mining (see point 21).

Sustainable landuse practices, innovations and community leadership

43. Indeed, landuse changes will have to be a key to reducing gross emissions (Table 1 of discussion document), given our excessive emissions from industrial animal agriculture. But improvements in land management can also yield substantial reduction.
44. These should involve reducing stock numbers (rather than vaccines), phasing out the use of urea, super-phosphate⁴⁹ and other agrichemicals to restore soil health and encourage multispecies in pastures, diversifying agriculture integrating tree crops, apiculture and agro-forestry, and reforming our forestry and logging practices⁵⁰ (e.g. no more clear felling; reduce reliance on fast-growing exotic species). Already some farmers are taking bold, positive steps and leading the way, as showcased by Ngai Tahu Farming (discussion document p.18). Such examples need to be championed and supported

to foster community-led initiatives that drive societal change to a more sustainable, just and resilient future.

45. In addition to developing more diverse and sustainable farming and forestry practices on land, innovations like seaweed farming⁵¹ may also have multiple benefits from carbon sequestration to the production of food, fertiliser and biofuel.

46. In closing this submission, CJT thank the Minister for this opportunity to share our views on this critically important matter.

¹ 97% owned, documentary online: https://www.youtube.com/watch?feature=player_embedded&v=d3mfkD6Ky5o

² Draft Reserve Bank of New Zealand (Creation of Currency) Bill 2012.

<http://www.positivemoney.org.nz/Site/Legislation/default.aspx>

³ Positive Money website, accessed on 12/07/2018. <http://www.positivemoney.org.nz/Site/What/default.aspx>

⁴ Climate Action Tracker, 30 April 2018. Country summary – New Zealand. <https://climateactiontracker.org/countries/new-zealand/>

⁵ Carbon Action Tracker website, accessed on 12/07/2018. Addressing global warming – 2100 warming projections.

<https://climateactiontracker.org/global/temperatures/>

⁶ Westpac NZ Climate Change Impact Report, April 2018. <https://www.westpac.co.nz/assets/Sustainability/Westpac-NZ-Climate-Change-Impact-Report.pdf>

⁷ Rockstrom, J., O. Gaffney, J. Rogelij, M. Meinshausen, N. Nakicenovic, H. J. Schellnhuber, 2017. A roadmap for rapid decarbonization. Science 24 Mar 2017: Vol.355, Issue 6331, pp.1269-1271. <http://science.sciencemag.org/content/355/6331/1269>

⁸ Plumer, Brad, 24/03/2017. Scientists made a detailed “roadmap” for meeting the Paris climate goals. It’s eye-opening.

<https://www.vox.com/energy-and-environment/2017/3/23/15028480/roadmap-paris-climate-goals>

⁹ Loomis, Terrence, Oct 2017. Ending government oil & gas subsidies.

http://www.terrenceloomis.ac.nz/uploads/5/3/3/3/5333337/govt_subsidies_update_report_2017-3.pdf

¹⁰ Larsson, Amanda, 13/07/2018. A \$100 million mistake: MP is wrong about a new gas-fired power plant.

<https://www.stuff.co.nz/taranaki-daily-news/news/105468493/a-100-million-mistake-mp-is-wrong-about-a-new-gas-fired-power-plant>

¹¹ Coal Action Network Aotearoa, accessed on 15/07/2018. Fonterra quit coal. <https://coalaction.org.nz/fonterra-quit-coal>

¹² GNS website, accessed on 15/07/2018. Oil and Gas – Enhancing petroleum prospectivity and exploration effectiveness.

<https://www.gns.cri.nz/Home/Our-Science/Energy-Resources/Oil-and-Gas>

¹³ GNS website, accessed on 15/07/2018. Gas hydrates as an energy resource. <https://www.gns.cri.nz/Home/Our-Science/Energy-Resources/Gas-Hydrates/Current-Research/Gas-hydrates-as-an-energy-resource>

¹⁴ Energy Efficiency and Conservation Authority website, accessed on 15/07/2018. Low emission vehicles contestable fund.

<https://www.eeca.govt.nz/funding-and-support/low-emission-vehicles-contestable-fund/>

¹⁵ Kunambura, Andrew, 18/03/2018. Agro-forestry: Missing link in nutritional, food security discourse.

<https://www.dailynews.co.zw/articles/2018/03/18/agro-forestry-missing-link-in-nutritional-food-security-discourse>

¹⁶ Buxton, Nick, 25/11/2015. The elephant in Paris – the military and greenhouse gas emissions. <https://www.tni.org/es/node/22587>

¹⁷ Edwards, Bryce, 16/07/2018. Political roundup: Where are the protests over the Government’s new ‘submarine-killers’?

https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12089992

¹⁸ US EPA website, accessed on 12/07/2018. Greenhouse Gas Emissions – Understanding Global Warming Potentials.

<https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>

¹⁹ NOAA National Centers for Environmental Information National Oceanic and Atmospheric Administration, accessed on 13/07/2018. Greenhouse Gases – Water Vapor.

<https://www.ncdc.noaa.gov/monitoring-references/faq/greenhouse-gases.php?section=watervapor>

²⁰ Schmidt, Gavin, September 2004. Research Features – Methane: A scientific journey from obscurity to climate super-stardom.

https://www.giss.nasa.gov/research/features/200409_methane/

²¹ Ruppel, Carolyn, 2011. Methane hydrates and contemporary climate change.

<https://www.nature.com/scitable/knowledge/library/methane-hydrates-and-contemporary-climate-change-24314790>

²² Colman, Zack, 1 August 2017. Should the world tap undersea methane hydrates for energy?

<https://www.scientificamerican.com/article/should-the-world-tap-undersea-methane-hydrates-for-energy/>

²³ Helmholtz Association of German Research Centres, 20 March 2018. Thawing permafrost produces more methane than expected.

<https://phys.org/news/2018-03-permafrost-methane.html>

²⁴ Berwyn, B. 19 July 2017. Methane seeps out as Arctic permafrost starts to resemble Swiss cheese.

<https://insideclimatenews.org/news/18072017/arctic-permafrost-melting-methane-emissions-geologic-sources-study>

²⁵ Konschnik, Kate and S.M. Jordaan, 2017. North American oil and gas sector: a proposed science-policy framework.

<https://www.tandfonline.com/doi/abs/10.1080/14693062.2018.1427538?journalCode=tcpo20>

²⁶ Fitzsimons, Jeanette, 19/06/2018. Cutting methane hard and fast is the best path to Carbon Zero.

<https://thespinoff.co.nz/society/19-06-2018/cutting-methane-hard-and-fast-is-the-best-path-to-carbon-zero/>

²⁷ Ministry recommended pest weeds in oversight for Billion Tree plan, 5 July 2018.

<http://www.radionz.co.nz/news/national/361119/ministry-recommended-pest-weeds-in-oversight-for-billion-tree-plan>

-
- ²⁸ Flooding and slips isolate Coromandel Peninsula, 15 July 2018. <http://www.radionz.co.nz/news/national/361840/flooding-and-slips-isolate-coromandel-peninsula>
- ²⁹ Ministry for Business, Innovation and Employment, 2017. Energy in New Zealand. <http://www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/energy-in-new-zealand>
- ³⁰ Methane emissions from coal sea gas development raise climate change concerns, 3 March 2017. <http://www.abc.net.au/news/2017-02-28/methane-emissions-from-coal-seam-gas-climate-change/8310932>
- ³¹ Earthworks, 19 Oct 2016. Endeavor Energy Davis-Owens A Unit, Reeves County, Texas. <https://www.youtube.com/watch?v=RAo3mh8CwMU&feature=youtu.be>
- ³² Guglielmi, Giorgia, 21 June 2018. Methane leaks from US gas fields dwarf government estimates. *Nature*: 558, p.496-497. . <https://www.nature.com/articles/d41586-018-05517-y>
- ³³ Gilblom,, Kelly. 20 Dec 2017. Insidious gas leaks are casting doubts over Shell's clean credentials. <http://royaldutchshellgroup.com/2017/12/20/insidious-gas-leaks-are-casting-doubts-over-shells-clean-credentials/>
- ³⁴ Loomis, T, May 2018. Why natural gas isn't a bridge fuel to a low emissions economy. Fossil fuels Aotearoa Research Network. http://www.terrenceloomis.ac.nz/uploads/5/3/3/3/5333337/ffarn_paper_-_gas_not_a_transition_fuel_v.2.pdf
- ³⁵ Ministry for the Environment, 2018. New Zealand's greenhouse gas inventory 1990-2016. <http://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/National%20GHG%20Inventory%20Report%201990-2016-final.pdf>
- ³⁶ Parliamentary Commissioner for the Environment, 2018. Response to Productivity Commission Low-Emissions Economy draft report. <https://www.pce.parliament.nz/publications/response-to-productivity-commission-low-emissions-economy-draft-report>
- ³⁷ Ministry for the Environment, 2018. New Zealand's Greenhouse Gas Inventory 1990-2016, p.1. <http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016>
- ³⁸ Huesemann, M. and J. Huesemann, 2013. Techno-Fix. <https://www.utne.com/arts/techno-fix-ze0z1304zcalt>
- ³⁹ GNS Science, accessed on 15/07/2018. Why we should assess CO2 storage potential in New Zealand? <https://www.gns.cri.nz/Home/Our-Science/Energy-Resources/Carbon-Capture-and-Storage/Why-CO2-Storage>
- ⁴⁰ Mikulka, Justin, 23 March 2018. Aliso Canyon disaster highlights risks, inadequate safety rules governing natural gas storage. <https://www.desmogblog.com/2018/03/23/aliso-canyon-disaster-phmsa-natural-gas-storage-regulation>
- ⁴¹ Taranaki set for \$20m provincial growth fund injection, 6/04/2018. <https://www.tvnz.co.nz/one-news/new-zealand/taranaki-set-20m-provincial-growth-fund-injection>
- ⁴² Tapuae Roa – Make Way for Taranaki Action Plan, 6 April 2018. <http://www.makeway.co.nz/media/1028/tapuae-roa-action-plan-6-april-2018.pdf>
- ⁴³ US Energy Efficiency & Renewable Energy, accessed on 18/07/2018. Hydrogen Production: Electrolysis. <https://www.energy.gov/eere/fuelcells/hydrogen-production-electrolysis>
- ⁴⁴ US Energy Efficiency & Renewable Energy, accessed on 18/07/2018. Hydrogen Production: Natural gas reforming. <https://www.energy.gov/eere/fuelcells/hydrogen-production-natural-gas-reforming>
- ⁴⁵ Stecher, Nicolas, 25/10/2017. Are Hydrogen cars the next big thing... again? <http://www.thedrive.com/tech/14431/are-hydrogen-cars-the-nextbig-t>
- ⁴⁶ Concerned Health Professionals of New York, 13/03/2018. Compendium of scientific, medical and media findings demonstrating risks and harms of fracking. <http://concernedhealthny.org/compendium/>
- ⁴⁷ Climate Justice Taranaki, 20 Feb 2018. Drivers & victims of the fossil fuel industry in New Zealand. <https://climatejusticetaranaki.files.wordpress.com/2018/02/slides-for-palmy-20feb2018-v5.pdf>
- ⁴⁸ Taranaki Energy Watch website, accessed on 18/07/2018. Regional and district plans. <http://www.taranakienergywatchnz.org/district-plan/>
- ⁴⁹ Sahrawis top New Zealand in legal test case, 27 Feb 2018, Asia Times. <http://www.atimes.com/article/sahrawis-top-new-zealand-legal-test-case/>
- ⁵⁰ GDC to investigate where Tologa Bay logging debris came from, 5 June 2018. <http://www.radionz.co.nz/national/programmes/checkpoint/audio/2018647967/gdc-to-investigate-where-tologa-bay-logging-debris-came-from>
- ⁵¹ NIWA, 21 June 2018. One of the world's leading scientific publishers has named a paper cowritten by a NIWA scientist as one of 250 groundbreaking findings that could "help change the world". <https://www.niwa.co.nz/news/niwa-seaweed-scientist-tackling-global-climate-change-issue>