

Pro-equity climate change and environmental sustainability action by district health boards in Aotearoa/New Zealand

Hayley Bennett, Paula King

ABSTRACT

AIM: With current health ministerial directives to prioritise actions on reducing health inequities and district health board (DHB) greenhouse gas (GHG) emissions, we argue that all climate change and environmental sustainability actions by DHBs must be pro-equity, and explore how the two priorities can be addressed concurrently.

METHOD: Building on prior knowledge of climate change and environmental sustainability action in the health and disability sector, we undertook a visioning exercise to generate ideas for pro-equity GHG emissions reduction initiatives in the DHB context. Visioning was further informed by presentation and feedback discussion at an Annual Scientific Meeting of the New Zealand College of Public Health Medicine.

RESULTS: Three scenarios were envisioned in the areas of DHB energy use, transport and procurement where GHG emissions could be reduced, and health determinants and outcomes for Māori and Pacific peoples improved.

CONCLUSION: Current ministerial directives to address both health inequities and DHB greenhouse gas emissions present DHBs with the opportunity to ensure they systematically address both priorities at the same time. In doing so, Aotearoa/New Zealand has the potential to lead the world in demonstrating pro-equity climate change and sustainability action in health systems.

The reality and potential severity of human-caused climate change is now well known,¹⁻² along with an understanding of the inter-relationships between climate change and health.³⁻⁷ As global average temperature rises, negative health impacts from phenomena such as excess heat, extreme weather events, food insecurity and changes in infectious disease patterns will increase.³⁻⁷ The magnitude of these health impacts will vary by age, ethnicity, health status, geographic location and socio-economic circumstances—with the greatest impacts falling on communities, including Indigenous peoples, who have contributed least to greenhouse gas (GHG) emissions.^{4,7-9}

For Māori in Aotearoa/New Zealand, climate change will intensify the adverse and inequitable burden of ill-health that

is the result of historical and ongoing processes of colonisation.¹⁰ Unless there are urgent and substantial pro-equity policy changes both within and beyond the health and disability sector, climate change will exacerbate health inequities.^{8,9}

We argue that with the current ministerial directives to prioritise action on both health inequities and district health board (DHB) greenhouse gas emissions,¹¹⁻¹³ DHBs have the opportunity to plan pro-equity climate and environmental sustainability actions that address both priorities. Pro-equity climate change and environmental sustainability action by DHBs will also fulfil legal mandates under the New Zealand Public Health and Disability Act 2000 for DHBs to 1) reduce (with a view to eliminating) health inequities by improving health outcomes for

Māori and other population groups; and 2) exhibit a sense of environmental responsibility by having regard to the environmental implications of their operations.¹⁴

Health and disability sector greenhouse gas emissions—impacts and opportunities

Greenhouse gas emissions from health systems in developed countries are substantial, making up around 3–10% of total national emissions.^{15–17} Hospitals in particular are very energy intensive, produce large amounts of waste, have large transport and procurement carbon footprints, and emit some gases with very high global warming potential (eg, anaesthetic gases).^{15–18}

It is acknowledged that our health and disability sector is contributing to health-harming climate change, and that causing harm in this way is contrary to the fundamental purpose of promoting, protecting and restoring health and wellbeing.¹⁹ Those health organisations that face up to their responsibilities to reduce GHG emissions find that action to reduce emissions and improve environmental sustainability can bring co-benefits such as saving money, improving the quality and resilience of health services, and improving staff and community wellbeing more widely.^{20–25} Forward looking health systems around the world are acting now to reduce GHG emissions, improve sustainability and increase climate change preparedness.^{26–28} However, to date health organisations have not considered how they can ensure that their climate change and environmental sustainability actions align with the achievement of health equity.

Why climate change and environmental sustainability action by DHBs must be pro-equity

When poorly designed and implemented, health services and new health initiatives/programmes can maintain or make worse existing health inequities that stem from the inequitable distribution of resources that determine health.²⁹ Aotearoa/New Zealand has several examples of health inequities being made worse by health organisations, as well as the introduction of new programmes locally or nationally. For example, inequities in the quality of primary

and secondary health care for Māori,^{30–36} and ethnic inequities in participation rates for the Bowel Cancer Screening Pilot.³⁷ If DHBs choose not to apply pro-equity thinking, planning and accountability mechanisms in the rollout of climate change and environmental sustainability actions, then there is a real risk of maintaining or worsening health inequities. For example, if cost savings resulting from interventions (eg, energy savings) were reinvested into existing primary and secondary care services as they currently operate, the inequities in health care for Māori would be perpetuated.^{30–36} However, the opposite could be possible if health equity underpins all climate change and environmental sustainability actions in the health and disability sector.

There is currently very little in the published literature about the deliberate pairing of climate change and environmental sustainability action in health systems with health equity goals; although large health organisations like the National Health System (NHS) in England and Kaiser Permanente in the US have linked sustainability in health organisations to wider ‘social value’.^{38–40}

The NHS in England has a goal in its ‘Sustainable Development Strategy for the Health and Care System’ to take every opportunity to contribute to healthy lives, communities and environments.^{38,39} However, annual ‘Health Check’ reports on the strategy state that there has not yet been enough done to encourage and value innovation in health for sustainability and social value. Quality care, fair access and ‘supporting the marginalised’ are noted as factors that could be improved through a sustainable health system, but achieving health equity is not highlighted as a particular goal.^{38,39}

Kaiser Permanente in the US has an environmental stewardship programme with goals including climate action, sustainable food and waste reduction. This is seen to be an integral part of their approach to emphasise the social, environmental, behavioural and clinical aspects that shape wellbeing.⁴⁰ Benefits to ‘minority’ health are mentioned, for example, that procurement of local food is both environmentally sustainable and supports small, minority-owned businesses.⁴¹ Kaiser Permanente

also recognises that its environmental actions contribute to reducing those health inequities in the US that arise from the higher exposure of Indigenous and other marginalised populations to health-harming pollution and environmental toxins in living and working environments, compared to 'white' populations.⁴²

In less developed countries, the relationship between the environmental performance of health organisations and increasing the resilience of local communities (who suffer considerable health inequities compared with people in developed countries) is well recognised. Improvement to energy, water and other infrastructure at Georgetown Hospital in the Caribbean as part of a World Health Organization 'Smart Hospitals' initiative in the Americas was noted to not only improve environmental performance (eg, a 60% reduction in energy use); but also resulted in better access and use of the health organisation by the local community; and full functionality following a severe storm in 2013 (which crippled other health services in the area). At that time, the hospital was also able to provide safe drinking water to the storm-affected community from its rain-water harvesting system.⁴³

A vision for pro-equity climate change and environmental sustainability action by DHBs

Given the very few specific examples in the literature regarding the deliberate pairing of climate change and environmental sustainability action in health systems with health equity, we undertook a blue-sky visioning exercise to generate ideas for pro-equity initiatives by DHBs. Blue-sky thinking is defined as 'creative ideas that are not limited by current thinking or beliefs'.⁴⁴ The exercise was based on knowledge of GHG reduction and environmental sustainability initiatives occurring both internationally as prior discussed, and within DHBs in Aotearoa/New Zealand,⁴⁵ and was further informed by presentation and feedback discussion at the 2016 Annual Scientific Meeting of the New Zealand College of Public Health Medicine. Rather than proposing that this method generates high-level evidence, we argue that the blue-sky visioning exercise is grounded within the current context of climate change

and environmental sustainability activity occurring within DHBs, and the considerable evidence around the urgent need for pro-equity thinking within the health and disability sector in Aotearoa/New Zealand.⁴⁶

Three DHB pro-equity GHG emission reduction scenarios are envisioned in the areas of energy use, transport and procurement which, according to NHS England analysis, are the biggest contributors to the GHG/carbon footprint of the health system in England.^{15,47}

Pro-equity DHB GHG Emissions Reduction Scenario 1

DHB One implements a sustainable energy management plan with support from the Energy Efficiency Conservation Authority (EECA). This involves a lighting retrofit (LED and motion sensors) in hospital buildings, solar panels on the renal dialysis unit (which uses large amounts of electricity during daylight hours), computer sleep-mode across the hospital campus, and modernising the heating, ventilation and cooling (HVAC) systems, including replacing the hospital coal boiler with a biomass boiler. The ongoing annual energy cost-savings are re-invested into collaborative community projects that create healthy, warm, energy-efficient homes in communities with a high proportion of Māori and Pacific peoples. Together with local council funding, and support from local Iwi and the Whānau Ora Collective, this allows a number of homes to be weather-proofed, retrofitted with insulation, double glazed and provided with heat pumps and ventilation. Working with the Whānau Ora Collective means that participating whānau are supported to access social and other services that address further determinants of health. Pre- and post-monitoring of avoidable hospital admissions related to poor-quality housing shows reduced hospital admissions for Māori and Pacific peoples in the intervention areas.

Pro-equity DHB GHG Emissions Reduction Scenario 2

DHB Two implements a sustainable travel management plan for staff travel to a regional hospital that is 100km distant from the base hospital. Outpatient clinic starting and finishing times are harmonised, a 'book a seat' (instead of book a car) system

is established, and a number of electric vehicles are introduced in place of petrol vehicles when the DHB fleet contract is renewed. Savings from fuel and car maintenance costs are reinvested into a tailored outreach service that improves access to care for a rural, predominantly Māori community. This service, designed and developed in partnership with the local community and Māori Health Provider, involves a shuttle service for first specialist appointments and a telemedicine service for follow-up appointments located in the Māori Health Provider clinic. Monitoring of Ambulatory Sensitive Hospitalisations (ASH) by ethnicity demonstrate a reduction in adult Māori ASH rates in the community following the initiative.

Pro-equity DHB GHG Emissions Reduction Scenario 3

DHB Three implements an environmentally sustainable food plan. A policy is put in place that 80% of fresh food (eg, fruit, vegetables) in the hospital will be procured from the local region—thus reducing food-mile GHG emissions, as well as supporting local employment and income opportunities within the local food economy. Furthermore, working in partnership with the local urban marae, DHB food waste is collected and composted, then used in the marae community food garden. This reduces GHG emissions from food waste and supports food security for the wider community by harnessing and supporting knowledge on Indigenous food sovereignty and food production. As part of the policy, the DHB commits to being a purchaser of the food produced by the marae garden, thus supporting Māori economic development.

Pro-equity DHB climate change and environmental sustainability action and resilience

Pro-equity sustainability interventions have the potential to enhance the resilience of populations who will face significant climate-health impacts. Māori and Pacific peoples, children and young people, the elderly and those on low incomes are more vulnerable to the health impacts of climate change. This is not only because of existing health inequities, but because of other vulnerability factors such as poorer infrastructure (eg, housing, safe water supplies) and less financial resource to respond to

damaging climate change-related events (eg, flood damage to homes with health implications related to cold temperatures, damp and mould).⁸⁻⁹

The reinvestment of energy cost-savings into improving community housing (Scenario 1) has the potential to not only improve health, but also means that the occupants would be more able to cope with future extreme weather events (eg, storms, heat waves) that could otherwise create a health risk. Reinvested savings from reduced DHB transport costs into a tailored outreach service (Scenario 2) contributes to the reduction of Māori health inequities, thus increasing community resilience for a population group that already bears the disproportionate burden of ill-health. Scenario 3 supports Indigenous food sovereignty and local food production. This would enhance the resilience of the community to future climate-change related changes in food systems (eg, food price spikes as food growing areas globally are affected by climate change).^{48,49}

Is this vision realistic?

While these scenarios were generated via a ‘blue-sky thinking’ process, it is important to note that it is situated within concrete knowledge of what is already happening within health organisations within Aotearoa/New Zealand and overseas. For example, some DHBs have already made use of EECA loans and support to bring about six-figure annual energy savings which are available for reinvestment by DHBs.⁵⁰ Indigenous food sovereignty is acknowledged as having considerable potential to promote to health, wellbeing, resilience and environmental sustainability.^{51,52}

We acknowledge however that there are limitations. The visioning aims to outline in broad brushstrokes what might be possible if DHB climate change and environmental sustainability action are deliberately pro-equity, in order to avoid the real risk of the worsening of health inequities if they are not. The scenarios have not been costed; and the real-world challenges and barriers that are present within all large health organisations have not been explored. On the other hand, tackling complex challenges may well require, at least as a starting point, the type of unconstrained ‘outside the box’ thinking that blue-sky visioning encourages.

What we need to move forward

For these DHB pro-equity climate change and environmental sustainability actions to become a reality we need the Government and the Ministry of Health to follow up on their health equity and GHG reduction directives to DHBs with some concrete actions, for example:

- Directing DHBs to keep equity at the centre of climate change and environmental sustainability action, and ensuring partnership with Māori at every level in the planning, implementation, monitoring and reporting processes.
- Establishing a national 'Sustainable Development Unit' for the health and disability sector, and the establishment of sustainability managers with expertise in health equity in each DHB, so that existing action can be coordinated and a pro-equity lens consistently applied to all initiatives.
- Mandating that all DHBs measure, reduce and report annually on their GHG emissions in accordance with the International Organization for Standardization (ISO) standard, and that as part of the annual reporting there is:

- Specific reporting on how GHG emission reduction actions have contributed toward the reduction of health inequities for Māori and Pacific peoples.

Conclusion

Unsustainable development, inequity and ill-health are all interlinked,⁵³ and any comprehensive plan for better health and wellbeing for all peoples must take these interconnections into account.

Too often new health priorities and programmes are implemented without sufficient thought to their potential to worsen health inequities; and the climate change and environmental sustainability impacts of our health and disability sector have until recently been largely overlooked.

We argue that current ministerial directives to address both health inequities and DHB GHG emissions present an opportunity for the health and disability sector to systematically address both priorities at the same time. In doing so, Aotearoa/New Zealand has the potential to lead the world in demonstrating pro-equity health system climate change and environmental sustainability action.

Competing interests:

Both authors are members of OraTaiao: The NZ Climate and Health Council. Dr Bennett is a member of the Sustainable Health Sector National Network NZ.

Author information:

Hayley Bennett, Public Health Physician, Rotorua; Paula King, Public Health Physician/ Research Fellow, Te Rōpū Rangahau Hauora A Eru Pōmare (Eru Pōmare Māori Health Research Unit), University of Otago, Wellington.

Corresponding author:

Dr Hayley Bennett, Public Health Physician, Rotorua.
drhayleybennett@gmail.com

URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1481-31-august-2018/7681>

REFERENCES:

1. Pachauri RK, Meyer LA (eds). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC, Geneva, Switzerland, 2014. <http://www.ipcc.ch/report/ar5/syr/>
2. Committee on Climate Change. *UK Climate Change Risk Assessment 2017. Synthesis Report: priorities for the next five years*. CCC, 2016. <http://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf>
3. Smith KR, Woodward A, Campbell-Lendrum D, et al. *Human Health: Impacts, Adaptation, and Co-benefits*. In: *Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field CB, Barros VR, Mastrandrea MD, Mach KJ, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 2014. http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIAR5-Chap11_FINAL.pdf
4. World Health Organization and World Meteorological Association. *Atlas of Health and Climate*. Geneva: WHO, 2012. <http://www.who.int/globalchange/publications/atlas/en/>
5. McCoy D, Montgomery H, Sabaratnam A, Godlee F. Climate change and human survival. *BMJ*. 2014; 348:g2351. <http://www.bmj.com/content/348/bmj.g2351>
6. Hales S, Kovats S, Lloyd S, Campbell-Lendrum D (eds). *Quantitative Risk Assessment of the Effects of Climate Change on Selected Causes of Death, 2030s and 2050s*. Geneva: World Health Organization, 2014. <http://www.who.int/globalchange/publications/quantitative-risk-assessment/en/>
7. Watts N, Adger WN, Agnolucci P, et al. Health and climate change: policy responses to protect public health. *The 2015 Lancet Commission on Health and Climate Change*. *Lancet*. 2015; 386:1861–1914. [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)60854-6/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60854-6/fulltext)
8. Bennett H, Jones R, Keating G et al. Health and equity impacts of climate change in Aotearoa-New Zealand, and health gains from climate action. *N Z Med J*. 2014; 127. <http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2014/vol-127-no-1406/6366>
9. Jones R, Bennett H, Keating G, Blaiklock A. Climate change and the right to health for Māori in Aotearoa/New Zealand. *Health and Human Rights Journal*. 2014; 16. <http://www.hhrjournal.org/2014/07/climate-change-and-the-right-to-health-for-maori-in-aotearoanew-zealand/>
10. Robson B, Harris R (eds). *Hauora Māori Standards of Health IV. A study of the years 2000-2005*. Wellington: Te Rōpū Rangahau Hauora a Eru Pōmare University of Otago, 2007. <http://www.otago.ac.nz/wellington/otago067759.pdf>
11. The Press, Nov 2, 2017 [online news]. New Minister of Health David Clark tells officials to get on board with new agenda [cited 2 Mar 2018]. <http://www.stuff.co.nz/the-press/news/98476480/new-minister-of-health-david-clark-to-meet-canterbury-district-health-board>
12. Beehive Press Release, 9th Feb, 2018. Healthcare sector committed to reducing carbon footprint. Hon Julie Anne Genter. <http://www.beehive.govt.nz/release/healthcare-sector-committed-reducing-carbon-footprint>
13. Clark D. Letter of Expectations for District Health Boards and Subsidiary Entities for 2018/19. Available from the Ministry of Health Nationwide Service Framework Library. http://nsfl.health.govt.nz/system/files/documents/pages/auckland_letter_of_expectation_2018.pdf
14. New Zealand Public Health and Disability Act 2000. Section 3 (1)(b), and Section 22 (1)(j). <http://www.legislation.govt.nz/act/public/2000/0091/latest/whole.html#DLM80051>
15. NHS England Sustainable Development Unit. *Saving Carbon Improving Health: NHS Carbon Reduction Strategy for England*. Cambridge; NHS SDU: 2009. <http://www.sduhealth.org.uk/policy-strategy/engagement-resources/nhs-carbon-reduction-strategy-2009.aspx>
16. Malik A, Lenzen M, McAlister S, McGain F. The carbon footprint of Australian healthcare. *Lancet Planetary Health*. 2018; 2:e27–e35. [http://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(17\)30180-8/fulltext](http://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30180-8/fulltext)
17. Eckelman MJ, Sherman J. Environmental impacts of the US health care system and effects on public health. *PLoS One*. 2016; 11: e0157014. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157014>
18. Gadani H, Vyas A. Anesthetic gases and global

- warming: Potentials, prevention and future of anesthesia. *Anesth Essays Res.* 2011; 5:5–10. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4173371/>
19. Healthcare's Climate Footprint [webpage]. Healthcare Without Harm [cited 2 Mar 2018]. <http://noharm-global.org/issues/global/health-care%E2%80%99s-climate-footprint>
 20. Kaplan S, Sadler B, Little K, Franz C, Orris P. Can sustainable hospitals help bend the health care cost curve? Commonwealth Fund Issue Brief. 2012; 29. http://www.commonwealthfund.org/~media/files/publications/issue-brief/2012/nov/1641_kaplan_can_sustainable_hospitals_bend_cost_curve_ib.pdf
 21. Thomas J, Cosford P. Place sustainability at the heart of the quality agenda. *Qual Saf Health Care.* 2010; 19:260–261. http://pdfs.semanticscholar.org/4c0c/c65fee050774770f35a1e4beda0c4e0f8d81.pdf?_ga=2.250131855.889292180.1521848354-573589550.1521848354
 22. Naylor C, Appleby J. Sustainable Health and Social Care: Connecting Environmental and Financial Performance. London: The Kings Fund, 2012. http://www.kingsfund.org.uk/sites/default/files/field/field_publication_file/sustainable-health-social-care-appleby-naylor-mar2012.pdf
 23. NHS Sustainable Development Unit. Save Money by Saving Carbon: Decision Making in the NHS Using Marginal Abatement Cost Curves. Cambridge: NHS SDU, 2010. <http://www.evidence.nhs.uk/search?q=saving%20money>
 24. World Bank. Climate-Smart Healthcare: low carbon and resilience strategies for the health sector. Washington: World Bank, 2017. <http://documents.worldbank.org/curated/en/322251495434571418/Climate-smart-health-care-low-carbon-and-resilience-strategies-for-the-health-sector>
 25. NHS Sustainable Development Unit. Healthy Returns from Sustainability Actions. Cambridge: NHS SDU, 2015. <http://www.sduhealth.org.uk/delivery/engage/health-returns-infographic.aspx>
 26. NHS Sustainable Development Unit. UN Climate Summit – Cross System Statement. September 2014. <http://www.sduhealth.org.uk/policy-strategy/engagement-resources/un-climate-summit.aspx>
 27. Kaiser Permanente. Kaiser Permanente Pledges Bold 2025 Environmental Performance to Benefit People and the Planet. 2016. <http://share.kaiserpermanente.org/article/kaiser-permanente-pledges-bold-2025-environmental-performance-to-benefit-people-and-planet/>
 28. NHS Sustainable Development Unit. Adaptation Report for the Healthcare System 2015. Cambridge: NHS SDU, 2015. <http://www.sduhealth.org.uk/areas-of-focus/community-resilience/adaptation-report.aspx>
 29. World Health Organization. Commission on Social Determinants of Health. Closing the Gap in a Generation: Health equity through action on the social determinants of health. WHO, 2008. http://www.who.int/social_determinants/thecommission/finalreport/en/
 30. Crengle S, Lay-Yee R, Davis P, Pearson J. A Comparison of Māori and Non-Māori Patient Visits to Doctors: The National Primary Medical Care Survey (NatMedCa): 2001/02. Report 6. Wellington: Ministry of Health, 2005. <http://www.health.govt.nz/publication/comparison-maori-and-non-maori-patient-visits-doctors>
 31. Davis P, Lay-Yee R, Dyal L, et al. Quality of hospital care for Maori patients in New Zealand: retrospective cross-sectional assessment. *Lancet.* 2006; 367:1920–25. [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(06\)68847-8/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(06)68847-8/fulltext)
 32. Rumball-Smith J, Sarfati D, Hider P, Blakely T. Ethnic disparities in the quality of hospital care in New Zealand, as measured by 30-day rate of unplanned readmission/death. *International Journal for Quality in Health Care* 2013; 25:248–254. <http://www.ncbi.nlm.nih.gov/pubmed/23411833>
 33. Health Quality and Safety Commission. A Window on the Quality of New Zealand Health Care. Wellington: HQSC, 2017 http://www.hqsc.govt.nz/assets/Health-Quality-Evaluation/PR/A_Window_on_the_Quality_of_NZ_Health_Care_2017.pdf
 34. Grey C, Jackson R, Wells S, et al. Ethnic differences in coronary revascularisation following an Acute Coronary Syndrome in New Zealand: a National Data-Linkage Study (ANZACS-QI 12). *Heart Lung Circ.* 2016; 25:820–8.
 35. Te Karu L, Bryant L, Harwood M, Arroll B. Achieving health equity in Aotearoa New Zealand: the contribution of medicines optimisation. *J Prim Care.* 2018; 10:11–15.
 36. Rahiri J, Alexander Z, Harwood M, Koea J, Hill A. Systematic review of disparities in surgical care for Māori in New

- Zealand. *ANZ J Surg*. 2017; doi10.1111/ans.14310
37. Ministry of Health. Final Evaluation Report of the Bowel Cancer Screening Pilot: Screening Rounds One and Two. Wellington: Ministry of Health, 2016. <http://www.health.govt.nz/system/files/documents/publications/bowel-screening-pilot-final-evaluation-report-redacted-january2017.pdf>
 38. NHS and Public Health England Sustainable Development Unit. Sustainable Development in the Health and Care System: Health Check 2017. Cambridge: NHS and Public Health England SDU, 2017. <http://www.sduhealth.org.uk/policy-strategy/reporting/sustainable-development-in-health-and-care-report-2017.aspx>
 39. NHS and Public Health England Sustainable Development Unit. Sustainable Development in the Health and Care System: Health Check 2018. Cambridge: NHS and Public Health England SDU, 2018. <http://www.sduhealth.org.uk/policy-strategy/reporting/sustainable-development-in-health-and-care-report-2018.aspx>
 40. Kaiser Permanente. Environmental Stewardship Overview [online webpage]. Kaiser Permanente [accessed 6 June 2018]. <http://share.kaiserpermanente.org/article/environmental-stewardship-overview/>
 41. Kaiser Permanente. Environmental Stewardship Sustainable Food [online webpage]. Kaiser Permanente [accessed 6 June 2018]. <http://share.kaiserpermanente.org/article/environmental-stewardship-sustainable-food/>
 42. Meyers K. Beyond equal care: How health systems can impact racial and ethnic health disparities. *The Permanente Journal* 2008; 12: 75-80. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3042345/>
 43. Ugate C. Ensuring Health Services Function in Emergencies [powerpoint presentation]. Pan American Health Organization: Regional Office of the World Health Organization. <http://climateandhealthalliance.org>
 44. Collins English Dictionary [online dictionary]. Harper Collins [accessed 9 Nov 2016]. <http://www.collinsdictionary.com/dictionary/english/blue-sky-thinking>
 45. Keating G. DHB Successes in Environmental Sustainability. A report for Community and Public Health Canterbury District Health Board. CDHB, 2017. http://d3n8a8pro7vnmx.cloudfront.net/orataiao/pages/72/attachments/original/1498983859/DHB_sustainability_FINAL_June_2017.pdf?1498983859
 46. Beehive Press Release. 29 May 2017. Major review of health system launched. Hon David Clark. <http://www.beehive.govt.nz/release/major-review-health-system-launched>
 47. NHS and Public Health England Sustainable Development Unit. Sustainable Development in the Health and Care System: Health Check 2016. Cambridge: NHS and Public Health England SDU, 2016. <http://www.sduhealth.org.uk/policy-strategy/reporting/sustainable-development-in-health-and-care-report-2016.aspx>
 48. Quiggin J. Drought, Climate Change and Food prices in Australia. University of Queensland, 2008. http://d3n8a8pro7vnmx.cloudfront.net/auscon/pages/1345/attachments/original/1474000113/Climate_change_and_food_prices_in_Australia.pdf
 49. Springmann M, Mason-D'Croz D, Robinson S, et al. Global and regional health effects of future food production under climate change: A modelling study. *Lancet*. 2016; 387:1937-46. [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)01156-3/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)01156-3/fulltext)
 50. Energy Efficiency Conservation Authority [online news]. Doubled Savings for Waikato DHB [cited 8 Mar 2018]. EECA, 2017. Available from: <http://www.eeca.govt.nz/news-and-events/media-releases/doubled-savings-for-waikato-dhb/>.
 51. Hutchings J, Tipene P, Carney G, et al. Hua Parakore: an indigenous food sovereignty initiative and hallmark of excellence for food and food production. *Mai Journal*. 201; 1:131-45. <http://www.journal.mai.ac.nz/sites/default/files/Pages%20131%20-%20145.pdf>
 52. Huambachano M. Food security and indigenous peoples knowledge: El Buen Vivir-Sumaq Kawsay in Peru and Tē Atānoho, New Zealand, Māori-New Zealand. *Food Studies: An Interdisciplinary Journal*. 2015; 5:33-57. http://www.academia.edu/20046754/Food_Security_and_Indigenous_Peoples_Knowledge_MARIAELENA_A._HUAMBACHANO_El_Buen_Vivir-Sumaq_Kawsay_in_Peru_and_T%C4%93_At%C4%81noho_New_Zealand_M%C4%81ori-New_Zealand
 53. Horton R, Beaglehole R, Bonita R, et al. From public to planetary health: a manifesto. *Lancet*. 2014; 383:84. <http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2814%2960409-8/fulltext>