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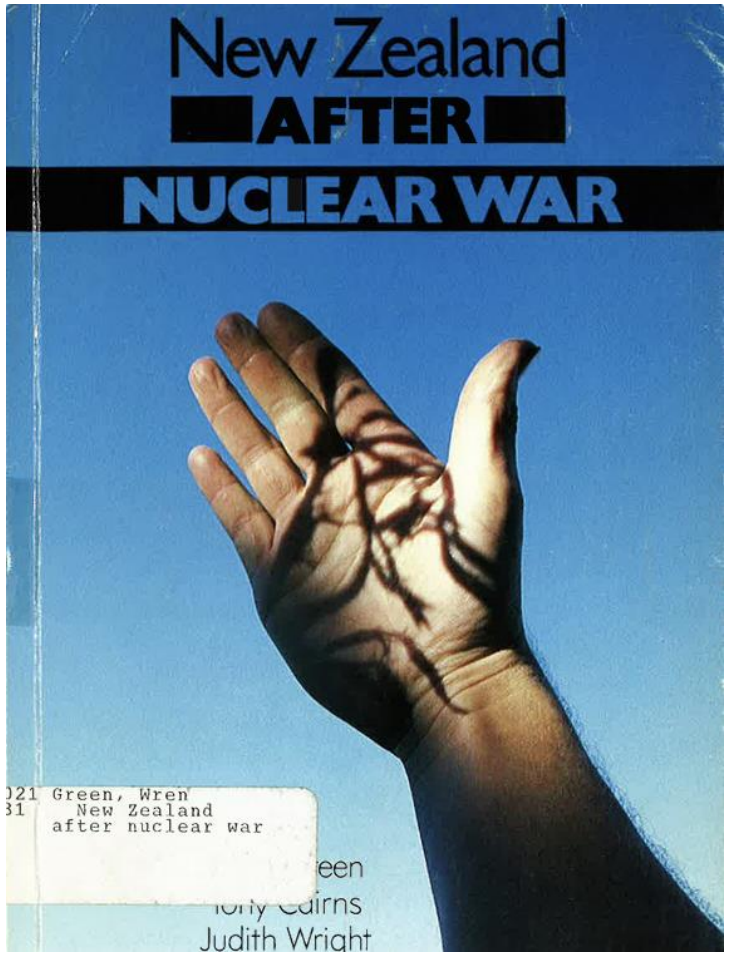
RONGO

Global Catastrophic Risks & NZ Fuel Security: Implications and Actions

Dr Matt Boyd (Adapt Research)
Prof Nick Wilson (University of Otago, Wellington)
5 September 2024

Funding: philanthropic and volunteer contributions

Global Catastrophe and Aotearoa NZ >> NZCat Project



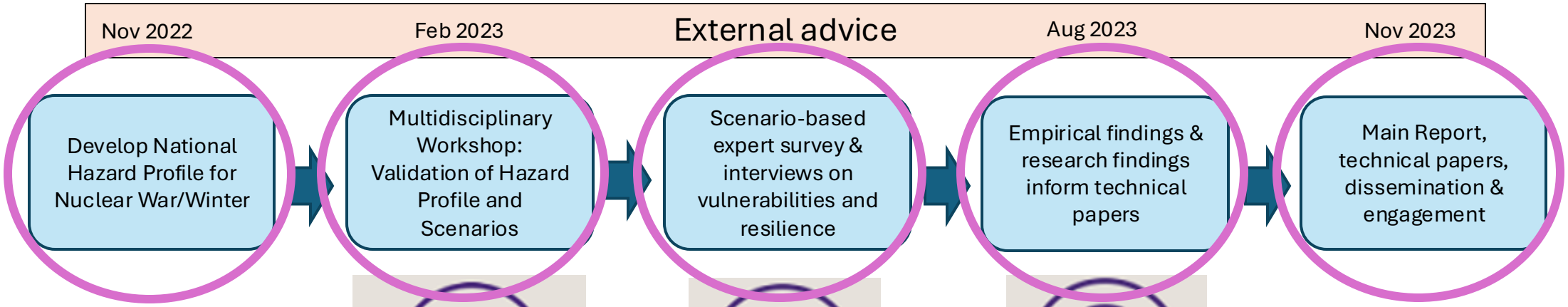
NZ Planning Council (1987)

McGuinness Institute (2022)

"1980s studies, including a study involving 300 industry experts, government officials, a survey, and role plays with citizens, found that New Zealand was severely at risk from nuclear war due to its dependence on trade, energy imports, and the intricate interdependence of societal systems (Green, 1989; Green et al., 1987; Preddey et al., 1982). These concerns remain relevant today." (Boyd & Wilson, *Risk Analysis*, 2022)

Boyd & Wilson (2022)

NZCat Project: Resilience to nuclear war/winter



Team Members
- Dr Matt Boyd
- Dr Ben Payne
- Simon Terry
- Sam Ragnarsson
- Prof Nick Wilson

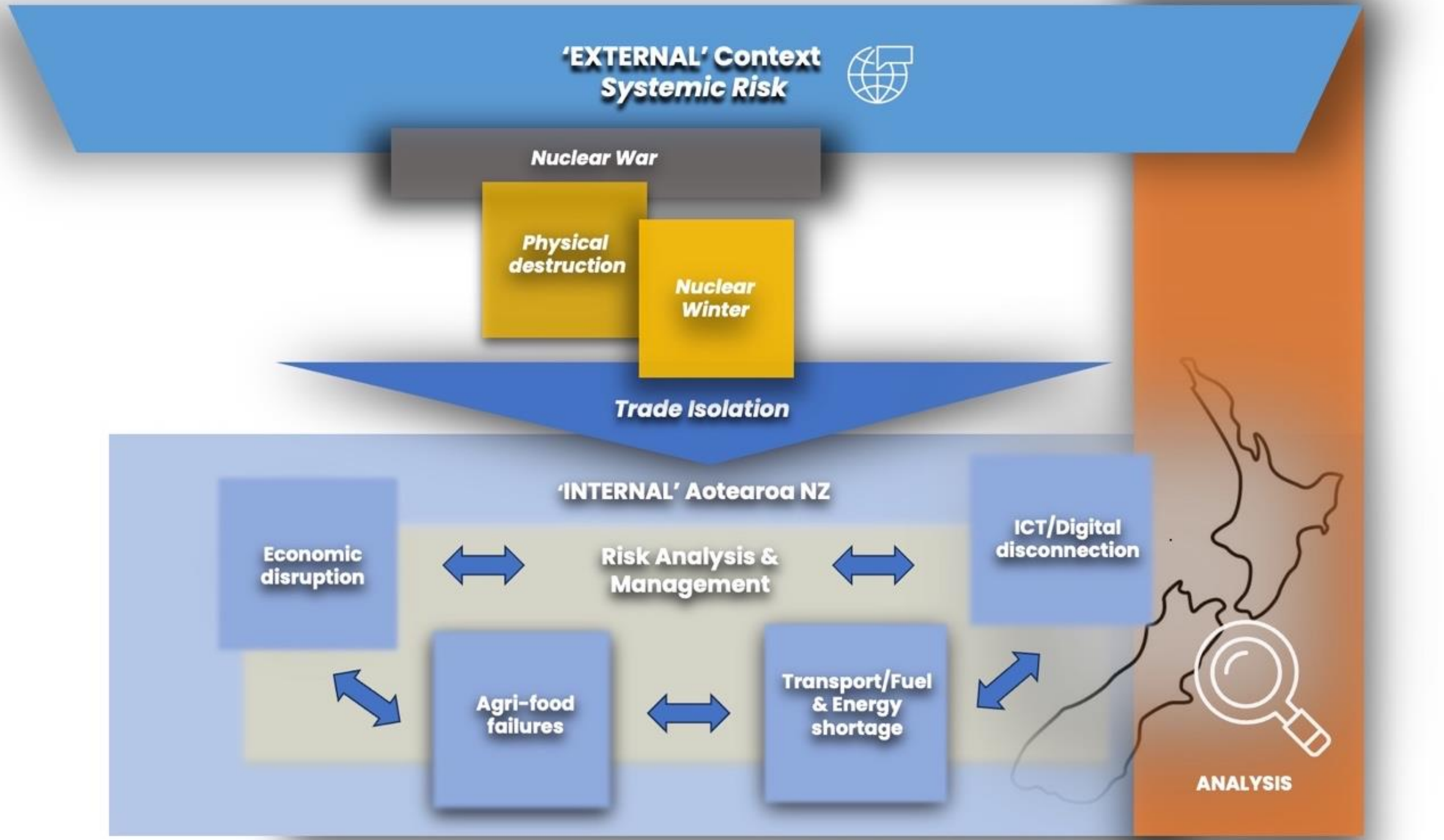
Multidisciplinary workshop with 20 diverse experts

Qualitative survey of 42 cross-sector knowledge holders

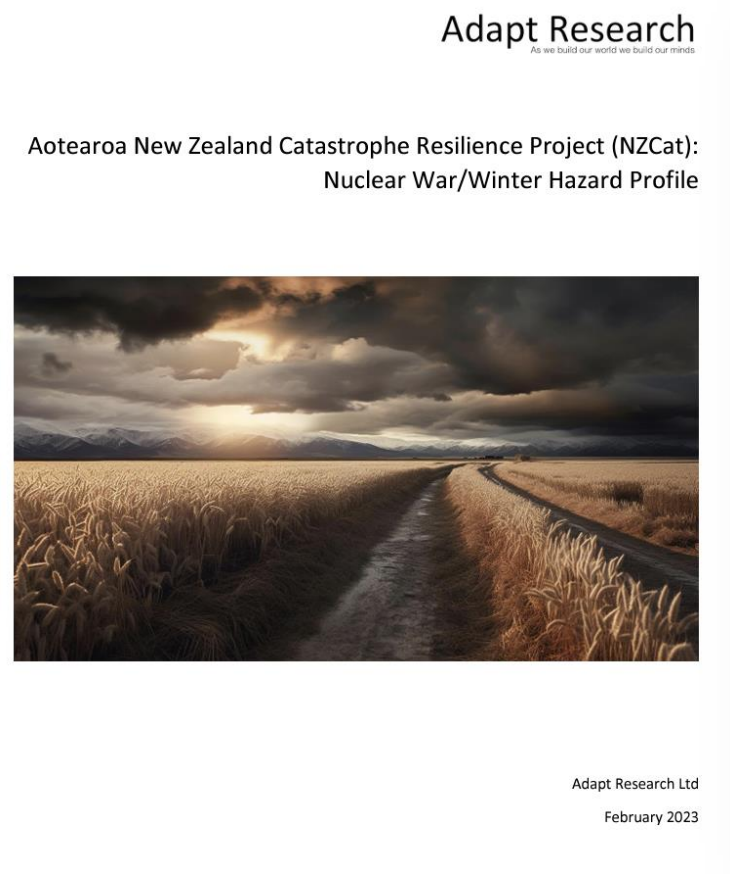
18 key informants interviewed

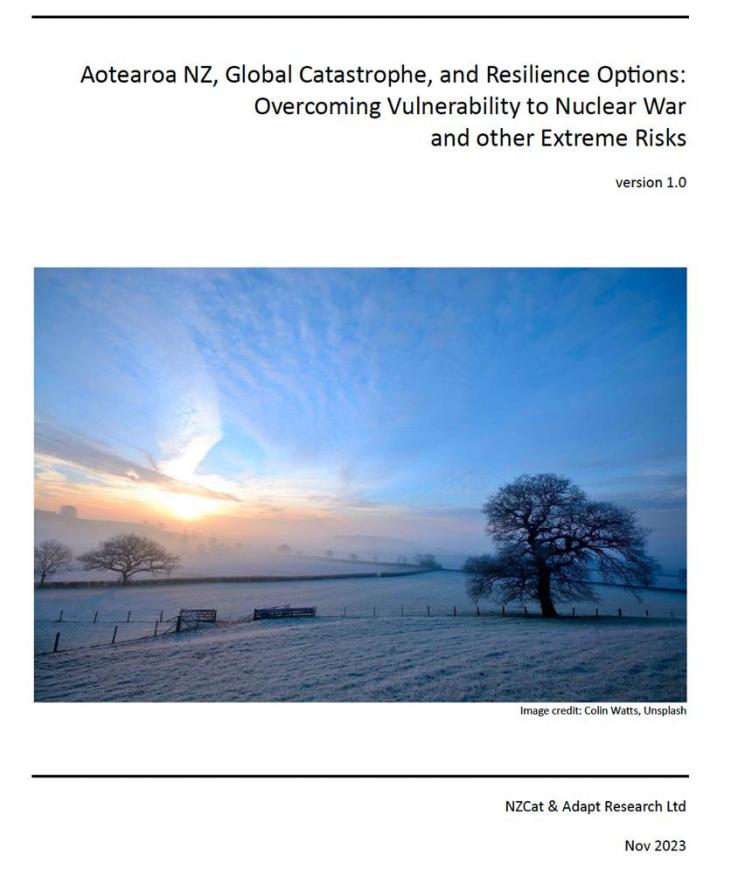
100+ Government and academic documents reviewed

Advice, feedback, peer-review & panel input from diverse experts


'EXTERNAL' Context
Systemic Risk
Nuclear War
Physical destruction
Nuclear Winter
Trade Isolation
'INTERNAL' Aotearoa NZ
Economic disruption
Risk Analysis & Management
ICT/Digital disconnection
Agri-food failures
Transport/Fuel & Energy shortage
ANALYSIS

The Aotearoa NZ Catastrophe Resilience Project (NZCat)





- Main Report
- NZ and Nuclear War Workshop
- Hazard Profile
- Interview study
- Survey of experts
- NZCat Webinar

Basic Needs* must be met, but an extended catastrophe would stretch NZ's capacity for survival

Table 4: NZ onshore fuel stockholdings have barely changed despite a new Fuel Resilience Act

	Diesel (days cover)	Petrol (days cover)	Jet Fuel (days cover)
Before Marsden Point Refinery closure	25	31	22
After Refinery closure (MBIE expected)	21	28	24
Minimum holdings required by Fuel Industry (Improving Fuel Resilience) Amendment Act 2023	21	28	24
Change from before Refinery closure	-4	-3	+2
NZ Government planned stockholding	7	-	-
Total change from before Refinery closure	+3	-3	+2

Original source: Terry, S (2023). Reimagining fuel resilience, and how to get it.

*This is the approach the United States is taking through the Global Catastrophic Risk Management Act 2022

NZCat Fuel Response Plan

See p.37-45

Main Report

Box 6: Resilience Nugget

Elements of an extended NZ National Fuel Response Plan for No-imported-fuel Scenario

Preparation for response actions:

- Assess quantity of fuel consumed by sectors over weeks, months, years
- Prioritise sector functions considering critical sector interdependencies
- Plan to implement demand reduction (by at least 90%+ in ongoing no-trade scenario)
- Identify optimal feedstock for biofuel production
- Develop capability to refine biodiesel and/or renewable diesel
- Research & prepare a plan for rapid scale up of biofuel production (identifying any resource investments needed ahead of time)
- Undertake cross-sector & interagency simulations/scenario exercises on the above

Response

- Implement strict rationing plan to optimise use of onshore fuel stocks and domestic energy production
- Implement logistics plan to scale up sowing of feedstock and biofuel production, during transition phase, to meet critical demands (eg, minimum viable agriculture)
- Ensure ongoing supply of diesel or biodiesel for essential coastal & interisland shipping, trans-Tasman trade, non-electric railway locomotives, and military/emergency uses
- Consider additional need for wood gasifiers, animal labour, or other fuel substitutes
- Ensure that fuel supply facilitates basic needs (water, food, shelter, safety) indefinitely
- Re-establish trade and seek to import fuels from Australia, Indonesia, etc (and have something of value to trade eg, food or even gold reserves)

Fuel for Basic Needs: Food

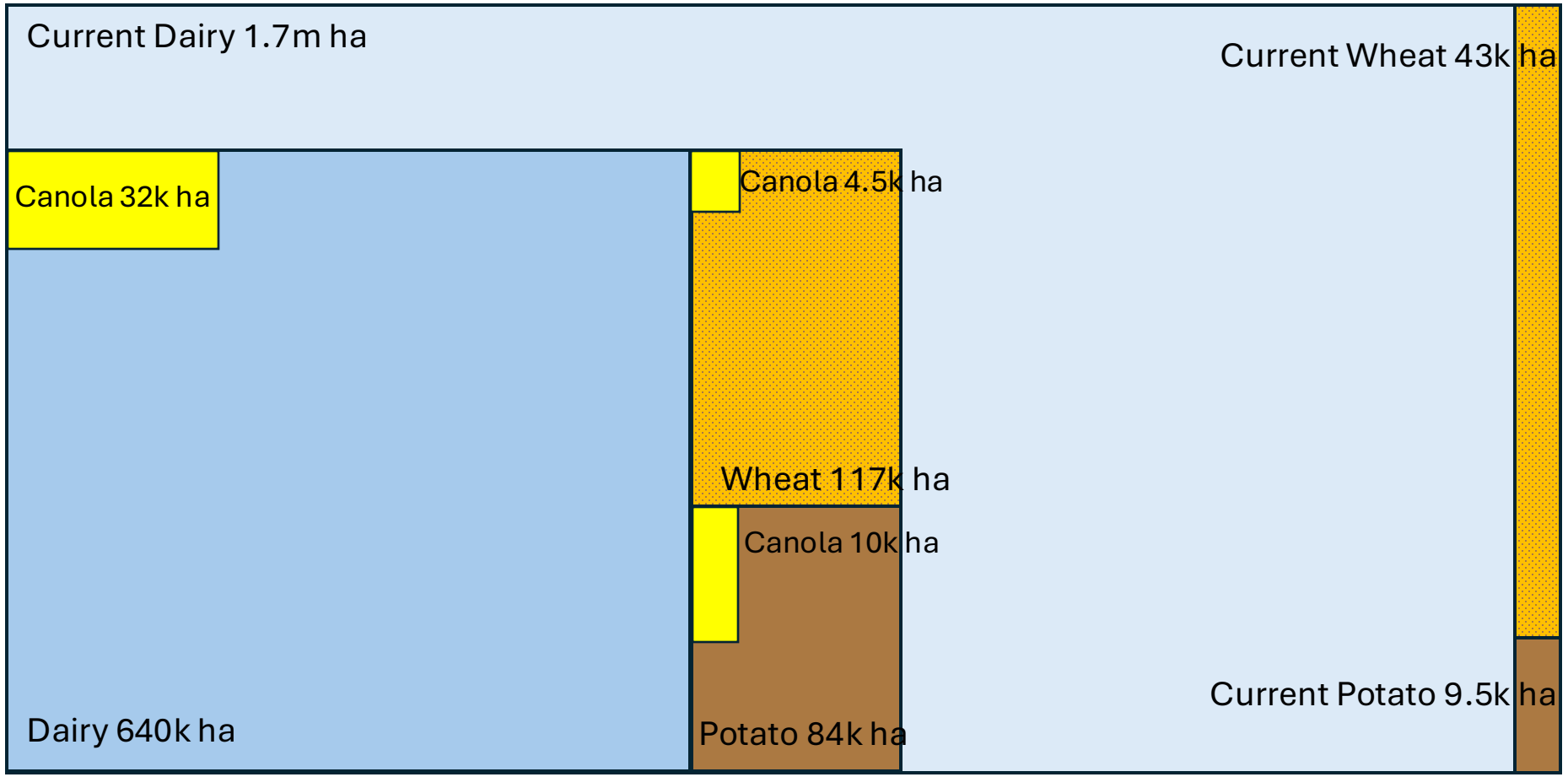
DOI: 10.1111/risa.14297

ORIGINAL ARTICLE

Peer reviewed paper in *Risk Analysis*

Mitigating imported fuel dependency in agricultural production: Case study of an island nation's vulnerability to global catastrophic risks

Matt Boyd[1] | Sam Ragnarsson[2] | Simon Terry[3] | Ben Payne[1] | Nick Wilson[4]



"food production consumed approximately 295 million L of diesel" [per annum]

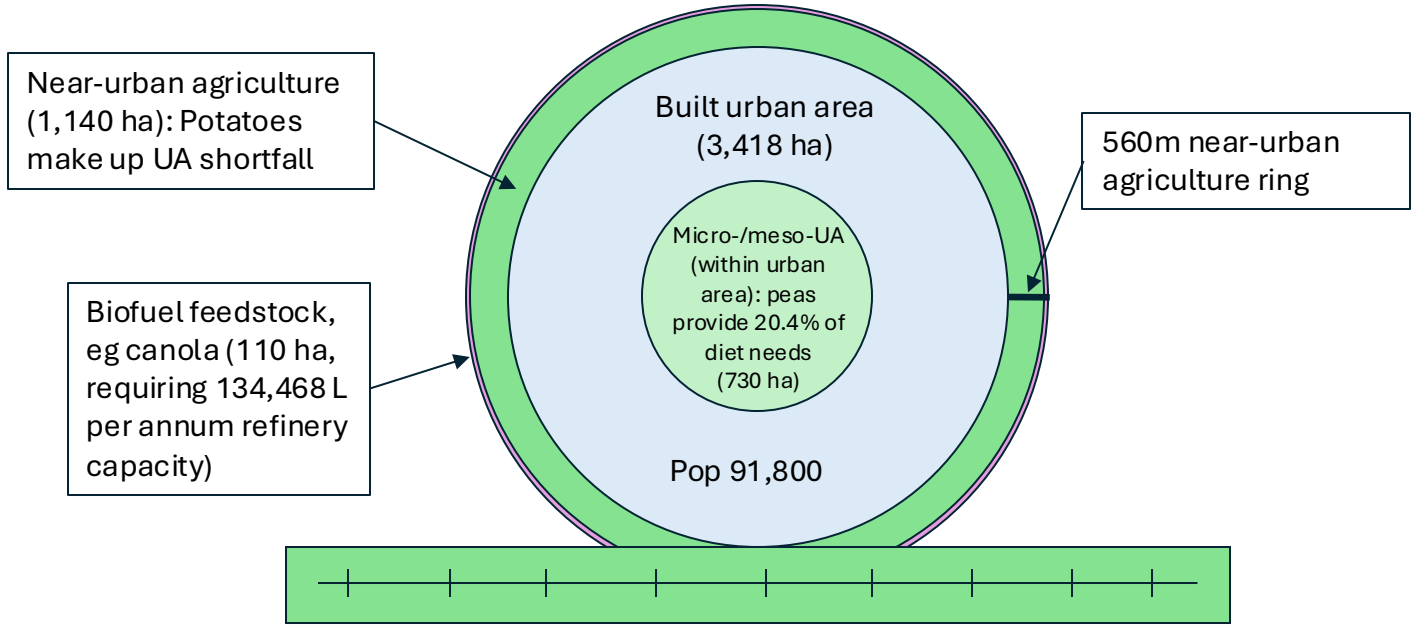
"biodiesel, could supply the 5–15 million L needed for wheat production" [to supply food calories to the NZ population]

Adapt Research blog on this paper

Urban and near-urban agriculture for global catastrophe resilience

A food security strategy for a median sized city in the normal climate scenario (shapes to scale)

Global catastrophic risks (GCRs), such as nuclear war, extreme pandemics, or supervolcanoes could devastate trade in food and fuels. In this context urban areas might need increased food self-sufficiency.



Near-urban agricultural land could follow transport routes, eg an electric railway or navigable river

Protecting near-urban land for efficient (potatoes) and frost-resistant (wheat, carrots) crops, plus biodiesel feedstock, could ensure urban resilience through GCRs.

Boyd & Wilson 2024, *Research Square*

People want to know what the plan is?

Otago Daily Times

Dunedin 14 | 7 Friday, **23 August 2024** Send us news & photos

News | Sport | Life & Style | Entertainment | Business | Regions | Fe

Tuesday, **9 April 2024**

Biofuel seen as way to boost NZ's resilience vs catastrophes

By John Lewis

13 0

News > National

RNZ Home News Radio Podcasts & Series Topics Te Ao Māori Pacific

WAR / SECURITY

Do we really need to prepare for nuclear war?

From The Detail, 5:00 am on 13 May 2022 Share this

Sharon Brettkelly, co-host of The Detail
sharon.brettkelly@rnz.co.nz

Russia's war on Ukraine has brought the world closer to the possibility of nuclear war than it's been in decades. But is New Zealand prepared for it?

RNZ Home News Radio Podcasts & Series Topics Te Ao Māori Pacific

ENVIRONMENT / TRANSPORT

Is canola the fuel to keep the country running in an emergency?

From Afternoons, 1:15 pm on 10 April 2024 Share this

MBIE's NZ Fuel Security Study

Project objectives

The objectives for the Fuel Security Study and the Fuel Security Plan (which will be developed based on the findings of the study) are to:

- Identify and mitigate vulnerabilities in New Zealand's fuel supply chains.
- Enable us to minimise the impact of fuel disruption events on essential services and economic activity.
- Investigate how New Zealand could improve sovereign fuel resilience.
- Maintain availability of fuel at an affordable price.

An understanding of the risks, impacts and mitigation measures of an extended fuel supply shortage	What are the risks of an extended fuel supply shortage and what would be the key likely impacts on New Zealand's economic activity? • The study should cover scenarios that impact fuel importation and distribution. • The study should look into the forecasted global refinery capacity, international fuel distribution networks and demand dynamics, and the likely impacts these may have on New Zealand's fuel supply. What mitigation measures could New Zealand take to minimise or prevent impacts of an international fuel supply shortage? • The study should include information on measures that could be taken now and in the future. • Each mitigation measure should be considered through a cost-benefit framework.

There are existing reports related to this work which are available on MBIE's website including (but not limited to):

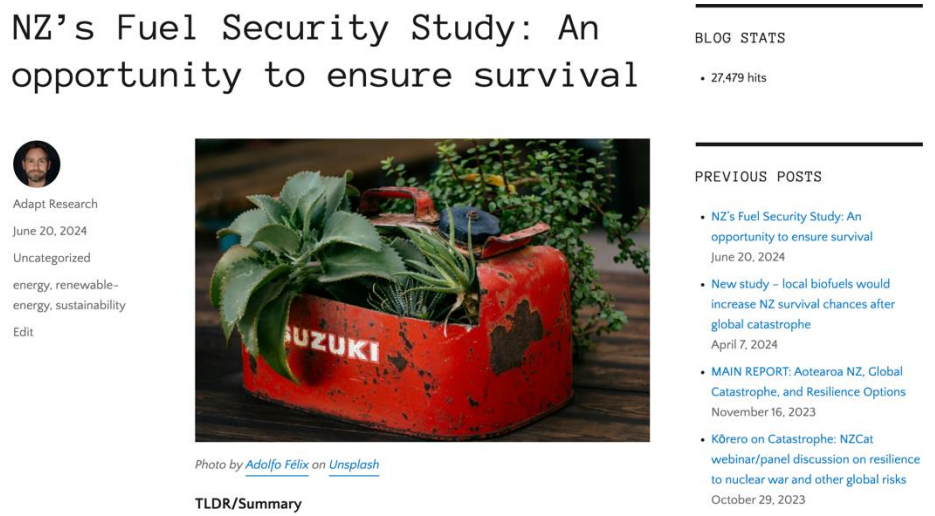
- *Refining NZ: Impact of Conversion to Fuels Terminal* (Hale & Twomey) March 2020
- *Fuel Security and Fuel Stockholding Costs and Benefits 2020* (Hale & Twomey) December 2020
- *Economics of Fuel Supply Disruptions and Mitigations* (M.E research) May 2019.

We have existing tools intended to manage the impact of fuel disruption events:

- **The National Fuel Plan** is the supporting plan to the Civil Defence Emergency Management Plan 2015. It sets out the emergency response and readiness framework for coordination between the government and fuel supply industry. It covers arrangements for responding to a major disruption to fuel supply including petrol, diesel, aviation fuel and marine fuel. The latest 2020 version incorporates the recommendations from the Government Inquiry into the Auckland Fuel Supply Disruption.
- **The International Energy Programme** enables coordinated and collective action by International Energy Agency member countries in response to oil supply emergencies. As a member country, New Zealand has an obligation to maintain oil stocks that are equivalent to at least 90 days of net imported oil. New Zealand meets its obligation through domestic stocks (recent stocks make up 40 days) and by purchasing the balance (around 50 days) in the form of "oil stock tickets" held overseas.
- **The minimum onshore fuel stockholding obligation** *(Fuel Industry (Improving Fuel Resilience) Amendment Act 2023),* from 1 January 2025, requires fuel importers to hold 28 days of petrol, 24 days of jet fuel and 21 days of diesel consumption on average each month.

Our blog on the NZ Fuel Security Study

- Contemplate absence of liquid fuel imports for months or years
- Determine volumes of fuel required guided by hierarchy of basic needs
- Recommend quantified updates to National Fuel Plan
- Contemplate mitigation measures that include local production of liquid fuels:
  - Refining local crude oil (from Taranaki)
  - Biofuel production
- Suggest options for developing mitigation measures
  - eg Pilot programmes; R&D; Alternative fuel production; Decentralisation; Other innovative solutions
- Estimate cost-effectiveness taking societal perspective, and global catastrophe risk across infrastructure lifetime
- Recommend a publicly facing risk register entry with priorities for action



NZ's Fuel Security Study: An opportunity to ensure survival

Adapt Research
June 20, 2024
Uncategorized
energy, renewable-energy, sustainability
Edit

Photo by Adolfo Félix on Unsplash

TLDR/Summary

BLOG STATS

- 27,479 hits

PREVIOUS POSTS

- NZ's Fuel Security Study: An opportunity to ensure survival
  June 20, 2024
- New study – local biofuels would increase NZ survival chances after global catastrophe
  April 7, 2024
- MAIN REPORT: Aotearoa NZ, Global Catastrophe, and Resilience Options
  November 16, 2023
- Kōrero on Catastrophe: NZCat webinar/panel discussion on resilience to nuclear war and other global risks
  October 29, 2023

Governing nationally significant risks

- Expand DPMC's List of Nationally Significant Risks
  - **Zero fuel imports** linked to a Fuel Security Strategy
    - Plan for destruction not just disruption scenarios
  - **Nuclear winter or industry disabled scenarios** linked to a Food Security Strategy
- National Fuel Security Strategy integrated with Food, Transport, and Communications Security Strategies
  - Scenario exercises (supply Basic Needs)
- Engage international experts in global catastrophic risks
  - Cooperate with Australia
- Ongoing independent research on these issues (National Missions)

The former Productivity Commission agrees

Box 2. Global catastrophic risks

The risk of extreme catastrophic disasters – such as nuclear winter, or a complete disintegration of world trade – is beyond the scope of this inquiry. However, submissions expressed concern that New Zealand is not equipped for such global catastrophes, even if our geography could enable us to be more self-sufficient than the rest of the world.

The New Zealand Government's central agencies steer the governance and management of nationally significant risks (including a broad set of hazards and national security threats) and emergency response. The Department of the Prime Minister and Cabinet (DPMC) has system leadership and coordination roles focused on building resilience to critical national risks, and the National Emergency Management Agency (NEMA) leads overall civil defence and emergency management.

Existing powers under the Civil Defence Emergency Management Act 2002 provide NEMA with a blanket authority to manage catastrophic risks, as for any other emergency. However, the scale, scope and intensity of their impacts would far exceed those caused by natural disasters (Green et al., 2022). Although the likelihood of global catastrophic risks is low, New Zealand's current preparation for them appears weak.

While long-term disruptions are beyond the scope of this inquiry, the potential impacts of global catastrophic risks are severe and wide ranging. The DPMC should support independent research to evaluate these risks for New Zealand. This could be part of current work programmes, such as the DPMC's assessment of national security risks and NEMA's National Disaster Resilience Strategy.

Improving Economic Resilience (2024)

Islands for the Future of Humanity

- NZ fuel security is important for the world
  - A robust solution can be a template for imitation
- Proper accounting of costs and benefits
  - Includes the expected disutility of low-probability high-impact events
  - Includes positive externalities such as **feeding millions of people**

> Our findings suggest a theoretical capability to feed up to 43.2 million people (16.8 in the severe nuclear winter scenario), if existing arable land is used for optimal crops, with adequate fuel supplies. This produc-

Boyd et al. 2024