

Nuclear War Impacts on Distant, Non-Combatant Countries

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“Above all, remember your humanity”

Joseph Rotblat, Nobel Peace Prize lecture, 1995

Abstract

This Policy Brief examines the rarely-discussed topic of how nuclear war might impact non-combatant countries that are far from likely conflict zones. Such countries won't face the catastrophic, immediate consequences of exploding warheads. But the subsequent cascade of economic social, and environmental disruptions will test the very fabric of their existence. This brief summarises and updates an earlier, wide-ranging study into the likely impacts of nuclear war on New Zealand as a distant non-combatant. The impacts would be pervasive, complex, long-term, and highly disruptive to all aspects of New Zealand's society. Modern, digital technologies would, perversely, now undermine the country's ability to respond and adapt, and would therefore further reduce the country's resilience, i.e., the ability to recover the essential functions of a modern society. Some of the identified vulnerabilities could be reduced beforehand and such actions could also make it easier for the country to recover from more likely global disruptions (e.g. economic collapse, pandemics). Other non-combatant countries will be in similar situations. The implications are chilling given that New Zealand is, relatively speaking, a 'good prospect' for surviving nuclear war. However, while that would be far from certain, some basic preparations should help. Other non-combatant countries are in a similar situation. Identifying and reducing key vulnerabilities increases resilience and would help recovery from global shocks including nuclear war. It also underscores the very real stakes they have in demanding much greater progress on reducing the multiple nuclear threats humanity still faces.

Introduction

This policy paper explores an aspect of the nuclear threat that is rarely researched, namely the consequences of nuclear war for non-combatant countries that are far from regions of actual conflict. The benefits of doing so are twofold and are not mutually exclusive. First, it strengthens the incentives for such countries to work internationally to reduce the many risks of nuclear war and for nuclear disarmament initiatives. This includes meeting obligations under the Treaty on the Prohibitions of Nuclear Weapons (TPNW) that has the goal of eliminating nuclear weapons. Secondly, it shows that these countries have to respond to the same system vulnerabilities (e.g. abrupt loss of trade) if faced with less catastrophic events such as a global financial meltdown, major pandemics, or disruptive instabilities from future global warming.

This paper first refutes the fallacy that nuclear war would spell the ‘end of civilization’, that even countries far from conflict zones would suffer the same fate as nuclear combatants – an inevitable descent into chaos, societal collapse and possible human extinction. But how might distant, non-combatant countries *actually* be affected? Might they be resilient enough, or make essential systems resilient enough to recover as functioning societies? The main part of the paper summarises and updates the key findings of a unique investigation into the consequences of nuclear war for New Zealand. It found that the country, despite suffering relatively minor impacts from fallout or nuclear winter effects, would still be vulnerable to major disruptions and ‘recovery’ would be uncertain. A recovery would be more likely if key vulnerabilities had been anticipated and contingency preparation had been made. It concludes with a proposal for what should be done in New Zealand to better understand and prepare for a possible nuclear war. This would also help identify vulnerabilities to other catastrophic events. The same rationale applies to other non-combatant countries.

Nuclear War Threats and the ‘All Doomed’ Fallacy

Nuclear war is not inevitable but it is certainly possible. As current conflicts continue and deepen, as the potential for new conflicts grows more serious, so do the threats of catastrophic nuclear war, either by accident, or by unintended escalation. Numerous policy briefs published by the Toda Peace Institute have identified different risks that could lead to nuclear conflict, particularly in the Asia-Pacific region. For example, Jingdong Yuan (2023) describes the growing risks of conflict between nuclear powers China, India and Pakistan, including accidental use of nuclear weapons.¹ Relationships between these nuclear states have been complex for decades; there are deep hostilities and growing concerns over the direction of their nuclear ambitions.² Other global regions of tension, aside from the Ukraine,

¹ Jingdong Yuan, “External and Domestic Drivers of Nuclear Trilemma in Southern Asia: China, India, and Pakistan,” *Toda Peace Institute*, Policy Brief No. 152 (January 2023). https://toda.org/assets/files/resources/policy-briefs/t-pb-152_external-and-domestic-drivers-of-nuclear-trilemma_yuan.pdf Accessed 6 February 2024.

² Manpreet Sethi, “Understanding the Nuclear landscape in Southern Asia: Complexities and Possibilities,” *Toda Peace Institute*, Policy Brief No. 149 (January 2023). https://toda.org/assets/files/resources/policy-briefs/t-pb-149_understanding-the-nuclear-landscape_sethi.pdf

could also escalate into nuclear conflict which led the Bulletin of the Atomic Scientists to leave their [symbolic Doomsday Clock](#) unchanged at 90 seconds to midnight for 2024. As Ramesh Thakur explained, “We are in an exceptionally dangerous period...” made worse by the substantial weakening of commitments to arms control agreements.³

Over the past 15 years there has been extensive new research into the humanitarian consequences of nuclear weapons across fields of risk (including Artificial Intelligence and close calls), nuclear decision-making and consequences of nuclear war. These have been usefully documented⁴ and make it very clear that we live in “...a precarious situation of heightened nuclear risks.”

Given that a nuclear war may happen, what images come to mind of an event so terrible that no-one would ever want to experience it? They are probably images of mushroom clouds, of devastated cityscapes like Hiroshima and Nagasaki, of millions dead with dazed, burned survivors.

And then what? The narrative of nuclear war ‘survival’ has been dominated, understandably, by perspectives from combatant countries. An early novel, and one of the most pessimistic, was “[On the Beach](#)”, published in 1957 and made into a movie in 1959. Following a northern hemisphere nuclear war, lethal radiation slowly spreads across the globe, and the last humans left alive on Earth finally succumb and die on the beaches of Melbourne, Australia. It had a major impact on people’s views that nuclear war could be the end of humankind.

In 1966, the BBC’s [pseudo-documentary film](#) “The War Game” depicted a nuclear war and its aftermath in Britain. Initially withheld because “the effect of the film has been judged by the BBC to be too horrifying for the medium of broadcasting”, it won the 1967 Academy Award for best documentary. In 1982, Raymond Briggs published his anti-Bomb, graphic novel “[When the Wind Blows](#)” about the fate of a retired couple following a nuclear attack on Britain. It was also a scathing critique of the government-issued pamphlets advising how to ‘protect and survive’ against nuclear attack. (Pamphlets included, for example, directions for making a lean-to using doors to protect from radiation.) Also, in 1982 Jonathan Schell published his influential best-seller “The Fate of the Earth”. The first part dealt with the consequences of a nuclear holocaust, again arguing that most people would probably die. In a [critique](#) of Schell’s book, Brian Martin disputed Schell’s argument, that extinction of the human species might be possible, on a number of grounds.

A year later in 1983, the American movie “[The Day After](#)” reached a massive domestic audience, and then a global one, with its depiction of harrowing scenes of nuclear explosions

Accessed 6 February 2024.

³ Ramesh Thakur, “Australia and the Post-Ukraine nuclear Disarmament Agenda,” *Toda Peace Institute*, Policy Brief No. 159 (May 2023). <https://toda.org/assets/files/resources/policy-briefs/t-pb-159-australia-and-the-post-ukraine-nuclear-disarmament-agenda.pdf>

Accessed 6 February 2024.

⁴ Nick Ritchie and Mikhail Kupriyanov, “*Understanding the Humanitarian Consequences and Risks of Nuclear War. New Findings from Recent Scholarship*,” (Federal Ministry for European and International Affairs, Department for Disarmament, Arms Control and Non-Proliferation, Vienna, 2023).

[Understanding the Humanitarian Consequences and Risks of Nuclear Weapons.pdf](#) Accessed 13 March 2024

over Kansas and Missouri and the devastation that would follow. Other less influential movies and books on the direct consequences of nuclear war have been made and written.

In the context of the Cold War and the nuclear disarmament movement, “When the Wind Blows”, “The Fate of the Earth” and “The Day After” provided powerful arguments against the proliferation of nuclear armaments and the nuclear threat. According to the back cover of “When the Wind Blows”, the Hansard for the English Parliament noted: “This House welcomes the publication of *When the Wind Blows* by Raymond Briggs as a powerful contribution to the growing opposition to nuclear armament and hopes it will be widely read.”⁵ Following a private screening of “The Day After”, President Ronald Reagan allegedly wrote in his diary that the film left him “[deeply depressed](#)”.

These publications and movie contributed to the global public opposition in the 1980s against nuclear weapons. Following the end of the Cold War in 1991, nothing since on the nuclear threat has quite so grabbed the public imagination. Why? One reason might be the extensive scientific research and publications on nuclear winter impacts. While this global research clearly showed the horrendous possibilities of even greater fatalities from starvation, it also clearly implied that human extinction would not follow nuclear war. Perhaps the collapse of the Soviet Union reduced the public’s perception of the nuclear threat, or maybe the rising concern over global warming replaced fears of nuclear Armageddon despite nuclear risks still remaining very high.

Perversely, this exaggerated narrative of overwhelming global destruction from a combatant’s perspective (and uncritically accepted by the peace movement)⁶ is likely to discourage distant non-combatant countries from more realistic assessments of their own post-nuclear fates. Should they just assume the inevitable collapse of their own societies and economies? Would nuclear winter impacts or global fallout (see below) mean ‘recovery’ was impossible and therefore why ask the question? Do governments have any responsibility to consider what ‘survival’ might mean and, more crucially, what responsibilities do they have to investigate how to mitigate such unprecedented upheavals? Even raising these questions requires us to put aside the post-nuclear mind-set of human annihilation that dominated thinking in combatant states. The onus of collective responsibility for ‘surviving’ and improving the odds of survival may well be a much heavier burden for us to carry.

Boyd and Wilson (2023) analysed possible island refuges whose societies might survive nuclear winter. The countries they identified as the most resilient were Australia, New Zealand, Iceland, the Solomon Islands and Vanuatu.⁷ Non-island countries in South America and possibly southern Africa, could probably be added to that list.

⁵ Raymond Briggs, *When the Wind Blows*, (London: Penguin Press, 1983).

⁶ Brian Martin, “Critique of Nuclear Extinction,” *Journal of Peace Research*, 19, No. 4, (1982): 287-300. <https://www.bmartin.cc/pubs/82jpr.html> Accessed 10 March 2024.

⁷ Matt Boyd and Nick Wilson, “Island Refuges for Surviving Nuclear Winter and Other Abrupt Sunlight-Reducing Catastrophes,” *Risk Analysis*, 43, (2023): 1824-1842. <https://onlinelibrary.wiley.com/doi/epdf/10.1111/risa.14072> Accessed 3 February 2024.

The New Zealand Study

During 1986-87, the New Zealand Planning Council with government funding, undertook a study in the form of a rapid assessment of the environmental, economic and societal impacts of a major, northern hemisphere nuclear war on New Zealand.⁸

The study approach was innovative. The three-person study team acted primarily as facilitators and 'information brokers' not as original researchers.⁹ Over 300 individuals and sector organizations responded to a scenario of the nuclear 'event' from their own areas of expertise. They identified the most likely immediate crises they would have to deal with, their first priorities, problems they could anticipate in six months' time and longer term, and feasible actions they might take in advance to reduce post-war disruptions. Interviews with departmental heads and senior officials explored likely impacts on the functioning of government itself.

The study's scenario assumed New Zealand was not a target, there had been little preparation, and all north-south trade ceased for the foreseeable future. The destruction of certain Australian-USA communication facilities and some Australian military bases was assumed. The scenario also included the possibility of a high-altitude nuclear explosion that would cover much of Australia and all of New Zealand with an electromagnetic pulse (EMP). The military benefits of a high energy EMP would be to disrupt electronic systems, thus potentially shutting down national energy and communication networks.

For each topic, the study listed policy actions that could reduce the identified vulnerabilities. Many of these policy responses would also be relevant to recovery from current major external shocks, hence this research is still relevant today. Resilience, defined as the ability to sustain or recover essential functions, emerged as the difference between a tolerable, cooperating society, and conflict and social collapse.

The key themes that emerged from the study are outlined below with updated information on significant recent changes that have occurred in communications, energy, and transport sectors. These sectors are now far more vulnerable to disruption. This, plus the dependencies between them, is reducing the resilience and ability of New Zealand to respond to massive disruptions, whether from nuclear war or other less catastrophic threats.

But first, it is important to correct misunderstandings over how radioactive fallout and nuclear winter would most likely affect a post-nuclear New Zealand.

⁸ Wren Green, Tony Cairns and Judith Wright, *New Zealand After Nuclear War* (Wellington: New Zealand Planning Council, 1987). A photocopy of the book is available from: <https://www.mcguinnessinstitute.org/wp-content/uploads/2022/11/New-Zealand-After-Nuclear-War-August-1987-full-text.pdf> Accessed 4 February 2024.

⁹ Karen Cronin and Wren Green, "The New Zealand Nuclear Impacts Study," *Ambio* 18, no. 7 (1989): 407-410. <https://www.jstor.org/stable/4313624> Accessed 4 February 2024.

Fallout Fears

Radioactive fallout was thought to be the most serious consequence for New Zealand by 46% of respondents to a nationwide public opinion survey done for the 1987 study. It was easily the public's most dominant concern. While the gloomy 'science' of "On the Beach" was purely fictional, it lingers with a continuing hold on the popular imagination. Fallout would indeed kill millions immediately and millions more through radiation illnesses over weeks and years in combatant countries after a major northern nuclear war. The picture in the southern hemisphere would be quite different. For distant southern countries the consequences would depend on the timing and amounts of radioactive products that actually reached southern latitudes.

Three types of fallout are defined according to the distance travelled from nuclear explosions. **'Local' fallout** consists of the larger, heavier radioactive particles that return to earth within two days of the explosion. These account for about 30% to 50% of all radiation from ground-level explosions. The rest are smaller, lighter radioactive particles that are lofted higher into the atmosphere, the 'delayed' fallout. Delayed fallout splits into two types defined by how high and far the particles travel. **'Intermediate' fallout** stays within the lower atmosphere to fall back to earth in rain or is pulled down by gravity within a few weeks. Intermediate fallout stays within the hemisphere of the explosion and makes up about 35% of all fallout. The remaining fallout is called **'global' fallout** and makes up about 13% of all fallout. It is the very small and light particles that are carried high into the upper atmosphere. They can stay there for months or years, circling the globe as they decay.

Given its southern location, only about 2% of the global fallout would reach New Zealand, eventually sinking in cold air masses to reach the ground in rain. Other southern hemisphere countries at similar latitudes would probably receive similarly small amounts of global fallout. Contrary to public fears, this amount of radioactive fallout over an extended period would lead to only a slight increase in cancers and deaths from cancer. For the 1987 study, scientific estimates put these as undetectable over a 70-year period. Scenarios that included 15 megatons of warheads exploded in the southern hemisphere, or a total of three megatons exploded on Australia, would still have small impacts on long-term cancer rates. In the latter case, however, cancers caused by iodine-131 could cause about 650 fatal cancers that would appear between 10 and 40 years later if no protective measures were taken. This total would be much lower if prompt preventative measures were implemented for two to three months, by which time nearly all of the radioactive iodine-131 would have decayed.

Since fallout fears probably still dominate the popular imagination (another consequence of the dominant northern narrative), this would be the first test of a government following news of nuclear war happening. The general shock of the news of nuclear war would be compounded by the likely anxiety amongst many New Zealanders over fallout risks. Rapid testing of air samples for radiation levels would be needed. Conveying the results quickly to the population with advice on the risks and what action to take, if any, would be an urgent task. The government would be faced with making decisions on more urgent matters, but responding effectively to the public's fear of radiation would be an early priority.

Nuclear Winter

In the 1980s, a major international research effort showed that the massive amount of smoke, soot and dust that would be released into the upper atmosphere from burning cities would cut out sunlight and drastically reduce global temperatures especially in the Northern Hemisphere. This 'nuclear winter' effect would continue for years and drastically cut, or eliminate, many basic food crops. The resulting starvation from these *indirect* effects would kill more people than would die from the *direct* effects of blasts and radiation. Early estimates were that an additional one to four billion people could die.¹⁰ Using more complex climate models, a recent study¹¹ estimated the impacts from six scenarios of injecting soot into the stratosphere. It concluded that more than five billion could eventually die from a major nuclear war between the United States and Russia. If the nuclear war was between India and Pakistan there would be less soot injected, but the study estimated that globally, more than two billion people could still die from the resulting drop in food production and an assumed suspension of international food trade.

The 1987 study considered the likely consequences of the possible temperature drops on agricultural production in New Zealand after a northern nuclear war. The science of nuclear winter and the implications for New Zealand and Australia were also elaborated in 1987 by Barrie Pittock.¹² New Zealand would certainly experience drops in temperatures over the following months and beyond, but they would be much less than in northern countries. Frost-sensitive crops that could be destroyed or severely reduced by unseasonal frosts include green beans, courgettes, kumara, potatoes, pumpkin, tomatoes, maize and wheat. Pasture growth would drop, causing a decrease in pasture production, especially in the first year.

The study concluded, however, that the magnitude of these reductions caused *solely* by temperature drops would be most unlikely to put the population at risk of starvation. New Zealand has a huge surplus of agricultural production that it exports compared to local consumption levels. Loss of wheat crops due to low temperatures could be the most serious shortage since New Zealand currently imports wheat. The following sections show why agriculture as a whole, and therefore food availability, would be affected to a much greater extent by other disruptions, quite apart from any nuclear winter impacts.

¹⁰ Mark Harwell and Christine Harwell, "Nuclear Famine: The Indirect Effects of Nuclear War," In *The Medical Implications of Nuclear War*. (Washington, DC: The National Academies Press, 1986). <https://doi.org/10.17226/940>. Accessed 5 February 2024.

¹¹ Lili Xia et al., "Global Food Insecurity and Famine from Reduced Crop, Marine Fishery and Livestock Production Due to Climate Disruption from Nuclear War Soot Injection." *Nature Food* 3, (2022): 586-596. <https://www.nature.com/articles/s43016-022-00573-0> Accessed 10 March 2024.

¹² Barrie Pittock, *Beyond Darkness: Nuclear Winter in Australia and New Zealand* (South Melbourne: MacMillan Company of Australia, 1987).

Trade Dependence and Financial Disruptions

The abrupt loss of northern hemisphere trade would have immediate and long-term devastating impacts on all sectors of the economy and affect everyone in New Zealand. The dependence on northern imports is pervasive and overwhelming. In 1987, over 80% of trade was with northern-hemisphere countries and a further 17% with Australia. That general pattern has changed little since then. The bulk of New Zealand's exports are agricultural and forestry products. The country's crucial imports, mostly manufactured, include all lubricating oils, ball bearings, motors, vehicles, machinery and medicines, plus a huge range of spare parts, building supplies and many industrial raw materials. New Zealand consumers rely on imports for most of their clothing and all of their smart phones, computing devices (laptops, etc.) and other sophisticated technologies that run modern economies, financial systems and data storage.

Rough estimates for the 1987 study suggested the loss of northern import and export markets could immediately reduce employment by 40-50%. So tied is the New Zealand economy to external trade that its loss would be pervasive and fundamental. It would quickly spill over into the financial sector, affecting banks and the stock market, upending prices as assets and goods changed in value overnight. What value would there be in shares, mortgages, pension funds and insurance contracts? What would city office blocks and luxury apartments be 'worth' compared to an old house on a large rural section with fertile soil? A cascade of effects in the financial sector would follow that might be less disruptive if there had been contingency planning for the initial crisis period and beyond. Coupled with the sudden loss of export-import related jobs, government would have to play a major role in trying to reduce the inevitable financial chaos.

How aware are New Zealanders of their massive dependency on trade and how any major catastrophic event would affect trade? For the nationwide public opinion survey done for the 1987 study only 4% of respondents identified 'loss of trade' as a 'most serious consequence' to nuclear war. This lack of public awareness of trade dependence is mirrored by an apparent lack of strategies for rationing and allocation systems to cover essential goods if trade stopped. New Zealand does not hold strategic stockpiles of important minerals or key industrial raw materials, unlike many European countries and the USA. The capacity to substitute, recycle and replace key imports would be severely limited without long-term advanced preparation. (The inadequate levels of fossil fuels held in-country is covered later.)

The 1987 study report referred to the increasing use of computers to process cheques. How quaint that seems now. In 2021, New Zealand banks largely stopped making checking facilities available to customers. Payment and withdrawal methods have become EFTPOS, internet and phone banking. Manual banking records have been digitized. The vulnerability of electronic deposits, payments and withdrawals is starkly revealed when there are technical problems or disruptions from natural disasters. On December 14, 2022, [EFTPOS NZ machines went down](#) across New Zealand because of an outage. The interruption was brief, but one reporter at a supermarket noted "Everyone was kind of milling around confused and then only people who had cash could buy things. It is chaotic." Chaos ensued for a brief period when electronic cards were suddenly useless pieces of plastic, yet this is

how a majority of people pay for a cup of coffee, airline tickets, or food. Or get cash out of 'money machines'.

Supply chain disruptions during and for long after the Covid pandemic were a major wake-up call for government and businesses. New Zealand discovered that being at the whim of international shipping lines, with limited influence over global supply chains, and far from key markets made the country very vulnerable. Supermarket shelves were empty of key products, exporters had goods stranded on wharves, and long lines of frustrated motorists queued for limited petrol. Many industries have since moved from 'just-in-time' delivery strategies which were vulnerable to delays in delivery, to a 'just-in-case' measures by holding larger inventories. The impacts of the Covid disruptions led to an investigation by the New Zealand Productivity Commission into the resilience of the New Zealand economy to supply chain disruptions.¹³ It warned the future will be increasingly volatile and uncertain. Some of its recommendations for improving supply chain resilience, e.g. building industry-government networks, would be equally useful preparation for much greater disruptions to trade flows.

Health

Loss of trade would cripple New Zealand's health care system. Medical supplies and pharmaceuticals (e.g. antibiotics, dental supplies, anaesthetics, contraceptives, laboratory chemicals and medical equipment) are almost entirely imported. What pharmaceutical are manufactured locally use active ingredients imported from northern hemisphere countries. The 1987 study found that the loss of imported insulin alone, in the absence of developing local supplies, would have killed over 6,000 severe diabetics within the first year. This would be five times the number of extra fatalities from cancers caused by radiation fallout over decades. At normal rates of use, most pharmaceutical supplies would last three to six months. Estimates were made that only an effective rationing system, promptly imposed, might extend supplies to a maximum of two years.

There is a growing pharmaceutical sector in New Zealand that is now making some pain relief medicines as well as nutraceuticals, supplements and animal health products. The question is whether it would have the capacity and expertise to produce the products on the World Health Organisation's (WHO) list of essential medicines to meet minimum national needs after pre-war supplies ran out. It would face significant challenges to do so. Would there be sufficient raw materials, key equipment, spare parts, knowledge, and the skilled staff willing to set aside personal traumas to work, and would companies cooperate to maximize their effectiveness? Higher level decisions and actions, well in advance of any hostilities, would be needed over funding and purchase of stockpiles of the active ingredients to last for, say, five years. What could be achieved during a time of severe social

¹³ New Zealand Productivity Commission, "Improving Economic Resilience: Report on a Productivity Commission Inquiry." (*New Zealand Productivity Commission*, 2024). <https://www.productivity.govt.nz/assets/Inquiries/resilience/NZPC-Improving-Economic-Resilience-inquiry-report.pdf> Accessed 11 March 2024.

upheaval is unknown, but the lack of action and preparation in advance would substantially reduce the chances of success.

The health of New Zealanders is dependent, however, on much more than medicines and health workers. It also relies on essentials such as clean water, operating sewerage systems, refuse collection, and access to healthy foods. Waste treatment needs a trained workforce, special infrastructure, electricity, fuel and transport. Rubbish collection, assuming there was diesel to run the trucks, would need a workforce that continued to put rubbish collection ahead of personal and family priorities. Pumps and machinery at sewage treatment plants would eventually break down if local substitutes for imported spare parts could not be made. Later failures of waste treatment systems would lead to water contamination, pollution, and finally the emergence of infectious diseases. As people's health declined and medicines ran out, the likelihood of chronic and infectious diseases spreading would rise. New diseases, such as plague and cholera, could arrive later with refugees. Hospital functions would steadily erode, intensive care facilities would become unusable as equipment failed, and operations could only treat a limited range of conditions. Dental care would become very basic. A collapse of the health system and spread of diseases would further weaken the social fabric and reduce the capacity of communities to meet the myriad other challenges they would be facing.

Agriculture

As mentioned earlier, temperature drops from nuclear winter impacts would reduce pasture growth and could seriously affect a number of crops. The major disruptions to agriculture, however, would come from within New Zealand, not from outside. With the loss of export markets, much of the farmed livestock would be a liability, not an asset. Farm machinery, food processing and rural transport all run on diesel which might run out within a few weeks. The loss of imported seeds for many vegetables, along with fertilisers, trace elements, animal antibiotics, pesticides, herbicides and fungicides would be felt over later months and years. If the usual strict animal vaccination programmes were not maintained, there would probably be cross-infection of people from animal diseases such as leptospirosis, tetanus, bovine tuberculosis and others. Disruptions to electricity supplies would affect milking, electric fences, irrigation pumps, shearing and other farm functions. Rural economies would be massively disrupted.

Related off-farm problems would appear quickly. Major urban centres have only two to three days' supplies of fresh vegetables and few urban New Zealanders (currently 84% of the population of 5.2 million) are self-sufficient in food. As fuel quickly became scarce, food supplies to cities from farms and food-processing industries would reduce and become erratic – assuming essential workers turned up for work and 'normal' commerce functioned in the chaos of the first days and weeks. Both would be problematic. There could be unplanned (and possibly chaotic) migration to rural areas from cities as jobs were lost and if cities became unsafe. There is not the housing stock or infrastructure in rural settlements to manage a large influx of dispossessed, jobless urbanites and the potential for conflict would be high.

Reorienting agriculture production to meet only domestic needs after nuclear war would be difficult, particularly in the absence of any strategic preparation. The survival of food-processing businesses might depend on how well prepared they were for major disruptions. Food processing companies have the same general problems of many other sectors of relying on imported spare parts for most (imported) machinery and would have to find local alternatives eventually, if possible. Over time, smaller operators able to process foods locally might emerge as an alternative as larger firms closed.

'Scaling down' of the large, industrialized dairy industry would be a logistical and organisational challenge, assuming that farmers could still get their milk to the factories. Expert advisors to the 1987 study advised that scaling down would be much easier if cooperative planning and research was done in advance. For example, dairy waste products, such as whey, could be used to make useful chemicals. Whey can be turned into some antibiotics, and also into methanol, ethanol, propanol, butanol, acetone and lactic acid. Acrylonitrile is another potential product that might be provide the basic feedstock for a plastics industry. Pre-disaster analysis would need to document production systems, work out what essential materials would need to be stockpiled and identify which existing facilities would be the best ones to use for such purposes. Other factories might be designated for rapid moth-balling for possible later re-opening. A reversion to smaller scale, local dairy operations and processing would be inevitable, probably including on-farm production of butter and cheeses. The most viable technologies would be open vat cheese-making and rotary churns to make butter after sudden or longer-term breakdown of important machinery. New Zealand once had all that equipment in abundance. What little remains can probably be found in small-town museums.

Food security is essential to any country's total security needs and wellbeing. If the only food issues to cope with after a major external shock were those related to having sufficient adaptive capacity, infrastructure, expertise, pasture and horticulture resources, then New Zealand could be considered to be well placed, even very well placed relative to many other countries after nuclear war. It has surplus animals, extensive horticulture, fertile lands, good rainfall, a modern agricultural infrastructure and a skilled workforce. Most importantly, any nuclear winter effects would be relatively minor. Would New Zealand therefore be able to adapt its agricultural sector and continue to feed the population? Such an outcome would be far from certain despite these advantages. Farms run on diesel which would run out in weeks at current levels of reserves and without rationing allocations in place. The fate of cities and the financial sector, as well as the ability of government to act quickly to hold the country together in the first chaotic days, weeks and months would shape a future that was potentially cooperative and functioning, or fragmenting and disintegrating. That outcome would determine the viability of food security for the whole country.

Energy and Transport

Modern economies run, literally, on fossil fuels (oil and gas) even when they have access to electricity. Fortunately, New Zealand's electricity is dominantly from renewable sources. Its power currently comes from hydro (about 58%), geothermal generation (about 18%), wind (6%), coal/gas (16%), solar (under 1%), and biogas (1%). This high proportion of electricity from renewable local sources means the country would be well placed to provide electricity after nuclear war. Experts advised the 1987 study that hydro stations should continue operating past the first two years without major problems. Then recycling, repairing and substitution would be essential as imported basic components failed or were used up. The orderly closure or reduction of the major industrial consumers of electricity, including an aluminium smelter and steel industries, would free up electricity for domestic consumption. Thermal stations use natural gas and coal to operate and could be sustained to some extent but would need to be wound back.

Managing and coordinating the sudden changes in demand for electricity as industries closed, breakdowns occurred, and making decisions on best uses of natural gas supplies, plus implementing conservation and rationing measures would be complex and difficult. Prior preparations for recovery and maintaining coordinated operations across the electricity, gas and coal sectors would certainly be beneficial. It could be the difference between a successful transition and major regional inequalities and breakdown. This all assumes that the diverse workforce running the various energy systems continued to do so throughout the initial shocks and disruptions, and beyond.

An EMP event affecting New Zealand would be catastrophic and immediate for the electricity network. The voltage surge would be two orders of magnitude greater than design limits for the network. There would be immediate loss across the electricity grid from short circuits as well as permanent damage to transformers. For the 1987 study, experts estimated that perhaps a quarter could be restored (unevenly) in two to ten days, and 40% to 50% after a year. Natural gas production and distribution would stop. Partial production and slow recovery might be possible after repairing damaged equipment. The impacts on electronic systems would be devastating, especially in banking and finance. Service station facilities providing petrol and diesel would be unable to operate pumps or process credit cards. Hand pumping of fuel would be needed, if available, for those with cash.

Aside from electricity, the other essential part of the energy mix is imported fossil fuels – diesel, petrol and aviation fuel. These account for around 45% of the primary energy consumption in New Zealand, 60% of industrial energy and 99% of transport energy. These percentages highlight a major national vulnerability if trade was to cease, or was significantly disrupted for long periods. Electric or hybrid vehicles made up only 2.2% of the national fleet at the end of 2023, and only 555 electric trucks were then registered in the country.

Over the past 30 years, political decisions have seriously eroded New Zealand's capacity for self-sufficiency in fossil fuels. These vulnerabilities have increased sharply in the decades since the 1987 study. Natural gas reserves are much reduced. Currently, estimated gas reserves will [last less than ten years](#) based on the average use rates of the past decade. This

would extend past ten years if use dropped significantly, but gas is likely to run out within a few decades. In 1997, the synthetic petrol plant at Motunui was switched to making only methanol for sale in Asia. (Previously, the methanol was further processed to make petrol.) Oil refining at New Zealand's only refining facility ceased in April 2022. In a [controversial move](#), the owner cited concerns over cyclical profitability and decided for corporate strategic reasons to close the refinery and then demolish it to leave an import-only terminal at Marsden Point. Several oil fields in Taranaki continue to produce high-quality crude oil that is all sold overseas. The country is now almost totally dependent on imports of all fuels, a very different and more precarious situation than 30 years ago.

Coupled with this near-total reliance on imported fuels (i.e. diesel, petrol, aviation), politicians have created a second major vulnerability that could be crucial to the economy and society if fuel tankers suddenly stopped arriving. New Zealand holds considerably lower onshore fuel stocks than most European countries despite being far more vulnerable to trade disruptions given its geographic remoteness from fuel suppliers. The International Energy Agency (IEA) agreement that New Zealand signed onto for energy security obliges it to hold oil stocks equivalent to at least 90 days of net oil imports. But currently, government requirements are for oil companies to hold less than 30 days onshore. The other 60 days of oil is either in tankers that are in transit, or in tanks in northern countries with the potential to be accessed, but only if supply chains are not broken and host governments permit its export. The absence of any additional contingency arrangements for supplying the country with crucial fuel in times of major international disruptions means the current policy is breathtakingly risky, given the economic costs that would be caused by an extended supply shortfall.

In a time of crisis, what could mitigate this vulnerability – the scarcity of local transport fuels and less than four weeks supply in the country? The locally produced methanol that is currently sold overseas could, despite drawbacks, be used as a fuel or fuel extender for cars, trucks, buses and ships. But advance planning and preparation would be needed. The high-quality crude from Taranaki could potentially supply about 10% of current fuel needs if Australian refineries would provide the capacity, and tanker transport could be found. Compressed natural gas (CNG) and liquified petroleum gas (LPG), produced in New Zealand, now fuels less than 1% of the national vehicle fleet.

The strategic advantage of having much [larger reserves](#) of diesel and petrol held in New Zealand is obvious, particularly for an extended supply shortfall. New Zealand's [National Fuel Plan](#) of 2020 assumes a supply 'crisis' would be over within months. It focuses on rationing fuel to 'critical customers' in an emergency but fails to identify in advance what quantity would be needed to sustain such services, and so what needs to be put in place for that contingency. It would help to have prepared and agreed in advance what level of stocks and other self-sufficiency measures need to be in place, together with what allocations of diesel would be made to keep critical sectors functioning while workarounds were developed where possible. Petrol is less critical, as over 90% is used for cars.

Diesel is the critical fuel. It runs emergency services, buses and trains, the five Cook Strait ferries, coastal shipping, the fishing industry, farm machinery, food production and processing industries, mining, forestry, and, most importantly, road logistics, which uses 80%

of the diesel stocks. Given the decline of rail networks over past decades, trucks are now essential for moving most goods around the country. Fuel supplies to some entire regions (the West Coast of the South Island and Manawatu/Whanganui) are completely dependent on trucked fuel. Getting all the necessary government agencies and private sector interests together to decide how to allocate finite diesel stocks after nuclear war had started would be extremely difficult, given all the other decisions government would be facing at the same time.

Communications and the Digital Meltdown

The ability of those in authority to communicate effectively during a disaster, as well as communication with families and friends, is essential to hold society together. This was evident during the Covid crisis in 2020 when daily national updates from New Zealand's Prime Minister created a remarkable sense of cohesion and 'togetherness'. By contrast, the consequences of bad communication were highlighted when deadly floods swept rapidly through Auckland city in late January 2023. Later, an [independent review](#) concluded:

Key leaders in Auckland City failed to appreciate the vital importance of visible leadership and frequent public communication during a time of crisis. Effective leadership in a crisis goes directly to public confidence in elected leaders, and thus to the overall health of our democratic institutions.

The same outcome, loss of public confidence, would be much greater during a more catastrophic national event if effective leadership and communications were lacking. At that time, one assumes the Prime Minister would be on radio and TV to reassure and appeal for calm, conveying vital information about what was happening internationally and locally. But radios and landlines have largely been replaced by mobile phones and TV is not the main news source for younger generations. Five fibre-optic submarine cables connect New Zealand to the United States and Australia for virtually all overseas communications. Satellites could provide limited capacity but would be swamped by demand if these cables stopped working.

The growing reliance on fibre-optic cables has clearly come at a cost should they fail or be targeted during a conflict. These cables carry almost all of the country's internet traffic, email servers, online banking, private sector data, EFTPOS transactions, health data, etc. They also link New Zealand to cloud computing and data storage which is effectively 100% offshore in United States computing facilities. Failure of this very complex, interlocked system, which would most likely happen first in the United States, would render people blind, dumb, ignorant and partially helpless with respect to electronic information and communication. And probably afraid. Email is not working, what is happening? How can I contact my partner, children? What should I *do*? Perhaps there would be time before an actual conflict broke out when systems were functioning normally to alert the public. But with rising tensions there would most likely be panic buying of food, fuel, and other things people suddenly decided were 'essential'. A rush to withdraw cash would put banks under pressure. How would leaders and government respond? That is impossible to say, because everyone would be in a world they had never 'known' before.

Beyond Natural Disasters

Natural disasters, such as fires, earthquakes and floods, happen reasonably frequently in New Zealand. The National Emergency Management Agency (NEMA) is the government lead for emergency management. NEMA states: “*We help build a safe and resilient Aotearoa New Zealand by empowering communities before, during and after emergencies.*” These disasters are local events; response and recovery happen with outside assistance. Would NEMA be the appropriate agency to have major responsibilities after nuclear war? Many of the NEMA structures could, indeed, be relevant. But any post-nuclear situation would be totally different from anything people had ever experienced, including those in authority. Key differences are summarised in the following table.

Natural Disasters	Nuclear War Aftermath
Disaster is localised	Whole country is affected
Help comes from outside	We are alone
Communications are unaffected	Major disruptions to information flows
Disaster period is relatively short	Problems multiply over years
Focus is on ‘return to normal’	‘Normal’ is not possible
Agencies have prior experience	Who ‘knows’ what to do?
Social knowledge of disasters	Misinformation is likely; there is no common experience to rely on
Communities cooperate and help	Increasing shortages lead to conflict
Authorities are trusted	Authorities might not be trusted
Focus on restoring infrastructure	Entire economic activity affected
People know things will get better	Things will get worse and ‘better’ may not happen
World view unchanged	World view shattered

NEMA has wide powers across central and local government for leading and coordinating ‘all hazards and all risks’ responses across New Zealand’s management system. But would it have the mindset and capacity to lead the response to a qualitatively different type of disaster?

People and Government Responses

The 1987 study investigated both ‘tangible’ and ‘intangible’ factors. It was easier to assess the ‘tangibles’ – material impacts on key systems (food, health, energy, etc.) – than it was the ‘intangibles’ – how people and institutions, including government, might respond. The study team interviewed a wide range of experts and senior government officials. The ‘intangibles’ were more subtle and probably more likely to determine ‘survivability’ as a functioning, cooperating country. People respond to natural disasters with a remarkable degree of self-control and adaptive behaviour. They have two dominant concerns, ensuring family members are safe and finding out what has happened. To make sense of disasters people urgently seek immediate and detailed information about the event, other threats and emergency needs. In short, they seek to reduce uncertainties based on accurate information (however dire) to decide on appropriate actions. The same concerns would arise, but in the shock and shattering of ‘normal’ it is not possible to say how people would react once war had actually happened.

Poor and inaccurate communications undermine public confidence. That was the lesson from the nuclear power station accidents at Three Mile Island (1979) and Chernobyl (1986). Strongly contradictory information and poor coordination between state and industry leaders at Three Mile Island left people depressed, frightened, and distrustful of inept leadership. After the Chernobyl explosion, confusing and contradictory information about radiation levels caused general panic in several countries. Fear was widespread, supermarkets and pharmacies were raided, and support for local and national authorities was seriously eroded. If there was a long lead time before hostilities, much could be done to consult widely, discuss options transparently, and fully engage with people across society and regions. The New Zealand government learnt from the Covid experience that Māori and Pacifica structures were more effective at building trust and engagement with their respective communities than Ministry of Health directives.

Contributors to the 1987 study were ambivalent about the appropriate role of central government after nuclear war. Some doubted that officials who were also coping with their personal concerns would be able to make the right decisions in a crisis if there had been little prior social engagement and preparation. Others thought government would assume ‘draconian powers’ over an unruly, unlawful populace. Optimists hoped that conditions would lead government and communities to develop cooperative power-sharing arrangements, possibly at regional scales. The forced contraction of activity because of fuel shortages would favour regionalism over central control, especially if communications were also degraded. Transport of goods and people between the North and South islands might cease without diesel supplies. An expert working party [described three models](#) of how government might respond and the possible consequences.¹⁴ The three (non-predictive) models were: panic and breakdown, a centralised repressive response, and a flexible regional response. Their paper emphasised that how government responded could be the

¹⁴ New Zealand After Nuclear War. The Background papers. 15. Policy Options and Planning Approaches for the New Zealand Government, by a Working party. (Wellington: New Zealand Planning Council, 1987). <https://www.mcguinnessinstitute.org/wp-content/uploads/2022/11/20221129-BP15.pdf> Accessed 6 February 2024

central element in recovery. It raised important questions about decision-making. What would be the most pragmatic and workable outcome – central or regional governance? How might power-sharing work when resources are in short supply and located unevenly? What roles might Māori tribal and business structures assume?

Increasing Resilience

‘Resilience’ is a current buzz word with multiple definitions. This paper has used it as defined by ecologists, namely as an important property of the social-ecological systems that we all live within. In this context, resilience thinking is systems thinking. An important concept in systems thinking is that social-ecological systems are complex adaptive systems.¹⁵ They change, but not in predictable, linear, or incremental ways. They can exist in more than one kind of ‘regime’ with different functions and structures. The three models in the previous section described different possible regimes that New Zealand might ‘flip’ into following a catastrophic disturbance. A cornerstone of the ability of any social-ecological system to persist is resilience. Resilience is less about the speed of bouncing back, and more about the ability to get back at all. A resilient social-ecological system is better able to avoid flipping into an undesirable regime in the face of external disturbances, e.g. from democracy to fascism.

The 1987 study identified four themes that were lowering resilience and would make the ability of New Zealand to ‘bounce back’ more difficult after a major shock. The first was trade dependence that has been discussed already. The second was the increasing adoption of advanced technologies that are far more vulnerable to the loss of imports and a diminished capacity to develop local substitutes. Since then, newer technologies have lowered resilience even further. One example is the near total reliance on imported mobile phones that, unlike their older manual counterparts, or land line networks, cannot be repaired locally. Health workers rely on convenient, imported one-use plastic syringes, so stocks of re-usable glass syringes are destroyed. Repairing vehicles with locally made parts is more difficult given the complexity of modern motors. The loss of skills and knowledge to actually make older workable substitutes has also eroded or vanished. These trends are not unique to New Zealand, and reflect the success of globalisation at the expense of local industrial capacity.

The third theme was the vulnerability associated with the tight interdependence between sectors. Many key systems are so strongly interconnected that vulnerability or failure in one threatens or disrupts others. Conversely, reducing vulnerabilities or easing the connections between systems would increase resilience of the system overall. One example is the near-total reliance now on road transport to move goods around the country since the previous extensive rail network linking major centres and regional towns has been massively downgraded. This strategic weakness disrupts other key sectors – food distribution from farms and food-processing industries to cities being an obvious one. Loss of electricity would disrupt natural gas production, the operation of cell phone towers, and

¹⁵ Brian Walker and David Salt, *Resilience Thinking. Sustaining Ecosystems and People in a Changing World* (Washington DC: Island Press, 2006).

much industrial and business activity. The reliance of people's health on so many systems beyond medicines (clean water, sewerage treatment, food, etc.) has already been mentioned.

The fourth theme, and the one that really stood out in 1987, was the lack of contingency planning or preparation by successive governments. This was, and remains, a major weakness. It is also the one that is the easiest and cheapest to fix. Some shortcomings were material and structural – no stockpiles of strategic minerals (unlike other developed countries), inadequate levels of on-shore fuel stocks, and limited capacities for making substitute goods, for example. Other shortcomings were less tangible – poorly informed and misinformed citizens, no analysis linking government, the private sector and the public on how to respond to the multiple crises in finance, banking, health, agriculture or energy sectors. If this is not done in advance of catastrophic events it is unlikely to be done quickly and effectively in the chaos afterwards. Resilience would be low, and the country would be more likely to flip into an undesirable state (repressive control, open conflicts, or?).

The 1987 study was well received across the political spectrum with extensive and positive media coverage. Preliminary work and funding for a larger, more in-depth second study was initiated. The first study was done by an independent body, but the second was based in a government agency (Ministry for the Environment) and thus vulnerable to bureaucratic interference. It died quickly, for reasons unspecified. One can speculate that it did not suit the interests of agencies focused on other security and foreign relations interests.

Key Findings

1. Radioactive fallout and 'nuclear winter' effects would be relatively small in New Zealand given its geographical distance from likely areas of nuclear conflict.
2. Abrupt cessation of trade would have an overwhelming, disruptive impact on all aspects of the New Zealand economy and society given it imports most of the goods essential for economic activity across all sectors, including health.
3. As a food exporter, New Zealand should have the capacity to feed its population, but its food security is dependent on diesel (which would quickly run out) for on-farm activity, food processing and transporting, and a functioning rural sector.
4. Options for energy self-sufficiency in fuels have been substantially degraded over the past 30 years although electricity is mostly generated from renewable sources and is reasonably resilient to shocks. On-shore fuel reserves are seriously inadequate.
5. The digital modernizing of many sectors (e.g. banking, finance, communications, data storage) is so heavily reliant on overseas equipment and links (fibre optic cables) that their abrupt loss would be catastrophic, especially for government-public communications when it was most needed.
6. The country is vulnerable to the interdependence between sectors. Failure in one could bring down others. A cascade of failures is not inevitable; by improving resilience and creating some independence between them, it might be avoided.
7. The impacts of nuclear war on New Zealand are inadequately researched. The 1987 study identified many cost-effective initiatives that would increase an understanding of impacts and reduce their effects. More investigation is needed (see below).

How New Zealand Should Prepare

Covid taught New Zealand's industries and government the value of proactive preparation against supply chain shocks. They need to apply the same logic and action to thinking how they would respond to far greater threats to the economy and society, such as a global economic collapse, a more deadly pandemic, or nuclear war. The [current national security strategy](#) for New Zealand takes a broader view of 'security' than in the past with repeated references to resilience. One of the three outcomes is: "*A resilient society, informed and engaged on national security challenges.*" This includes "Working Together" with New Zealand society by building "Understanding", "Preventing", and "Preparing". The latter is defined as "*Being prepared involves identifying vulnerabilities and building collective resilience to ensure that we are able to meet challenges and recover when needed.*" This is exactly what the above, second study was intended to do after 1987, in the context of recovering from nuclear war.

'Preparing' in the context of national security should therefore also include preparing for catastrophic events where New Zealand was collateral damage, not a direct target. A two-phase approach is recommended. The first phase would involve funding an independent specialist unit (of eight to ten people) for a set period (ideally three years). The unit would focus on in-depth analysis of national vulnerabilities, how to reduce impacts, and develop preparation options. It should have cross-party support with direct reports to Parliament. It would engage across government agencies, Māori organisations, the private sector and communities. It would also engage with different sectors (e.g. health, finance, energy, agriculture) to set up separate working groups and identify options to improve resilience as safeguards against catastrophic events. Appropriate governance models for different levels of economic disruption should also be explored. Citizens assemblies would be an effective and valuable way to engage the public in some of these initiatives.

The gains from this first phase could easily be eroded and lost through inertia and bureaucratic neglect. Hence the need for a long-term 'home' for implementation actions, monitoring and public engagement. Since the National Security Strategy and the National Emergency Management Agency are both responsibilities of the Department of the Prime Minister and Cabinet (DPMC) this is the logical place to establish a small, specific unit for implementing ongoing responsibilities. Despite the difficulties of getting politicians to think beyond tomorrow, implementing the proposals outlined here would make New Zealand much better prepared to weather the extraordinary shocks and existential threats that could well threaten its future survival as a democratic society.

Policy Implications

One objective in writing this brief was to argue that the ‘we are all doomed’ narrative after nuclear war is both unrealistic and, paradoxically, disadvantages non-combatant countries. Current scenarios for different nuclear wars between nuclear states (e.g. USA and Russia, or India and Pakistan) would leave billions of survivors. What happened next would depend, in part, on the resilience of countries and what they had done that improved their resilience before war happened. ‘Doomed’ makes efforts to increase resilience seem futile. Despite the difficulties of getting traction from politicians and policy makers, other countries are encouraged to consider what has been done in New Zealand and undertake their own evaluations of strengths and weakness in the context of nuclear war and other global threats. We now live in such a globalized, inter-connected world that there are other, more likely, disruptions – economic collapses, or pandemics more deadly than Covid – for which preparation would be advantageous. All efforts to eliminate nuclear weapons must, however, be given the highest priority.

The Author

Wren Green was the Project Leader for the New Zealand Planning Council study into the consequences for New Zealand of nuclear war. In 2022, he updated the findings of that study for the McGuinness Institute. He is a past-President of the New Zealand Association of Scientists and served eight years on the Council of the International Union for the Conservation of Nature (IUCN).

Disclosure Statement

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