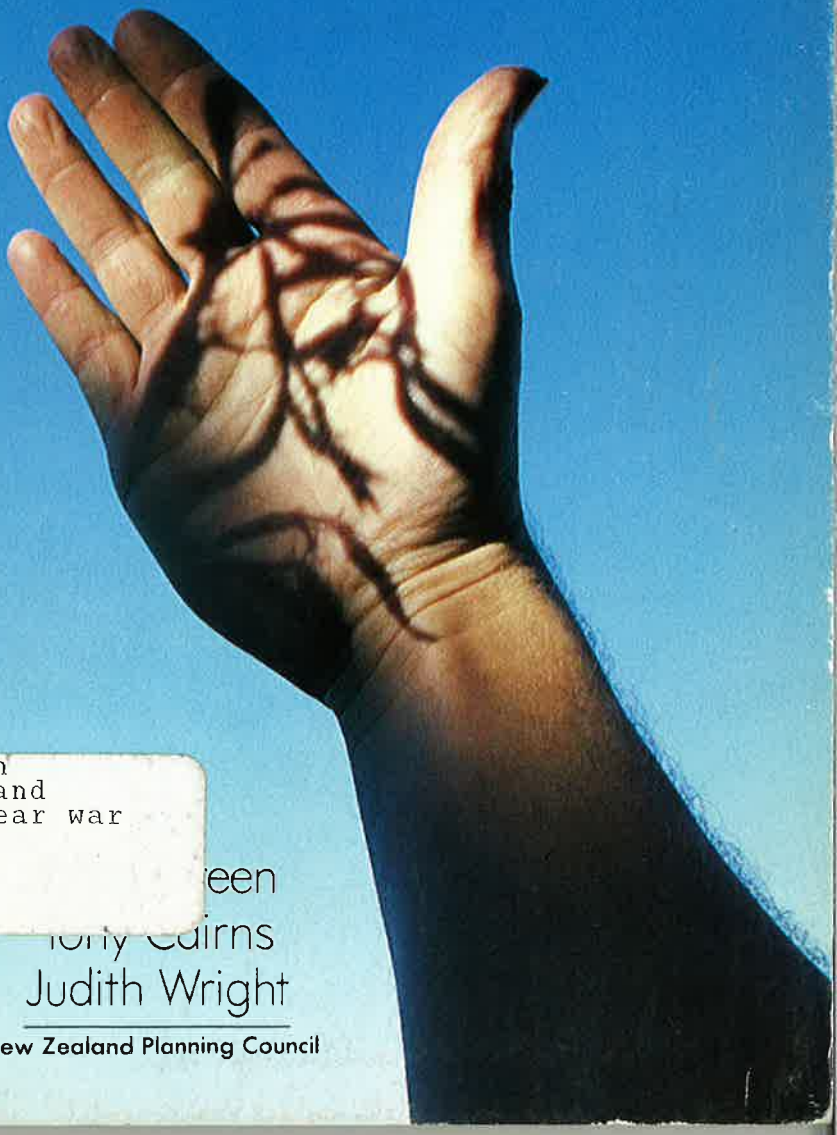
New Zealand AFTER NUCLEAR WAR



Wren Green
Tony Cairns
Judith Wright

New Zealand Planning Council

NEW ZEALAND AFTER NUCLEAR WAR

It is essential that not only governments but also the peoples of the world recognise and understand the dangers in the present situation.... Removing the threat of a world war – a nuclear war – is the most acute and urgent task of the present day.

United Nations General Assembly
First Special Session on Disarmament

Our representatives depend ultimately on the decisions made in the village square ... to the village square we must carry the facts.

Albert Einstein

New Zealand AFTER NUCLEAR WAR

by
Wren Green
Tony Cairns
Judith Wright

August 1987

New Zealand Planning Council
PO Box 5066
Wellington
New Zealand

DESIGNED BY BRIAN MOSS
COVER PHOTOGRAPH BY MARCEL TROMP
PRODUCED BY PLATFORM PUBLISHING
PRINTED BY WRIGHT & CARMAN

ISBN 0–908601–56–5
ISSN 0111–0470

CONTENTS

LIST OF FIGURES

LIST OF TABLES

FOREWORD

NUCLEAR WAR IS A POSSIBILITY THAT MUST BE FACED, however horrifying the prospect might be. The Planning Council undertook this study of the impacts on New Zealand of a nuclear war because it felt the possibility should be examined rather than ignored. The outcome of the study justifies this judgement. The issues for New Zealand are very different from those most commonly perceived. Knowing what they are should encourage our efforts to prevent nuclear war and give us some basis for coping should prevention fail.

The project has been difficult and challenging. Information from many unrelated sources had to be assembled, assessed and assimilated. The task of the project team would have been impossible without the assistance of the many people in New Zealand and overseas who willingly gave their time and energy to it.

This was intended to be a preliminary study. The team has achieved much more than that. While no study of such a complex, hypothetical event can be definitive and more research and information is needed, the team has taken its work beyond the preliminaries to the point where proposals for action can be properly considered.

Readers will find this report useful for more than its designed purpose. In the course of exploring the impacts of a nuclear war, the authors have provided a valuable picture of the mechanics of New Zealand society and thrown light on the roles and interdependencies of its elements.

The report is only part of the result of the project. The background papers from which it is drawn and the Planning Council's recommendations for further study and action are also available from the Council.

Funds for the project came through the Ministry for the Environment. The Minister's forbearance in granting an extension of time to complete the study and in respecting the Planning Council's independence is appreciated.

To the authors Wren Green, Tony Cairns and Judith Wright, other members of the study team and the many contributors within and outside the Planning Council's secretariat I offer the Council's thanks.

GARY HAWKE
Chairperson

INTRODUCTION

THIS BOOK IS THE RESULT OF A STUDY of how New Zealand would be affected by a nuclear war. A team was set up under the auspices of the New Zealand Planning Council, after the government allocated $125,000 from reparations paid as a consequence of the sinking of the Rainbow Warrior in Auckland Harbour. The six month contract stated that the study should be a preliminary overview, looking at environmental, social and economic impacts on New Zealand of a major nuclear war in the Northern Hemisphere and identify important issues where further second-phase studies and actions are required. This study assumes New Zealand was *not* a direct target.

The time constraint meant that the material had to be gathered as quickly as possible. This, and the wide range of topics studied, has meant that there may be inaccuracies in the report, and there are most certainly omissions. However, it is the view of the authors that the order of any errors or omissions is not so great as to detract from the overall message, that catastrophic long-term impacts would be experienced in New Zealand, not from environmental effects, but from major social disruptions that would spread to every aspect of life in New Zealand.

It was discovered in the course of this study that public understanding of the issues reflects a Northern Hemisphere bias with fear of radioactive fallout being a major concern. Since the nuclear bombings of Hiroshima and Nagasaki, public understanding of the consequences of nuclear war has been largely limited to the direct effects of nuclear explosions. However, the indirect, long-term effects of nuclear war are now being recognised by scientists as being even more devastating, particularly for non-combatant countries.[1] For this reason considerable effort has been made to make this book useful to the general reader with the first four chapters answering some general questions about nuclear war, radiation, "nuclear winter", and the lesser known phenomenon, electromagnetic pulse (EMP).* Chapters 5-16 each give an overview of the main impacts on a

* *See Chapter 4 for detailed explanation of electromagnetic pulse and its effects*

particular sector, consider how they might be dealt with and conclude with a summary of the planning and policy issues that have been raised.

In order to study how New Zealand would be affected by a nuclear war, it was necessary to first compile information on how particular aspects of New Zealand society operate and interact. Much of the material for this report has been based on information supplied by many individuals and organisations throughout New Zealand with special expertise and knowledge. Their contributions, and detailed research have been summarised into Background Papers (see Appendix 2) which are available from the Planning Council. They provide more detail for both the scientist and the general reader.

THE AUTHORS

WREN GREEN, BSc (Hons), PhD (Environmental Science) is a member of the New Zealand Royal Society's Scientific Committee on Problems of the Environment (SCOPE), and was the New Zealand delegate to the 1985 SCOPE General Assembly in Washington DC where the findings of the international study of nuclear winter effects were presented. Dr Green is a past president of the New Zealand Association of Scientists. As a Council member of the New Zealand Ecological Society he co-ordinated the 1984 Statement on the Environmental Impacts of Nuclear War on New Zealand.

TONY CAIRNS, BA, BSc and JUDITH WRIGHT, BA, Dip. Tchg are both researchers.

RESEARCH METHODOLOGY AND ASSUMPTIONS

THIS IS A NATIONAL CASE STUDY of the effect of a nuclear war on a non-combatant, non- nuclear country far from the "war zone". It builds on both international and local investigations into the consequences of nuclear war and it is hoped that it will, in turn, prove helpful to other countries initiating national case studies on the consequences of nuclear war.

Previous New Zealand studies have concluded that local impacts were likely to be dominated by social disruptions, but they have not examined, in any detail, the massive effects of an electromagnetic pulse (EMP) and they also pre-dated the research findings now available on "nuclear winter" effects.

This study examines both environmental and social issues.

PREVIOUS RESEARCH

International research

Since the first atomic explosions in 1945, most of the research into the effects of nuclear war has been focussed on the direct effects of nuclear explosions. Weapons tests have yielded quantitative information from which the impacts of blast, fire and initial radiation have been calculated.[1,2,3] Medical studies of survivors from Hiroshima and Nagasaki have documented the

long-term effects of radiation on people.[4] Therefore, until the recent research on the indirect effects of nuclear war, scientific and public attention has focussed on the horrifying images of death by blast and radiation and the massive destruction likely to occur in combatant countries. These images now dominate people's perceptions of nuclear war even in countries that are unlikely to be direct targets of nuclear attack. This affects the way people think about nuclear war and the way they would react should it occur (Chapter 5).

The first indirect effect of nuclear war to be recognised and studied was that areas remote from a blast site could be affected by radioactive fallout. A 1954 nuclear explosion produced a zone of radioactive fallout which extended several hundred kilometres downwind from the Bikini Atoll test site. It eventually covered an area of 5000 km^2 and resulted in the study of the long-term global fallout of radioactive particles.

Depletion of the atmospheric ozone layer was the next major indirect effect of nuclear explosions to be recognised. In the 1970s, scientists discovered that nitric oxide (NO), one of the products of nuclear fireballs, could reduce the ozone layer by 15-45%.[5] Without the shielding provided by ozone in the upper atmosphere, more ultraviolet (UV) radiation would reach the earth's surface. This would increase the risk of cancers (especially of the skin) and sunburn, and adversely affect plant growth.

Another indirect consequence of nuclear war, often referred to as "nuclear winter", was recognised in 1982. It was realised that large fires started by nuclear fireballs would produce enormous amounts of sooty smoke that would absorb sunlight.[6] This reduction in the amount of sunlight reaching the earth would have a cooling effect (see Chapter 2).

The research focus on the physical and atmospheric effects was then broadened to include ecological and agricultural effects in an international collaborative effort requested by the International Council of Scientific Unions (ICSU), a non-governmental group of scientific organisations. In late 1982, the Scientific Committee on Problems of the Environment (SCOPE), began an assessment of the environmental consequences of nuclear war on behalf of ICSU. The SCOPE study [7,8] confirmed the concept of "nuclear winter" and made major advances in showing that the resultant collapse of agricultural systems could place a majority of the surviving global population at risk of starvation. Scientists realised that the indirect and long-term effects of a nuclear war could be as catastrophic as the direct effects (Chapter 2).

New Zealand research

The Commission for the Future's report *Nuclear Disaster*, published in March 1982, considered four scenarios ranging from a nuclear war in the Middle East to a global war including nuclear attacks on New Zealand. The Commission's study pre-dated information on "nuclear winter" and did not analyse in detail local social impacts or the effect of an EMP. An important result of the Commission's study, however, was the conclusion that "the impacts on New Zealand of a Northern Hemisphere nuclear war are unlikely to result from fallout or other weapon effects, and the most serious would result from the loss of trading partners." [9] G. Preddey, the principal author of the report subsequently incorporated many of these ideas in a later publication, *Nuclear Disaster. A New Way of Thinking Down Under*.[12]

In December 1984, the New Zealand Ecological Society published a survey of literature on global disruptions to climate, and interpreted them for New Zealand's circumstances.[10]

In 1985 the Royal Society of New Zealand released a report *The Threat of Nuclear War: A New Zealand Perspective* which examined general issues including weapons, the role of scientists in the nuclear arms race and disengagement strategies.[11] The medical and economic implications for New Zealand of losing trade links with Northern Hemisphere countries were considered and found to be of major importance. Other social issues were not examined.

REASONS FOR THIS STUDY

The release of the SCOPE report in September 1985 found a receptive audience amongst the New Zealand scientific community. It provided both the understanding of global impacts on which a New Zealand case study could be based and the incentive to build on the SCOPE findings at the national level.

Effects on society had been outside the brief of the SCOPE study but the report had concluded, "There is a critical need for comprehensive and concerted study of the potential societal responses to nuclear war". [8] Such studies were seen as the responsibility of individual countries to investigate.

While the scientific support in New Zealand for a study which exam-

ined both environmental and social impacts was growing throughout 1986, other related concerns were being expressed. Public interest groups, while arguing the imperative of preventing nuclear war, also saw that it would be irresponsible not to consider ways to reduce the impacts of nuclear war on New Zealand. They, and others,[12] favoured some planning to increase the likelihood of survival in New Zealand. Public support for planning was revealed in a survey for the 1986 Defence Committee of Inquiry which found that 82% of New Zealanders are "strongly of the opinion that there should be some preparation or plans being made for coping with the aftermath of a nuclear war in the Northern Hemisphere".[13] The Committee report stated the need for "a realistic assessment of the risks, consquences and measures required in the event of a nuclear conflict." These studies made it clear that there was a need for an up-to-date New Zealand case study.

METHODOLOGY

The study team was given six months to identify the conditions likely to face New Zealand following a large-scale nuclear war in the Northern Hemisphere, and investigate the impacts of those conditions on the environment, society and economy. It was therefore necessary to gather information as rapidly as possible from a wide range of sources and contributors. The approach taken was therefore primarily investigative and consultative. Because of their obvious importance, the main topics chosen were food, health, energy, communications and transport. While there are separate chapters on the effects on human behaviour and the economy they are brief because references to these two themes are made directly or indirectly throughout the chapters on all the other topics. Given more time, impacts on other sectors such as education, social welfare, manufacturing and the construction industry could also have been investigated, although this could not have been done until the impacts on the above topics were established, since to a large extent they depend on the systems providing food, energy, communications and transport and maintaining health. As a starting point, basic assumptions on the conditions likely to face New Zealand after a major nuclear war had to be established. These assumptions were developed using the available literature and in consultation with scientists, (see following section). Events leading to and during a nuclear war will not necessarily follow any specific scenario, so this study

could not possibly cover all eventualities. For practical reasons, impacts have been assessed according to a particular set of assumptions and this should be borne in mind when reading the report.

Likely responses to such post-nuclear war conditions were explored early in the study through role plays and structured discussions with several groups of people. These were very useful in identifying the potential for conflict between the responses of government and its officials and those of the general public. They underlined the vital importance of social and governmental responses.

Information and opinions were collected from organisations and individuals with specialised knowledge in particular areas, such as farmers, medical doctors, engineers, academics and city planners. Some 300 individuals were contacted, provided with the assumptions and asked a series of questions concerning the short- and long-term impacts on their area of expertise.

Their responses were refined through further consultation with other experts. Interviews were conducted with senior government officials to assess likely impacts on their departments and to find out what preparations, if any, had been made against the event of a nuclear war.

Several people were commissioned to write background papers on specified study topics. These papers draw on background literature, some of it from overseas work; on responses to the questions posed in the current study; and on discussions with the Nuclear Impacts Study team. These papers provided the base for this overview report but they are also being made available as background reading (see Appendix 2).

In order to seek opinions beyond the group of experts and officials, a public opinion survey was commissioned, based on a random sample selected to represent the New Zealand population. The aim of this survey was to find out what people think would be the likely impacts of a nuclear war on New Zealand (Appendix 1).

STUDY ASSUMPTIONS

In order to provide a starting point for analysis of the impact of a nuclear war on New Zealand, seven assumptions were made on the nature and extent of a hypothetical war. Two of the assumptions included variable outcomes to accommodate uncertainties.

1/ *A major nuclear war occurs in July in the near future.*

2/ *Bombing is confined largely to the Northern Hemisphere and New Zealand is not a target.*

3/ *Conditions in New Zealand are much as they are today with little effective planning or preparation undertaken in any pre-nuclear war crisis phase (weeks or months).*

4/ *All trade between the Northern and Southern Hemisphere ceases for the foreseeable future.*

5/ *Because of destruction of ozone in the upper atmosphere, caused by oxides of nitrogen from nuclear fireballs, ultraviolet (UV) levels increase by about 50% for a year and decline to normal over the next year.*

6a/*Three Australian-USA communication facilities at North-West Cape (Western Australia), Pine Gap (near Alice Springs) and Nurrungar (South Australia) are all destroyed by separate nuclear strikes. Re-establishment of trade with Australia is possible, but at reduced levels.*

or

6b/*As well as the destruction of the three communication facilities some military bases and cities are destroyed by direct targeting. These include the naval facilities at Cockburn Sound (Western Australia), Darwin's RAAF base, Canberra, and another major eastern city. In addition, a high altitude nuclear explosion 400 km above southeast Australia covers New Zealand and two-thirds of Australia with an electromagnetic pulse (EMP) (see Chapter 4). Because of the destruction in Australia and the widespread disruptions caused by the EMP, trade between the two countries collapses.*

7a/*New Zealand experiences no significant changes in temperature.*

or

7b/*Temperatures drop by an average of 3°C throughout the New Zealand spring months (September-November), by an average of 2°C throughout summer, and by 1°C for the following 18 months. Thus, temperatures are below average for two years in total.*

BASIS OF THE ASSUMPTIONS

The reason for assuming that war occurs in the near future was to ascertain how New Zealand would cope at its present level of preparedness and with its existing resource base and social and industrial structures. These factors change constantly and future trends may enhance or diminish New Zealand's capacity to cope. The assumption does not imply that nuclear war is particularly likely in the near future.

While a nuclear war could occur in any season, the time of year would make a significant difference to the effects on Southern Hemisphere climate. Nuclear war during a northern summer (July) would lead to more smoke travelling south than would occur during a northern winter (Chapter 2). This smoke would block sunlight and cause surface temperatures to drop.

Since the terms of reference for the study specified a large-scale nuclear war in the Northern Hemisphere, this study assumes an escalating conflict between NATO and Warsaw Pact forces, starting with attacks against key military targets, escalating to destruction of secondary military targets, then the military industrial base and finally attacks against economic targets. Over 10,000 nuclear warheads with an explosive force of 5,000 to 6,000 megatons are assumed to be used. This general scenario for nuclear war has been used in several recent studies of the consequences of nuclear war, and was the basis for the international SCOPE study.[7,8]

The assumption that New Zealand would not be a target was developed after considering the strategic military interests of the USA and USSR as revealed through the available information on the USA's SIOP (Single Integrated Operational Plan) and expressed Soviet policy.[14,15] As stated in the Ministry of Defence Report [16] New Zealand has no military or communication facilities of major strategic importance to either superpower.

Loss of trade between hemispheres is assumed because, whilst many Northern Hemisphere countries would not be targeted during nuclear war, northern non-combatant countries would still experience the severe impacts outlined in Chapter 2. Many societies would be stressed past breaking point. Consequently, a sudden end to organised trade is likely between northern countries and more particularly with Southern Hemisphere countries. Countries would turn inwards to their own problems. Localised land-based trade might continue, but sea-based trade would effectively cease for some time.

The three Australian communication facilities (see Fig 1) are widely regarded as high priority targets because of their importance to the USA's nuclear war strategies. The latest admission of their significance as potential nuclear targets was contained in the 1987 Australian Defence Department report which stated, "... there is a need for the appropriate government bodies at various levels to undertake basic civil defence planning for the protection of the population in the areas concerned."[17]

The more extensive bombing in Australia and a high altitude explosion to generate an EMP (Assumption 6b) may be viewed as less likely, but is still plausible. Strategic analyst Desmond Ball wrote in 1983:

> "There is now a widespread acceptance within the defence community of the argument that Australia's hosting of American defence and intelligence installations is likely to involve Australia in a nuclear war in which not just the installations but perhaps also Australia's military bases and facilities, and even cities, might be targets."[18]

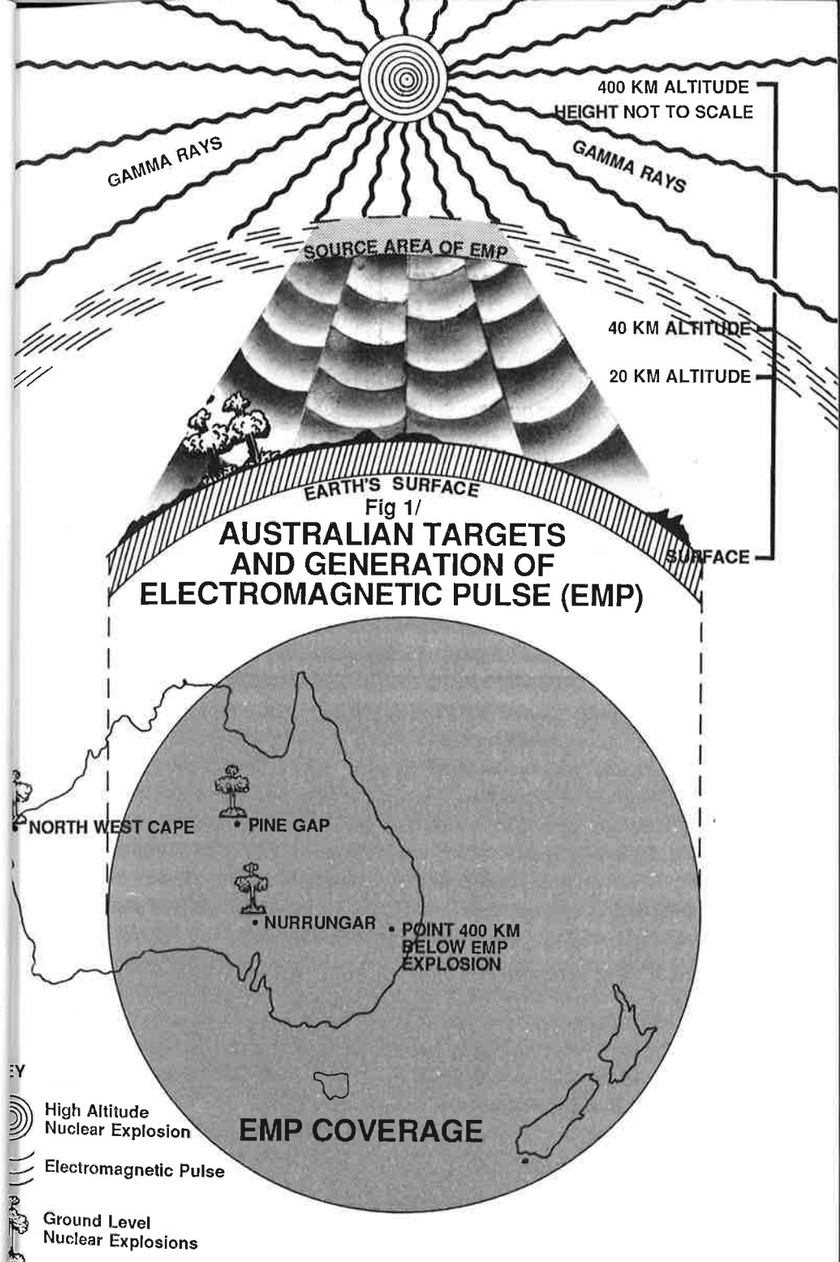
Assumption 6b includes New Zealand being covered by an electromagnetic pulse (EMP). While this is generally regarded as an unlikely event, it is nevertheless possible and the effects would be catastrophic, dramatically altering the picture of post-nuclear war New Zealand.

Chapter 4 discusses EMP in some detail, explaining what it is and describing the massive devastation it could cause (see Fig 1).

High altitude explosions generating EMP effects would satisfy a number of military objectives. First, the disabling of command, control, communication and intelligence centres that are integral to the military infrastructure for fighting nuclear war. Second, the crippling of industries and economic activities in countries to reduce their value as forward bases or manufacturing centres. Third, the disabling of satellites with military functions. The SCOPE report suggests that future development of space-based defensive systems ("star wars") could lead to much higher numbers of high altitude nuclear explosions in the event of nuclear war.[7]

Two high altitude explosions over Australia would be sufficient to disable the communication bases and disrupt Australia's economic activity. The EMP effects on New Zealand might therefore be the incidental outcome of an EMP-generating explosion over eastern Australia, designed to disable the Nurrungar facilities in a pre-emptive attack. Assumption 7a

Fig 1/
Ground level explosions are shown at the three communication facilities. The high altitude explosion is centred on the south-east coast of Australia creating an electromagnetic pulse (EMP) over an area that includes New Zealand.



allows for a nuclear war during a Northern Hemisphere winter when the amount of smoke reaching New Zealand might be too small to affect the temperature (Chapter 2).

The temperature decreases were chosen for Assumption 7b after consultation with the SCOPE study authors. It assumes the nuclear war takes place in the Northern Hemisphere summer. The smoke from a July war would reach New Zealand in significant quantities by the end of August and would then depress spring temperatures. The smoke clouds corresponding to these temperature drops could reduce light levels by about 20% for the first year. Average temperature drops would be greatest for inland areas of Otago and central North Island.

The study assumed no change in rainfall levels. Rainfall might decrease, but the effects would probably vary between different parts of the country and cannot be usefully estimated at this time.

It is recognised that many of the assumptions are arguable since no-one can predict exactly what would happen in a nuclear war. However, the study team took all reasonable steps to ensure the assumptions were sound, searching literature and consulting with scientists and nuclear war specialists, locally and internationally.

SOME IMPORTANT QUESTIONS ABOUT NUCLEAR WAR

ALTHOUGH THE LIKELIHOOD OF NUCLEAR WAR remains small, it is still high enough to justify concern, given the severity of the impacts it would have. This chapter evaluates the likelihood of nuclear war and summarises the likely disruptions to global climate, environmental impacts, and the long-term consequences for the world's population for both Northern and Southern Hemispheres.

HOW LIKELY IS NUCLEAR WAR?

It has been said that: "Deterrence should never fail for the simple rational reason that the horrors and costs of nuclear war would be so overwhelming that no advantage could be gained from it" (USA Arms Control Agency 1975). However, dismissing the likelihood of nuclear war on these grounds is inadequate. That it is *possible* means the likelihood is greater than zero. The deterrence theory depends on it being possible since a deterrent is not effective if the enemy is certain that it will never be used.

Both superpowers have threatened to use nuclear weapons against each other during international crises several times over the past 40 years. There is no guarantee that a future crisis that escalates to a "launch-on-warning" alert will not – through human error, false alarm, system failure or bad judgement – precipitate a decision to launch nuclear missiles.

There is increasing concern over the risks of accidental nuclear war because of the enormous computerised complexity of the nuclear forces of both superpowers. In 1986, scientists from East and West at the 14th Pugwash Workshop on Accidental Nuclear War concluded that the most