HUMAN HEALTH AND CLIMATE CHANGE IN OCEANIA: A RISK ASSESSMENT 2002

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CONTENTS

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2. EXECUTIVE SUMMARY

It is now widely considered in the scientific community that the world has begun to warm as a result of human influence. Climate change, in turn, causes various environmental and ecological changes. Some of these changes (such as sea-level rise) will continue to respond to this century's warming for many centuries. Climate change differs from many other environmental health problems because of its gradual onset, widespread rather than localised effects, and the fact that the most important effects will probably be indirect.

This document provides a risk assessment of various potential health impacts of climate change over the coming decades in Australia and, in specified instances, neighbouring populations of New Zealand and the Pacific Islands. There are large uncertainties in climate change health risk assessments. To address this, a range of climate change scenarios is used to represent a combination of the various intrinsic uncertainties around projections of future climate. Additional statistical uncertainties exist around the dose-response relationship between climate and each health impact, and the potential modifying effects of future adaptation.

The key findings are summarised below.

- Extreme temperatures currently contribute to the deaths of some 1100 people aged over 65 each year in 10 Australian and 2 New Zealand cities. The projected rise in temperature for the next 50 years is predicted to result in a substantial increase in heat-related deaths in all the cities studied, in the absence of adaptive measures. Temperate cities show higher rates of deaths due to heat than tropical cities. Global warming is projected to reduce the number of cold winter days, and a few cities may experience fewer annual deaths in the short-term. In the medium to long-term, however, these health gains would be greatly outnumbered by additional heat-related deaths.

- Extreme rainfall events are expected to increase in almost all Australian states and territories by 2020. Annual flood-related deaths and injuries may also increase by up to 240%, depending on the region. The situation by 2050 is mixed. As the climate changes, parts of Australia are projected to have substantially less rainfall, and in these places the risk of flooding is predicted to reduce. Most parts of the country, however, are still predicted to be at far greater risk of flood-related deaths and injuries than at present.

- The "malaria receptive zone" may expand southwards, to include regional towns like Rockhampton, Gladstone and Bundaberg. However, in the foreseeable future malaria itself is not a direct threat to Australia under climate change, as long as a high priority is placed on prevention via the maintenance and extension of public health and local government infrastructure.

- Suitable conditions for the transmission of dengue may expand southwest down to Carnarvon, and southeast down to Maryborough and Gympie by 2050. If no other contributing factors were to change, a larger number of people living in northern parts of Australia would be at risk of dengue infection (a total of 0.3-0.5 million in 2020, and 0.8-1.6 million in 2050). This increased risk need not mean an increase in dengue cases, provided there is (i) continuing expansion of vector control and public health surveillance, and (ii) quarantine efforts to ensure that a secondary dengue vector, *Ae. albopictus,* does not become established in the country.

- Warmer temperatures and increased rainfall variability are predicted to increase the intensity and frequency of food-borne and water-borne disease. Successful adaptation to the projected climate changes will require the upgrading of sewerage systems, and safer food production and storage processes. Due to their poor living conditions and access to services, Aboriginal people living in remote arid communities are likely to be at increased risk. An increase of 10% in the annual number of diarrhoeal admissions among Aboriginal children living in the central Australian region is predicted by 2050.

- The number of people exposed to flooding due to sea-level rise in Australia and New Zealand is predicted to approximately double in the next 50 years, although absolute numbers would still be low. For the rest of the Pacific region, however, the number of people who experience flooding by the 2050s could increase by a factor of more than 50, to between 60,000 and 90,000 in an average year. As well as the impact of flooding on settlements, the impact of sea-level rise on freshwater quality and quantity is likely to be a critical threat to Pacific Island health and welfare.

- The first *detectable* changes in human health may well be alterations in the geographic range and seasonality of certain vector-borne infectious diseases. Summer-time food-borne infections (e.g. salmonellosis) may show longer-lasting annual peaks. The public health consequences of the disturbance of natural and managed food-producing systems, of rising sea-levels, and of population displacement for reasons of physical hazard, land loss, economic disruption and civil strife may not become evident for several decades.

- Reducing the total level of greenhouse gas emissions remains a primary preventive health strategy. Given that current levels of greenhouse gases will continue to influence climate over the next several hundred years, a greater research effort must now also be directed towards how humans can adapt to these changes.

- The health impacts of climate change will be strongly influenced by the extent and rate of warming, as well as local environmental conditions and social behaviours, and the range of social, technological, institutional, and behavioural adaptations taken to reduce the threats.

- Some individuals and communities are likely to lack the resources required for adequate response. Remote Aboriginal communities, people on low incomes, elderly people and many Pacific Island countries will be most vulnerable.

3. INTRODUCTION

It is now widely acknowledged in the scientific community that Earth's climate system has demonstrably changed since the pre-industrial era, and that at least some of these changes are due to human activities *(IPCC 2001a)*. Already, changes have been observed to many physical and biological systems, and there are preliminary indications that social and economic systems have also been affected. Even if global concentrations of greenhouse gases (GHG) were stabilised, Earth would continue to respond to warming for many centuries *(IPCC 2001a)*. There is no doubt that there has been an unusually rapid increase in average global surface temperature over the past quarter-century. Climatologists assess that most of the increase since around 1950 is attributable to human activities (IPCC 2001).

Projected climate change is expected to have beneficial and adverse effects on environmental and socio-economic systems, with both direct and indirect effects on human health. The impact of climate change will depend on the rate and extent of warming, as well as the adaptive capacity of society. It is thus necessary for national, state, and local governments, as well as individuals, to prepare for a changing environment by understanding the risks to public health, and to develop plans to reduce and adapt to these risks.

In 1991, the National Health and Medical Research Council (NHMRC) published a two-volume report entitled *Health Implications of Long Term Climate Change.* That report was based primarily on an extensive review of expert opinion. Selected experts wrote detailed chapters on specific aspects of the topic. There were, at that time, virtually no empirical data directly relating to the human health impact of a long-term change in climatic conditions. Further, there were very few peer-reviewed results of mathematical modelling of this relationship. This dearth of information was clearly reflected in the First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 1990, in which the topic of potential health impacts was dealt with summarily within several brief paragraphs. The NHMRC's 1991 report – viewed within that context – was a ground-breaking exercise that helped to raise the profile of the research questions pertaining to climate change and health.

Subsequently, during the 1990s, there was a steady increase in the amount of formal research in this topic area. This was reflected in the growing emphasis given to the work of the IPCC, especially in its Second and Third Assessment Reports (1995 and 2001). In recent years, a number of national governments have commissioned scientific assessments of the actual and potential impacts of climate change on the health of the national population. These include: the USA, the UK, Canada, New Zealand, Portugal, the Netherlands, and Japan. In 2002, the World Health Organization completed an estimate of the contribution of 26 risk factors to the global and regional burden of disease *(Ezzati et al. 2002)*, which included an estimate of the impact of global climate change. Ten years on from the publication of the original NHMRC report, there is now an opportunity to examine this question on the basis of more sophisticated modelling of both climate change and its impacts, greater insights into the nature of the uncertainties in this domain of science and a better understanding of the priority needs for further research.

4. SCOPE OF ASSESSMENT

4.1 Assessment objectives

This document provides a risk assessment of the potential health impacts of climate change in the medium-term in Australia and, in specified instances, the neighbouring populations of New Zealand and the Pacific Islands.

There are only limited empirical observations of climate-health relationships yet available from research in Australasia. However, there is now a well-reviewed body of evidence from other countries. This empirical information base, along with recently evolved mathematical models, now enables a quantitative approach to be applied to much of this scenario-based health risk assessment task. Quantitative approaches are possible for assessing the future risks of some health outcomes (e.g. mortality impact of heatwaves; altered transmission probability for some vector-borne diseases), but not for others (e.g. social and public health consequences of increased flow of refugees from low-lying Pacific islands; impacts on human well-being due to changes to the physical and socio-economic environments). The public health consequences of the latter type of issue are addressed qualitatively in this report.

The enHealth Council has published guidelines for the conduct of environmental health risk assessments *(enHealth Council 2002)*. In the context of this climate change risk assessment, the exercise entails estimating the population at risk of, or the attributable burden of disease from, specified health consequences of climate change for the years 2020 and 2050, for alternative greenhouse gas emissions scenarios *(IPCC 2000)*, and using future projections of the Australian population (by statistical local area).

4.2 Regions considered in this report

This assessment is principally focused on determining possible impacts to health resulting from climate change to populations in Australia. In addition, impacts for New Zealand and the Pacific Islands were considered where data availability and resources permitted. Quantitative estimates are provided for Australia for six health impacts (dengue, malaria, diarrhoeal diseases, deaths due to extreme rainfall, flooding due to sea-level rise, and heat-related deaths). The quantitative estimates provided for New Zealand are for dengue, sea-level rise, and heat-related deaths. Quantitative estimates provided for the Pacific are for dengue and sea-level rise. In addition, a qualitative discussion of some health issues relating to the Pacific Islands is presented.

4.3 Vulnerable populations

Not all populations will be equally affected by changing climate conditions. The social stability of a community, existing health of population groups, access to and availability of resources, and the capacity to respond to changing conditions, all effect a community's ability to adapt to the additional challenges climate change will bring to human health states. Each section of the report identifies sub-populations that are expected to be at greatest risk of a particular health impact. General issues relating to vulnerable populations are provided in Section 10.