

# FRAGILE PARADISE

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## Health and Climate Change in the South Pacific

LACHLAN MCIVER AND ELIZABETH HANNA

### Abstract

Island countries of the South Pacific are among the most vulnerable in the world to the effects of climate change, including the likely detrimental impacts on health. In general, the burden of these impacts falls disproportionately to particular subsectors of the population, such as the socio-economically deprived, certain occupational groups, those with pre-existing illnesses and residents of areas of high exposure to climate-related phenomena such as floods, droughts and sea level rise. Thus, climate change has the potential to exacerbate social and health inequalities further. As part of a suite of adaptations integrated across sectors, protection of Pacific Island communities from climate change-related health threats requires an evidence-based approach that incorporates a context-based assessment of vulnerability.

Pioneering work by McMichael and colleagues in the 1990s and early 2000s provided templates for performing assessments of vulnerability and compiling plans for adaptation to protect human health from the effects of climate change. This chapter reviews the inclusion of the human health dimension in the climate change impact and adaptation research landscape. We summarise the mixed methods approaches employed to assess climate change and health vulnerabilities and adaptation opportunities in the Pacific region. Results of these assessments are provided, key themes are identified and we map the planned direction of health adaptation to climate change in the Pacific.

## Background

While it may seem, to some, that the scientific community's interest in and concern about the changing global climate is a relatively recent phenomenon, the reality is radically different. The concurrent rise in post-Industrial Revolution global greenhouse gas emissions and increasing ambient temperatures has been occurring for more than two centuries, and the causal link between the two was first hypothesised in the 19th century, when Arrhenius recognised the relationship between atmospheric carbon dioxide concentrations and the temperature at the Earth's surface (Arrhenius, 1896), building on earlier work that explored the effect of gases and vapour on radiation and heat (Tyndall, 1861).

In the late 1980s, the World Health Organization (WHO) convened a working group to consider the health impacts of the climate change scenarios developed in 1987 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP). These scenarios included the possibility of warming air and sea surface temperatures, rising seas and increasing variability and impacts of extreme weather events such as floods, droughts and storms (WMO and UNEP, 1988). The resulting WHO report, entitled 'Potential health effects of climatic change', considered both 'direct' impacts, such as heat-related morbidity and mortality, as well as 'indirect' effects, including the impacts on crops and nutrition, communicable diseases such as those spread by vectors (e.g. malaria, schistosomiasis, lymphatic filariasis) and those related to water quality (e.g. diarrhoeal illness) (WHO, 1990). This early, speculative work has been expanded and refined over recent years, with much of that led by McMichael, who continued to update and improve upon his own conceptual models of the pathways and impacts of climate change on health to incorporate contemporary evidence and reflect the evolution of our understanding of the issues.

The Intergovernmental Panel on Climate Change (IPCC) was convened in 1988, and issued its first report in 1990. Within three years, WHO was collaborating with WMO and UNEP in a series of consultations that culminated in the publication of the seminal work, *Climate Change and Human Health*, in 1996. This book laid out the established and potential links between climate variables and the climate-sensitive determinants of health and disease (McMichael et al., 1996). It expanded on the original list of diseases of concern in the context of climate change and laid the epidemiological foundation for investigation of the current and, more importantly, future impacts of climate change on health. In so doing, the authors explained the methodological challenges involved in estimating climate change-attributable impacts and burdens of disease, based on multiple scenarios and layers of uncertainties. It was a pioneering work of

public health research, and its authors were breaking new scientific ground in the exploration of the link between a healthy human population and a healthy planet. The book's first editor was Tony McMichael.

McMichael and a group of close colleagues (including Andy Haines, Jonathan Patz, Diarmid Campbell-Lendrum, Sari Kovats, Carlos Corvalán, Alistair Woodward, Simon Hales, Kris Ebi and Yasushi Honda) published a series of subsequent papers and texts in the late 1990s and early 2000s that undertook the difficult dual tasks of estimating the attribution of climate change causality to the global burden of disease and suggesting strategies to manage these climate change-related threats to health. Assistance with this venture came in the form of the establishment of a small unit within WHO's Environmental Health team in its Geneva headquarters and research support provided by the London School of Hygiene and Tropical Medicine.

Of the most significant achievements of this group during that period were the compilation of chapters on the potential risks of climate change to human population health for the Second (1996) and Third (2001) Assessment Reports of the IPCC. While the focus was still primarily on the direct health effects of heat and hydrometeorological disasters and the indirect impacts on communicable diseases and malnutrition, by the time of the Third Assessment Report there was growing recognition of the unique vulnerabilities of certain regions (e.g. low-lying island communities) and populations (e.g. developing countries, the socio-economically deprived) (IPCC, 2001). Terms such as 'adaptive capacity' were coined, defined and used to explain both natural and social phenomena in the climate change context.

In 2003, McMichael and colleagues compiled another pivotal work, commissioned by WHO, WMO and UNEP, entitled *Climate Change and Human Health – Risks and Responses* (McMichael et al., 2003b). One of the most widely referenced texts on the topic ever since, this book built on the growing body of literature describing the pathways by which climate change affected health and, for the first time, quantified the estimated global burden of disease due to climate change (as part of WHO's 'Comparative Quantification of Health Risks' project in 2000) and reviewed and synthesised the attempts by a number of countries to assess the health impacts of climate change at a national level. The global climate change-attributable burden of disease at that time (using 2000 as a baseline) was estimated at approximately 150,000 deaths per year (McMichael et al., 2004), a figure which included the results of regional assessments, including the Oceania risk assessment, led by McMichael (McMichael et al., 2003b).

This burgeoning regional focus prompted the Western Pacific Regional Office (WPRO) of WHO to compile a 'Regional Framework for Action to Protect Human Health from the Effects of Climate Change in the Asia Pacific Region'.

This important document mandated WHO to support member countries in the region to assess their vulnerabilities to the health impacts of climate change and develop national strategies and plans to manage those risks (WHO, 2008). The health ministers in the Pacific region responded at their biennial meeting in Madang, Papua New Guinea, in 2009, with the resultant 'Madang Commitment', laying out a series of recommendations related to planning, coordination, implementation and health system strengthening in the context of climate change and health adaptations in the Pacific (WHO, 2009).

It is important to note that, while these may have been the first policy documents from the health sector specifically addressing the health impacts of climate change in the Pacific region, these issues had been considered in many Pacific island countries (PICs) as part of their early work on climate change adaptation. Much of this had been taking place since the early 1990s, often in the absence of significant inputs from the health sector. As part of their Initial National Communications to the United Nations Framework Convention on Climate Change (UNFCCC) (mostly submitted in the mid- to late 2000s), several countries in the region noted the potential for climate change to impact on health, despite the limited level of understanding of those effects at the time.

Also in the late 2000s, the Australian government embarked on an ambitious programme of technical support for PICs in the area of climate science via the Australian Bureau of Meteorology (BOM) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Originally called the Pacific Climate Change Science Program (now the Pacific–Australia Climate Change Science and Adaptation Program), this project included among its key outputs a series of country reports outlining historical climate trends and climate change forecasts for the 21st century in the key areas of temperature, rainfall, sea level rise, ocean acidification and extreme weather events (BOM and CSIRO, 2011).

These regional projects, guidelines and mandates provided the launching pad for another ambitious WHO initiative. Commencing in 2010 and completed in 2012, this project saw WHO assisting 11 PICs in conducting climate change and health vulnerability assessments and adaptation plans, culminating in National Climate Change and Health Action Plans (or variations thereof) for each of these countries in this most vulnerable of regions.

The following sections summarise the methods employed for – and the results of – these assessments and plans and, in doing so, highlight key knowledge gaps, challenges and opportunities related to the protection of human health from climate change in the South Pacific.

## Methods

The 11 PICs involved in WHO climate change and health project (Federated States of Micronesia, Republic of the Marshall Islands, Palau, Vanuatu, Solomon Islands, Nauru, Kiribati, Tonga, Niue, Cook Islands and Tuvalu) were divided into three groups, based on broadly geo-cultural lines. Each of these three groups was supported by a team of WHO consultants throughout a three-phase project over two years.

The first phase involved inception workshops, which brought together the country representatives and consultants to review the current state of knowledge on climate change and health and discuss vulnerabilities and approaches appropriate to each country. The second phase saw the consultant teams visit each of the countries for further stakeholder consultations – across government and non-government agencies, including community representatives and the private sector – as well as examination of the available local data on climate and climate-sensitive diseases. In the final phase, during return visits to each country, WHO teams assisted the country teams in drafting National Climate Change and Health Action Plans (NCCHAPs), reflecting each country's key vulnerabilities and adaptation priorities with respect to the country-specific health impacts of climate change.

The process and outcomes described above, while broadly similar across the 11 countries, were nevertheless unique for each country, reflecting the preferred methodological approach and expertise of the consultant groups, the availability of climate and health data (or, more often, the lack thereof) and the particular priorities of the stakeholders and climate change and health teams within each country.

The project in each PIC incorporated, to varying degrees, the separate elements of vulnerability assessments recommended by WHO (Kovats et al., 2003; Campbell-Lendrum and Woodruff, 2007) and others, including a modified Health Impact Assessment (HIA) approach appropriate to climate change and health (Nelson, 2003; Brown et al., 2011), as well as quantitative estimations of the climate health–disease relationship (Campbell-Lendrum and Woodruff, 2006).

A common and recurring theme throughout this process was the imperative to consider the specific needs of vulnerable groups (such as young children, the elderly, those in poverty, those with pre-existing illnesses and disabilities, those in certain geographic locations – coastal villages, for example – and people engaged in certain occupations, such as fishing, agriculture or construction). Thus, in the context of health systems strengthening related to climate change adaptation, issues of equity and access are cross-cutting and of paramount importance, reflecting yet another area in which McMichael made his mark

(Friel et al., 2008; Patz et al., 2008). It is worth highlighting at this point, the irony of inequity in the context of climate change in the Pacific (and other developing countries around the world), vis-à-vis the fact that PICs have contributed the least of almost any country to the problem of greenhouse gas emissions but will be among those countries and communities hit hardest by a changing climate.

A strong feature of carrying out this work in PICs was its qualitative element, achieved by engagement with stakeholders in a series of consultations in each country. This was particularly important, given the very small populations in question (Tuvalu and Nauru vie for the title of the world's smallest independent country, with Tuvalu's population hovering around 10,000; Niue, in free association with New Zealand, has a population of approximately 1,500), under-resourced health systems and health professional capacities stretched to the extreme. While in many cases health data were incomplete, of poor quality, or missing altogether, the relevance and urgency of the challenge is widely acknowledged. Health-sector colleagues and other stakeholders proved willing to engage in the discussions, debates and consensus building that ultimately resulted in assessments and plans that were strong on qualitative inputs, albeit weak quantitatively. This characteristic of the PIC project, where precision was lacking and uncertainty large, meant that the adaptation planning process tended towards a 'no-regrets' approach, consistent with that recommended for smaller and/or developing countries and weaker health systems (Wardekker et al., 2012).

## Results

The results of the vulnerability assessments in the 11 above-mentioned countries are summarised in Table 17.1 (McIver, 2012).

**Table 17.1 Priority climate-sensitive health risks in Pacific Island countries.**

Country	Main climate-sensitive issues
Cook Islands	Dengue fever, diarrhoeal disease
Federated States of Micronesia	Water- and mosquito-borne diseases, malnutrition
Fiji	Dengue fever, typhoid fever, leptospirosis, diarrhoeal disease
Kiribati	Food (safety, security, food-borne diseases), water (safety, security, water-borne diseases) and vector-borne diseases
Nauru	Air quality, food security, non-communicable diseases (NCDs)

Country	Main climate-sensitive issues
Niue	Vector-borne diseases, ciguatera, diarrhoeal disease, respiratory disease, heat-related illness, NCDs, trauma from extreme weather events
Palau	Vector-borne diseases, zoonotic infections, gastroenteritis, respiratory disease, NCDs, trauma from extreme weather events, mental health issues
Republic of the Marshall Islands	Food-, water- and vector-borne (dengue) diseases, respiratory diseases, malnutrition
Solomon Islands	Vector-borne diseases (malaria), respiratory diseases
Tonga	Diarrhoeal diseases, vector-borne diseases (dengue), food security/nutrition, NCDs, injuries and deaths from extreme weather events
Tuvalu	Diarrhoeal disease, respiratory disease, compromised food security and impacts on NCDs
Vanuatu	Food- and water-borne diseases

Source: McIver, 2012.

The priority adaptation strategies for each PIC, outlined in their respective NCCHAPs, relate directly to their key vulnerabilities. Broadly speaking, a holistic but pragmatic approach was taken to the adaptation planning process, with countries strongly favouring adaptation strategies that were feasible – recognising technical capacity limitations and financial constraints – in the context of grossly under-resourced health systems and multiple, often competing, health priorities.

Adaptation strategies were considered under a number of different categories, listed below with examples of specific activities under each category:

- Legislative/Regulatory
  - Reviewing building codes and standards to ensure adequate resilience to hydrometeorological disasters
- Public Education/Communication
  - Developing health promotion materials regarding food safety and protection against water-borne diseases under warmer conditions
- Surveillance/Monitoring
  - Expanding and enhancing ‘syndromic surveillance’ for key climate-sensitive diseases such as diarrhoeal illness and dengue fever
- Ecosystem Intervention
  - Carrying out regular community clean-up activities targeting mosquito breeding sites (e.g. pots, puddles, tins, tyres, coconut shells)

- Infrastructure/Development
  - Retrofitting schools, aged care facilities and public buildings with adequate ventilation and/or air conditioning
- Technological/Engineering
  - Procuring appropriate laboratory equipment for food testing, water monitoring and mosquito identification
- Medical Intervention
  - Refining clinical case definitions for climate-sensitive diseases; stockpiling appropriate medications and supplies for extreme weather events
- Research/Further Information
  - Collecting, collating, synthesising and analysing health data in relation to historical climate variability, with a view to estimating future country-specific, climate change-attributable burdens of disease.

## Discussion

As can be seen from Table 17.1, the majority of the climate change and health priorities identified in the PICs largely reflect the long-held concerns of experts in the field: issues such as increasing incidence of food-, water- and vector-borne diseases; the health impacts of heat extremes and natural disasters; and mental health stressors have all been included in earlier conceptual models.

One important area of emerging concern – and a climate change exposure-impact pathway largely missing from the conceptual models to date – is the potential for climate change to exacerbate the existing and rapidly increasing burden of non-communicable diseases (NCDs). NCDs were among the top priorities in terms of climate change and health in several PICs, and many participants in the vulnerability assessment and adaptation planning process around the Pacific were firm in their opinion that climate change would lead to a worsening of the NCD ‘crisis’.

The literature on climate change impacts on NCDs is scant; once again, one of the most significant contributions to the topic – a paper that focuses on the pathways between extreme weather events and acute exacerbations of existing disease; adaptation and development opportunities; and the potential for ‘co-benefits’ (see below) – has been made by a group that included the indefatigable Tony McMichael (Friel et al., 2011).

Island countries in the Pacific region have among the highest rates of obesity and NCDs such as hypertension, dyslipidaemia and type 2 diabetes in the world (WHO, 2011a). Concern about this trend has led some countries to take



extraordinary measures, such as the government of Palau declaring a state of emergency in an attempt to access a wider range of resources to tackle the problem. At least some PICs see climate change as a potential additional driver of NCD risk; for example, by further worsening the conditions for domestic agriculture (due to increasing temperatures, variable rainfall, salinisation of soil and other factors) and by decreasing one's willingness or ability to exercise or perform outdoor work in hotter and/or wetter conditions.

An extensive recent online discussion forum on the topic of climate change impacts on NCDs in the Pacific, moderated by WHO, to which more than 30 prominent stakeholders and community members from a wide range of PICs and backgrounds contributed, found that four key themes emerged in relation to potential solutions to the problem: community education, legislation and government regulation, improved food security (e.g. the propagation of drought- and salt-resistant traditional staples such as taro and cassava) and further research.

Another area in which the Pacific may be unique in terms of the timing and/or nature of climate change impacts on health relates to the combined geographic and demographic vulnerabilities of PICs. In 2000, McMichael and Beaglehole (2000) pointed out the contemporary convergence of globalisation, environmental change and the gradual transition from a world where infectious diseases were the predominant burden of ill health to the new world of NCDs. This transition is taking place, apace, in Pacific atoll nations.

Kiribati and the Marshall Islands provide alarming examples of this confluence of social and environmental determinants of ill health, where NCDs such as diabetes coexist with overcrowding and high rates of smoking – all major risk factors for tuberculosis transmission in these two high-prevalence countries (Clark et al., 2002; Alisjahbana et al., 2007; Lin et al., 2007; Baker et al., 2008; Jeon and Murray, 2008). There is a real and concerning possibility that, in these tiny, very low-lying countries with high population densities, climate change phenomena – in particular, sea level rise – may contribute to the burden of diseases such as tuberculosis by additional forcing of population pressures and NCDs.

Despite these risks, and the challenges of implementing effective adaptations for climate change and health in very small countries with limited capacity in many areas, there are some causes for optimism and examples of innovation and progress in PICs. Some of these examples include:

- **Mainstreaming:** Palau merged its climate change and health team within a larger Pacific Adaptation to Climate Change project, ensuring that health issues were considered in community awareness surveys and adaptation activities such as experimenting with climate-resistant crops and fish and clam aquaculture.

- Infrastructure and health systems development: Kiribati's NCCHAP has been reviewed extensively and implementation of this Plan, which focuses on building environmental health capacity (via direct investment in physical resources as well as training and programme support), is the main objective of a well-funded climate change adaptation project coordinated by the Office of the President, with external donor and technical assistance.
- Research: Fiji is one of seven countries participating in a global climate change and health adaptation pilot project aimed at using climate information for disease early warning systems and improving the abilities of health professionals and communities to manage climate-sensitive health hazards.
- All-hazards planning: Tonga, the Marshall Islands and the Cook Islands have opted to combine plans for climate change adaptation with disaster risk reduction in Joint National Action Plans (JNAPs), thus opening up additional avenues for funding and technical support to manage the threats presented by extreme weather events such as cyclones, floods, droughts and storm surges, which almost certainly will all be affected by climate change.

Finally, and somewhat paradoxically, given the negligible contribution of PICs to the problem of climate change itself, it is clear that these countries have a substantial amount to gain from the potential 'co-benefits' of mitigation strategies, such as increasing the use of active and public transport over motorised vehicles and increasing physical activity in the pursuit of fishing and farming (noting that the loss of the latter skills, particularly in younger generations, is an oft-heard lament in the Pacific) (Ganten et al., 2010).

## Conclusion

Most of the scenario-based predictions of climate change impacts pertain to the 21st century; many focus on what our world will look like in the year 2100. Over the past 25 years, Tony McMichael was instrumental in shaping, thinking and guiding research and policy priorities related to the health impacts of climate change. His intellectual footprints can be seen in most, if not all, significant works on the topic; his name dominates reference lists of scholarly publications on climate change and human health. To the end of his long and productive life, he continued to supervise research, analyse data and publish on these issues. Much of his work is of critical significance to climate change and health in the island countries of the South Pacific, including a very recent review of the health aspects of climate change-related migration, co-authored by two generations of McMichaels (McMichael et al., 2012).

Given the vogue for basing future climate scenarios around 2100, it is poignant to note that there are now babies and small children alive today who may still be alive in 2100. What world will they see? By that time, some PICs may be uninhabitable, or at least unrecognisable, from the effects of climate change. What will that mean for the health – physical, emotional, spiritual and mental – as well as the nationhood and identity of the most vulnerable communities in the South Pacific?

While climate change represents one of the most significant challenges to development in small island countries in the 21st century, it also provides a unique opportunity to build resilience in the health sector, address health inequities and pilot new approaches to health protection and improvement, for the betterment of communities in the Pacific and around the world.

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This text is taken from *Health of People, Places And Planet: Reflections based on Tony McMichael's four decades of contribution to epidemiological understanding*, edited by Colin D. Butler, Jane Dixon and Anthony G. Capon, published 2015 by ANU Press, The Australian National University, Canberra, Australia.