One Planet, One Health

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One Planet, One Health

Edited by Merrilyn Walton

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Cover image by Conor Ashleigh. The treasurer of the cattle group in Karang Kendal hamlet, Java, Indonesia, washes one of his cows in a small creek.
Cover design by Miguel Yamin.

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Foreword

As human pressures on our planet increase, the sustainability of our way of life, our continuous push for development and so-called progress is under threat. Human contributions to declining ecosystems and the reality of climate change are no longer debatable. Already countries in different parts of the world are unable to support populations as a result of droughts, famine, conflict, epidemics and lack of infrastructure.

Nature is revealing to us the interdependence of environmental, animal and human health and emphasising that our resources are finite. This concept is embedded in the title of this unique book, *One Planet, One Health*. The following chapters bring together different academic and real life perspectives and examples, beginning with the post-industrial history and concepts of One Health and including a consideration of legal, gender and ethical issues and constraints, case studies, the importance of surveillance and interdisciplinary research and climate change.

The University of Sydney's Marie Bashir Institute for Emerging Infectious Diseases and Biosecurity has as its central vision reducing the health and socioeconomic impacts of emerging infectious diseases through the lens of One Planet, One Health. Our remit encompasses interdisciplinary research, capacity building and advocacy with governments, professions and communities. I am delighted that we

have been able to bring together the perspectives of distinguished authors under the editorship of Professor Merrilyn Walton. I trust that you, the readers, will find the book informative and possibly contentious in parts, but always thought-provoking and stimulating.

Tania C Sorrell AM, FAHMS

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Preface

By most measures, human health is better now than ever before in human history. Since 1950, global average life expectancy has risen 25 years to its current level of 72 years, and infant mortality rates have decreased substantially from around 210 per thousand live births to just over 30 per thousand now.

However, these gains in human health have been unequally distributed, and alongside them, and overall development gains made in the same period, we have witnessed environmental degradation on a massive scale. Pollution, deforestation, biodiversity loss, and climate change are among the striking examples of the damage caused by collective human endeavour.

The report of the Rockefeller Foundation–Lancet Commission on Planetary Health found that continuing environmental degradation threatens to reverse the health gains achieved during the last century. The consequences are far reaching, ranging from the emergence and spread of infectious diseases like SARS, Ebola, and Zika, to malnutrition, conflict, and displacement.

Those who are the least responsible for driving these changes – poor people in developing countries – are the most vulnerable to them. In short, we have been mortgaging the health and wellbeing of future generations to realise economic and development gains in the present.

But, the Commission report does conclude that solutions are within reach. They will require, however, a redefinition of prosperity to focus on quality of life and improved human health, together with respect for the integrity of the natural environment. The report identified three sets of challenges:

- First, conceptual challenges, which include the pressing need for genuine measures of progress which go beyond gross domestic product to measure human development and the state of environment.
- Second, governance challenges, such as how governments and other institutions recognise and respond to threats, especially when faced with uncertainty and the need to pool resources.
- Third, the report identified research challenges, such as ignoring the social and environmental context of human health, and the relative lack of cross-disciplinary research.

Planetary health is about safeguarding the health and wellbeing of current and future generations through good stewardship of Earth's natural systems, and by rethinking the way we feed, move, house, power, and care for the world. It requires us to challenge received wisdom, to acknowledge the interdependence of all species, and to think, and to act, in more integrative ways.

To respond effectively to the health challenges of the Anthropocene, we need to grapple with the global transitions that are currently shaping our lives – demographic, epidemiological, food, energy, urban, economic, cultural and ecological. Humanity can chart a safe, healthy and prosperous course ahead by addressing unacceptable inequities in health and wealth within the environmental limits of the Earth however, to do so, will require the generation of new knowledge, the implementation of wise policies, decisive action, and inspirational leadership.

As a member of the Rockefeller Foundation–Lancet Commission on Planetary Health, I am delighted see this timely book *One Planet, One Health* published by Sydney University Press. The book will be a valuable resource for policymakers, practitioners and students

interested in learning more about planetary health, and concerned about the need for urgent action in the interest of planetary health.

Anthony Capon

Inaugural Professor of Planetary Health and Director, Planetary Health Platform, The University of Sydney

Works cited

Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, de Souza Dias BF, et al. (2015). Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health. *Lancet* 386:1973–2028.

From the editor

Merrilyn Walton

The genesis for this book has been my involvement with an interdisciplinary team working with hard-to-reach rural communities in South-East Asia and the Pacific, and the challenges we faced in explaining our One Health approach to funding bodies. Government organisations and peer reviewers, unfamiliar with One Health methods, asked what did agriculture have to do with human health? While interdisciplinary research is now actively encouraged in some universities, research institutes, and policy and funding bodies are yet to fully understand how One Health methods, while complex in nature, offer an alternative way to solve intractable problems that have thus far eluded solutions.

This book is a window into the interconnectedness of the sentient beings on the planet and the world they inhabit. It will provide readers and researchers with the fundamentals underpinning One Health. Governments concerned for the livelihoods of hard-to-reach rural communities in all countries know these communities suffer despite efforts to improve their situations. Millions of dollars of aid money directed to improving livelihoods in low-resource countries have yet to make a significant difference. Lack of will is not the problem. *The human development report: human development for everyone* (United Nations Development Programme 2017) reported uneven human development, with millions struggling with hunger, poverty, illiteracy, and malnutrition: one in three people is malnourished, more than one

in ten lives in extreme poverty, and the same number cannot read or write. The 2017 Save the Children Report, *Short changed: the human and economic cost of child undernutrition in Papua New Guinea,* argues that reducing poverty and improving livelihoods of people, particularly emphasising the nutrition crisis, is a priority. These grave findings should not be surprising: the speed of population growth, reduced areas for food production, water scarcity, emerging infections, and other anthropogenic changes are making the planet unstable, with increasingly unequal access to safe environments and food security for many inhabitants in the poorest countries.

A 2016 study of Australian funding outcomes published in *Nature* showed that research involving multiple disciplines is less likely to be funded when compared to projects with a narrow, more specialised focus (Bromham, Dinnage and Hua 2016). Governments, statutory funding bodies and universities are structured according to specific disciplines – public health experts or agriculturalists or vets – and are less familiar (or comfortable) with a holistic approach. Peer review of interdisciplinary research requires a more expansive view, one that accepts and anticipates that the usual metrics may not always be appropriate or helpful. Academic track records across a range of disciplines will not fit one model, nor will the research methods be familiar to all. One Health projects also take more time and usually cost more than research funded under the Australian Competitive Grants Category 1 schemes such as the Australian Research Council and the National Health and Medical Research Council or Public-Sector Research Income grants under Category 2. The two- to three-year time frames typical of these research grants are too short for projects aiming to improve human–animal–environmental health.

Over the last decade, we have come to better understand unintended consequences of progress: climate change, habitat destruction, food insecurity, wealth inequality, species extinction, and zoonosis. Addressing these consequences and facing new challenges demand we respond but not by doing the same thing over and over. Yet there is evidence that we continue to repeat errors from the past. When the railroad network in India was built under British rule in the 19th century it paved the way for trade and mass travel, symbolising the ingenuity of the British in the post-industrial world. But railways also paved the

way for infectious diseases, shocking labour conditions, and changed landscapes – unintended side effects that remain today. Raw sewage dropped from trains enabled the spread of disease by organisms (vectors) that transmit disease between humans or from animals (birds, insects, rodents) to humans; sewage also penetrated the underground water table. Trains also harbinger epidemic diseases such as cholera and influenza. The unintended consequences of human actions are found everywhere, not just in India and not just in the last century. Plastic bags in the Pacific Ocean, constituting around 80 per cent of marine debris, are being consumed by marine life as they fragment into smaller and smaller pieces, causing environmental devastation. The Green Revolution of the mid-20th century achieved spectacular success bringing agricultural technologies to poor countries where famine and starvation were frequent occurrences. However, the success in providing adequate carbohydrate nutrition was followed by a complacency regarding agricultural sustainability and food quality, resulting in environmental degradation and the double burden of malnutrition now afflicting all countries.

Tackling problems from just the perspective of a human, or of an animal, or of the land are unintended consequences of the 20th-century obsession with specialisation. This approach fails to recognise the interconnectedness of humans, animals, ecosystems and climate. Planetary Health, EcoHealth, and One Health are terms in this book that describe methods for solving these universal problems. The different terms express similar themes: multidisciplinary, transdisciplinary, interdisciplinary collaborations, a system approach, close engagement with communities, knowledge transfer, gender equity, and sustainability.

The Global Research Council meeting in New Delhi in 2016 identified interdisciplinarity as a key feature in future research and advocated increased support from governments and funding bodies, noting that their role in shaping interdisciplinary research is paramount (Lyall et al. 2013). Universities emphasise multidisciplinary research, but in reality One Health projects still occur opportunistically through networking rather than from an organised structured framework. Designing a One Health intervention involves more actors than traditional siloed research – the communities of interest must be

engaged from the beginning – including identifying the problem they want to solve. This adds to the complexity and cost.

This book is for governments, health, agricultural and environmental administrators, bureaucrats, philanthropic organisations, and funding bodies as well as the general reading public, particularly in low- and middle-income countries. Written for non-specialist readers, it explains what One Health is and how it works. Its practical approach shows the benefits when people with different skills and knowledge work with communities to resolve problems.

To date, One Health funded initiatives have emphasised the human–animal interface, prompted by the urgency of containing the spread of disease from animals to humans (zoonosis). This book is not just about zoonoses because much has already been written about emerging and re-emerging infections; there is general acceptance that most emerging infections are caused by anthropogenic influences on the ecology (Lindahl and Grace 2015). How to contain the spread of infections remains a vexed issue. The 2018 Bangkok Statement acknowledged that despite advances in knowledge and practice, epidemics and pandemics remain a threat (Prince Mahidol Award Conference 2018). Attendees at that conference also called for the removal of 'the professional, bureaucratic and cultural barriers, as well as the obstacles inherent within social, economic and political processes, that silo human health, animal health and the environmental sectors from effective multi-sectoral partnership and actions'.

This book describes different pathways to a sustainable planet. Attention to natural systems and understanding how the parts of different systems interrelate is a core understanding for One Health research and a theme in all chapters. To understand one component of the system it is also necessary to understand how the other parts relate and interact. This interdependence is what specialisation neglects.

Why the urgency

In mid-2017 scientists from around the globe signed for the second time a 'Warning to humanity'. The first notice signed in 1992 by 1,500 scientists included most of the living Nobel laureates in the sciences.

Back then they drew attention to the destruction caused by ozone depletion, human population growth, climate change, biodiversity destruction, forest loss, and ocean dead zones, concluding that 'humans were on a collision course with the natural world' (Ripple et al. 2017). In 2017, the stratospheric ozone layer had stabilised but stalled progress prompted the second notice. This call for action sets out the steps to the sustainability of humanity, other species, and environs.

Readers will appreciate that One Health is not new, first appearing in the 19th century when industrialisation and overcrowded cities were hosts to cholera epidemics. The origins of that disease were uncovered by environmental and health workers who discovered that water, sewage and drainage all played a role in spreading the disease. Since these public health advances, the 20th and 21st centuries have seen the development of specialisation and a move away from the polymaths. Specialisation happens in many domains including biology but in humans it refers to the process of accumulating expert knowledge or skill in a particular area. There have been unquestionable benefits from specialising (antimicrobial medicines, vaccines, surgical advances, technology) but there have also been unintended consequences. Becoming an expert in an area has often been at the cost of working with multiple disciplines – work that necessarily understands the relevance of context and the interrelatedness of different components in any system. While the authors in this book are specialists in their domains of study and work in different professions, countries and environments, they share a common humanity in their wish to improve the health of the planet and the health of humans, animals and the environment.

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Works cited

Lindahl, J., and D. Grace (2015). The consequences of human actions on risks for infectious diseases: a review. *Infection Ecology & Epidemiology* 5(1): 1–38.

Lyall, C., A. Bruce, W. Marsden, and L. Meagher (2013). The role of funding agencies in creating interdisciplinary knowledge. *Science & Public Policy* 40(1): 62–71.

Prince Mahidol Award Conference (2018). Bangkok statement: a call to action. Prince Mahidol Award Conference, Bangkok, 29 January–3 February.

Ripple, W., C. Wolf, M. Galetti, T. Newsome, and E.A.M. Alamgir (2017). World scientists' warning to humanity: a second notice. http://scientistswarning.forestry.oregonstate.edu/.

Save the Children (2017). *Short changed: the human and economic cost of child undernutrition in Papua New Guinea*. Carlton, VIC.: Save the Children Australia. http://bit.ly/2UUxjGj.

United Nations Development Programme (2017). *Human development for everyone*. New York: United Nations Development Programme.