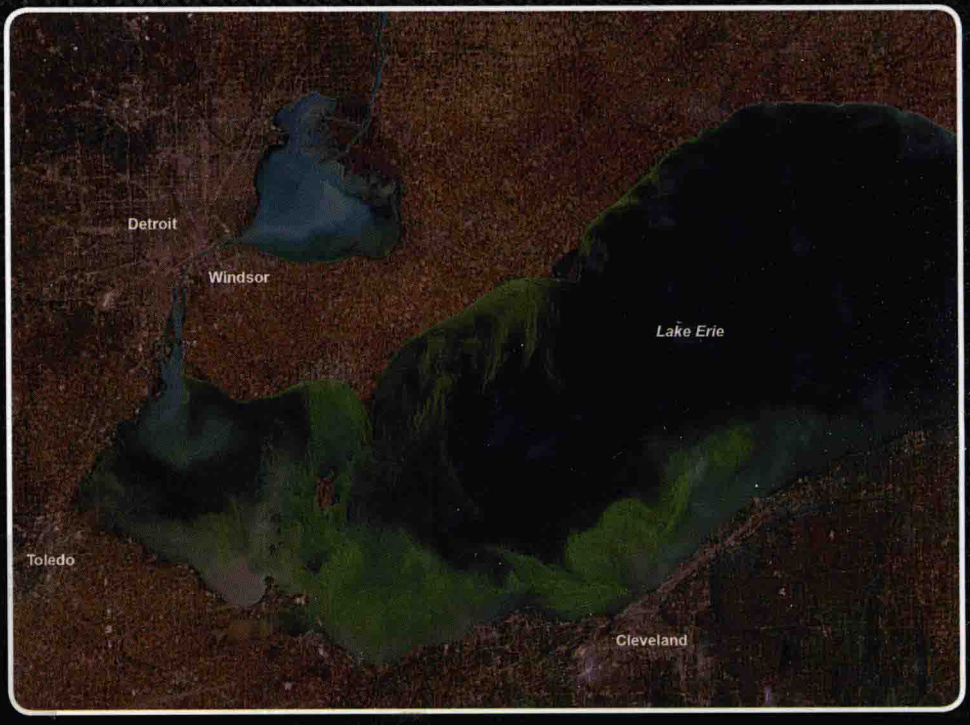
HAZARDS AND DISASTERS SERIES

BIOLOGICAL AND ENVIRONMENTAL HAZARDS, RISKS, AND DISASTERS



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Hazards and Disasters Series

Biological and Environmental Hazards, Risks, and Disasters

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PARIS • SAN DIEGO • SAN FRANCISCO • SINGAPORE • SYDNEY • TOKYO

Elsevier
Radarweg 29, PO Box 211, 1000 AE Amsterdam, Netherlands
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, UK
225 Wyman Street, Waltham, MA 02451, USA

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British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

ISBN: 978-0-12-394847-2

Cover Image courtesy: NASA

In memory of my mother T.V. Padmini
who inspired me through her love,
hard work and dedication
— *Ramesh Sivanpillai*

Title and Description of the Cover Image

ALGAL BLOOM IN LAKE ERIE, USA

In October 2011, Lake Erie experienced its worst algal bloom in decades. This image captured by the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard the Aqua satellite on October 9 shows this bloom. The Western basin of Lake Erie has witnessed many such blooms since 1950s due to runoff from farms, and urban and industrialized areas. However, improvements in agriculture and sewage treatment in the 1970s have reduced the number of blooms. Heavy snow in the fall of 2010 and the spring 2011, followed by high rainfall led to increased runoff from crop fields, yards, and built surfaces. This increased flow carried several pollutants including phosphorus from fertilizers into streams and rivers resulting in this bloom (Image source: NASA's Earth Observatory, Toxic algae bloom in Lake Erie, October 14, 2011, http://earthobservatory.nasa.gov/IOTD/view.php?id=76127). Also Chapter 2 (in this volume), "Algal Blooms," provides additional information about algal blooms and its impact on environment and biota.

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Editorial Foreword

GENERAL HAZARDS, RISKS, AND DISASTERS

Hazards are processes that produce danger to human life and infrastructure. Risks are the potential or possibilities that something bad will happen because of the hazards. Disasters are that quite unpleasant result of the hazard occurrence that caused destruction of lives and infrastructure. Hazards, risks, and disasters have been coming under increasing strong scientific scrutiny in recent decades as a result of a combination of numerous unfortunate factors, many of which are quite out of control as a result of human actions. At the top of the list of exacerbating factors to any hazard, of course, is the tragic exponential population growth that is clearly not possible to maintain indefinitely on a finite Earth. As our planet is covered ever more with humans, any natural or human-caused (unnatural?) hazardous process is increasingly likely to adversely impact life and construction systems. The volumes on hazards, risks, and disasters that we present here are thus an attempt to increase understandings about how to best deal with these problems, even while we all recognize the inherent difficulties of even slowing down the rates of such processes as other compounding situations spiral on out of control, such as exploding population growth and rampant environmental degradation.

Some natural hazardous processes such as volcanoes and earthquakes that emanate from deep within the Earth's interior are in no way affected by human actions, but a number of others are closely related to factors affected or controlled by humanity, even if however unwitting. Chief among these, of course, are climate-controlling factors, and no small measure of these can be exacerbated by the now obvious ongoing climate change at hand (Hay, 2013). Pervasive range and forest fires caused by human-enhanced or induced droughts and fuel loadings, megaflooding into sprawling urban complexes on floodplains and coastal cities, biological threats from locust plagues, and other ecological disasters gone awry; all of these and many others are but a small part of the potentials for catastrophic risk that loom at many different scales, from the local to planet girdling.

In fact, the denial of possible planet-wide catastrophic risk (Rees, 2013) as exaggerated jeremiads in media landscapes saturated with sensational science stories and end-of-the-world Hollywood productions is perhaps quite understandable, even if simplistically shortsighted. The "end-of-days" tropes promoted by the shaggy-minded prophets of doom have been with us for

centuries, mainly because of Biblical verse written in the early Iron Age during remarkably pacific times of only limited environmental change. Nowadays however, the Armageddon enthusiasts appear to want the worst to validate their death desires and prove their holy books. Unfortunately we are all entering times when just a few individuals could actually trigger societal breakdown by error or terror, if Mother Nature does not do it for us first. Thus we enter contemporaneous times of considerable peril that present needs for close attention.

These volumes we address here about hazards, risks, and disasters are not exhaustive dissertations about all the dangerous possibilities faced by the ever-burgeoning human populations, but they do address the more common natural perils that people face, even while we leave aside (for now) the thinking about higher-level existential threats from such things as bio- or cybertechnologies, artificial intelligence gone awry, ecological collapse, or runaway climate catastrophes.

In contemplating existential risk (Rossbacher, 2013), we have lately come to realize that the new existentialist philosophy is no longer the old sense of disorientation or confusion at the apparently meaninglessness or hopelessly absurd worlds of the past, but instead an increasing realization that serious changes by humans appear to be afoot that even threaten all life on the planet (Kolbert, 2014; Newitz, 2013). In the geological times of the Late Cretaceous, an asteroid collision with Earth wiped out the dinosaurs and much other life; at the present time by contrast, humanity itself appears to be the asteroid.

Misanthropic viewpoints aside, however, an increased understanding of all levels and types of the more common natural hazards would seem a useful endeavor to enhance knowledge accessibility, even while we attempt to figure out how to extract ourselves and other life from the perils produced by the strong climate change so obviously underway. Our intent in these volumes is to show the latest good thinking about the more common endogenetic and exogenetic processes and their roles as threats to everyday human existence. In this fashion, the chapter authors and volume editors have undertaken to show you overviews and more focused assessments of many of the chief obvious threats at hand that have been repeatedly shown on screen and print media in recent years. As this century develops, we may come to wish that these examples of hazards, risks, and disasters are not somehow eclipsed by truly existential threats of a more pervasive nature. The future always hangs in the balance of opposing forces; the ever-lurking, but mindless threats from an implacable nature, or heedless bureaucracies countered only sometimes in small ways by the clumsy and often feeble attempts by individual humans to improve our little lots in life. Only through improved education and understanding will any of us have a chance against such strong odds; perhaps these volumes will add some small measure of assistance in this regard.

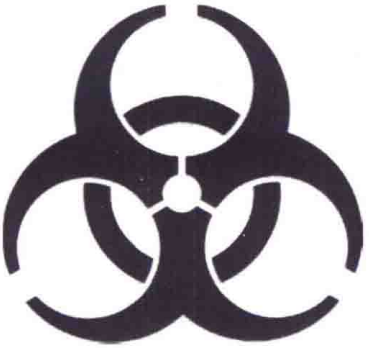

FIGURE 1 The standard biohazard symbol is meant to be evocative of danger, and was designed to be memorable but meaningless so that people could be taught what it meant.

BIOLOGICAL ASPECTS OF HAZARDS, RISKS, AND DISASTERS

Biological hazards, also known as biohazards, refer to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include medical waste or samples of a microorganism, viruses, or toxins (from a biological source) that can affect human health. Symbolized by a striking medallion of curving, curlicue scepters (Figure 1), the sinister nature of the biohazard is evoked by the sharp and pointed nature of the otherwise round symbol.

The chapters presented in this volume are reflective not of such vector-based biohazards, but of the greater and more widespread or more generalized threats caused by the diversity of insect plagues and swarms, blooms of poisonous algae, direct animal threats, degradation of land, deforestation, desertification, ecological impacts of climate change, and even strikes upon the Earth by comets and asteroids that would so devastate life if they were large enough. The possible disruptions of the biological communities of the planet upon which humanity depends absolutely for the continuation of its own existence are most serious situations that can exert great controls on future economies. Knowing more about the nature of such generalized biohazards is an obvious need in the community of experts concerned about hazards, risks, and disasters.

Many volumes are written about the various point-source vectors of disease, contagion, and pandemics because of the insidious nature of that group of medical hazards. Less concern is generally exhibited with the diverse biologic hazards discussed in this volume, probably because of the more diffuse nature of many of those hazards discussed, and their seemingly lower impact to life, limb, or infrastructure. Nevertheless, many of these varieties of biological hazard can also do considerable damage, even to the loss of life, so greater attention needs to be paid to expositions of their many varieties.

This volume, by no means exhaustive of all the possibilities of such biohazard, still addresses numerous such problems and should be read as an introduction to a very problematic and quite diverse area of hazard occurrence.

John (Jack) Shroder
Editor-in-Chief
July 9, 2015

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Acknowledgments

This book project materialized from the invaluable contributions from numerous individuals. First, I express my thanks to ***Dr David Butler*** and ***Dr George Malanson*** for the invitation to submit a chapter to this volume. Shortly after that they recommended me to serve as the editor. I thank ***Dr John Shroder*** for accepting their recommendation and entrusting this task to me. He provided incredible support while I learned the ropes as an editor. His words of wisdom helped me to move forward and bring this project to fruition. I am indebted to the authors for contributing chapters and units to this volume.

I thank ***Ms Louisa Hutchins***, associate acquisitions editor (Elsevier, UK), for the valuable support she provided since I took over the editorial responsibilities. She made herself available to answer all my questions, however, trivial they might be, contacted the authors at crucial steps, and ensured that every aspect of this project progressed smoothly. I was amazed how she could do all this despite her busy work and travel schedule. This project would not have materialized without her contribution. ***Mr Unni Kannan***, Technical Assessor (Elsevier, India) did an excellent job of scrutinizing each manuscript prior to typesetting. ***Mr Poulouse Joseph***, Production Manager (Elsevier, India) and his team did an outstanding job of taking the text, figures, and photos, and creating the impressive layout for this book. ***Ms Tharangini Sakthivel*** (Elsevier, India) worked with the authors and rest of us to keep the necessary paperwork in order. I also extend my thanks to others at Elsevier who worked on this book.

I owe a wealth of gratitude to the reviewers (table at the end of this section) who spent considerable amount of their time to review the manuscripts. All manuscripts immensely benefited through their suggestions and comments and I thank them for their valued contributions.

Identifying authors is never a trivial task and like every editor, I contacted numerous experts to contribute a chapter to this volume. While several declined my invitation, the following people took the time to provide words of encouragement and suggest names of potential authors or, at times, served as reviewers: ***Dr T. Mitchell Aide*** (University of Puerto Rico), ***Dr Dana Blumenthal*** (USDA-ARS), ***Dr Tim Collier*** (University of Wyoming), ***Dr Chris Kettle*** (ETH Zürich, Switzerland), ***Dr Anthony Fauci*** (NIH, USA), ***Dr Esther Gilman-Kehrer*** (University of Wyoming), ***Dr Ann Marie Hart*** (University of Wyoming), ***Dr Anthony Ives*** (University of Wisconsin–Madison), ***Dr William Lauenroth*** (University of Wyoming), ***Dr Jeff Pettis*** (USDA-ARS, Beltsville, MD),

Dr Ben Phalan (King's College, UK), ***Dr Lian Pin Koh*** (The University of Adelaide), ***Dr Daju Pradnja Resosudarmo*** (Center for International Forestry Research—CIFOR, Indonesia), ***Dr Tom Rudel*** (Rutgers University), ***Dr Osvaldo E. Sala*** (Arizona State University), ***Dr Scott Shaw*** (University of Wyoming), ***Dr Peter Stahl*** (University of Wyoming), and ***Dr Mark Winston*** (Simon Fraser University). I am grateful for the kind words of encouragement and assistance to identify authors and reviewers.

Mr Philip Polzer and ***Dr Kenneth L. Driese***, my colleagues at the university, deserve special mention for editing some of my text that is included in this volume. Editing someone's text is not an easy task but they did an outstanding job to add clarity. I thank them for their help.

Last but not least, I thank my family members for their patience and understanding.

This volume is by no means comprehensive or free from mistakes or omissions. If there are errors or could be further improved please send a note to me at sivanpillai.ramesh@gmail.com.

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