

Learning From The “Eco-Doom” Books

Edward Church, Ph.D., Shripal Shah, MBA¹
Institute for Environmental Entrepreneurship
September, 2012



Introduction

Publications on sustainability regularly review new books, but they do not follow a standard practice in many disciplines of comparing and contrasting books on the same topic. In our inaugural effort to explore what those engaged in “sustainability” can learn from that practice, we have chosen signal works about what many consider to be the focal point of planetary sustainability: understanding, and reducing or coping with climate change brought on by global warming.²

Each of these books demands attention individually, and contributes significantly to the issue. We think that there is added value in viewing them as a group. They were all written at about the same time, close to 2009, but by authors with very different backgrounds and locations. That each had a publisher who judged there would be a sufficient public interest and readership for financial viability, and that they emerged at the same time, implies a certain ripening of the available information and public receptivity to it.

While each book has a provocative title and their themes are challengingly dismal, writing a book is an inherently optimistic exercise, especially so when the author recommends remedies to problems identified. We extend their optimism by suggesting that their individual calls for action can be amplified by taking them as parts of a compelling whole.

¹ We thank Jennie Richards, MBA for her contributions to this paper. Information about the reviewers can be found in the Appendix.

² The concept of “sustainability” is seen by many as the antidote to our most pressing global problems. Yet, currently it has neither the analytical nor the prescriptive power adequate to the task. It is a loose grouping of unrelated publications, videos, speeches, or blog posts, which are not pulled together for productive use. How do we begin acting as if sustainability were a science? What might that look like? The Institute of Environmental Entrepreneurship is offering this multi-book review to demonstrate the power of organizing and structuring existing sources of knowledge. More information about the Institute can be found at www.enviroinstitute.org.

Our work at the Institute immerses us in the issues of planetary sustainability, and from our experience, we think it valuable for even the most expert physical scientist to read these works, especially the ones by the two journalists, who tell the scientific tale very well indeed.

We found a kind of unity in the four authors' divergent views. Each of the four authors describes climate change scenarios that range from dramatic to calamitous, but even the least dramatic necessitates definitive, timely and strong action. The climate science they begin with is both literally and figuratively sky-high. It is mathematically and atmospherically ethereal, the product of decades of rigorous scientific work which is usually not accessible to the lay reader. The authors' task is to make that work as real and understandable to the public and policy makers as it is to the scientists, which they do commendably. The climate change "science" they distill is basically the same across authors, so the scientific front ends of the books are quite similar. The back end prescriptions for action are quite different, reflective perhaps of the authors' differing biographies and geographies.

Each author brings the meaning of the analysis squarely down to earth. Bill McKibben centers his prescriptions on localized action, Mark Hertsgaard on adaptations and mitigations that are a bit larger in scale, Clive Hamilton on fundamental cultural and behavior shifts, and James Hansen on international-scale planetary projects and policies. At the level of solutions, their narrative and examples are textured with a tangible physicality, a physicality of place, land, water, and people. Across the books, the large scale public analysis, and the private impacts and actions become one.

The intellectual and the physical are brought together by a moral and ethical imperative. It is significant that the connective tissue between the two is moral. Nothing in science itself compels solutions, and although the "science" of global warming provides information, by itself it provides no guidance for action.

Solutions can be derived from a number of premises for action. One dominant mode of action to mitigate global warming is the proliferation of "green tech" solutions, attached to the potential for personal profit. Geopolitical gain is another motive for seeking solutions, to mitigate the ramifications of climate change. Yet, the four authors choose to organize their analysis and solutions based on moral and ethical considerations of the impact of global warming on others, whether in other lands or coming generations. The authors' distillation of causes and effects into actions based on a shared morality democratizes both the problems and the solutions.

Moral exhortations are self-limiting without specific application. When they become moral compasses which guide action, however, they can be quite productive. For each author, abstract scientific findings are converted into very physical impacts and recommendations for action – and the impulse for the conversion is moral obligation to others. Hertsgaard, for example, frames his book in terms of his obligation to his daughter, and Hansen to his grand daughter.

Our reviews also act as a primer on the topic of global warming, detailed at length in the books themselves. In the sections that follow, we take central themes in the four books and compare them for similarities and differences. We cover causes and effects of climate change, predictions, and remedies. We also offer Appendices, author biographies and information about

the sources of information they used.

Brief Summaries

Eaarth: Making Life on A Tough New Planet

by Bill McKibben

In *Eaarth*, Bill McKibben – Vermont-based journalist, activist, writer – offers a vision of an altered planet; a new planet called Eaarth. Our Earth has morphed into a new planet following an era of global climate change. While science can not offer precise predictions, there is a high likelihood of global disruption as a result of new planetary disasters in the form of rising seas, changing hydrological patterns, longer and more intense fire seasons, loss in agricultural productivity, decrease in size of rainforests, and collapse of coral reefs and marine ecosystems.

As this reality materializes, we human beings have to become aware of how the world is changing around us, and then take steps to become more in-tune with the new nature around us. We have to respect this new reality and adapt by becoming more local, more grounded, and more decentralized. In this new world, as global population stabilizes, the role of nation-state and other global institutions declines, whereas the magnitude and scope of smaller, local communities grows. And, just as energy and food production will need to become more decentralized, we can remain globally connected through the power of the Internet. In order for nature to reclaim its place in the world, humanity must reduce its consumption and become more resilient. The new lifestyles we create have to be more amenable to the realities of this new planet. We will find ourselves embracing the natural world more, as we de-emphasize material possessions.

Requiem for a Species: Why We Resist the Truth About Climate Change

By Clive Hamilton

Clive Hamilton – Australian professor, writer, ethicist – posits that the problem of climate change is already here; the science is overwhelming and it is settled. The reasons for our predicament are rooted in our value systems, value systems that lead to collective actions that are not in alignment with the natural world around us. For Hamilton, the problem lies within us; it is the weakness of our moral resolve in choosing how to live, act, and think. The problem is how we value material possessions, which in turn leads to misappropriations of what we value, and by how much in relation to some things that are invaluable. For instance, we as investors value economic growth without realizing the impact of the machinations driving that growth. And, as consumers, we live in a world where material things satisfy our wants and needs externally, but leave us unfulfilled internally. These behavioral inconsistencies lead us to many forms of denials – such as hoping that the future will be just like the past and denying that we are on the brink of losing the stability of the future.

There are deep reasons for why we engage in denying the importance of nature, but chief among them is our growing disconnection from nature. In order to save the natural world, and thus save ourselves, we must learn to appreciate, respect and interact with nature. If we fail to properly value and understand natural capital, the choice of solutions we have are increasingly technological and inherently risky.

Human systems need to evolve in order to avert a world where natural systems cross tipping points and pass a point of no return. Such a world – a four-degree Celsius rise in global average temperatures – would create catastrophic consequences. In that world, humans would experience a psychological shift that will produce a long and painful path forward. This shift can be explained in three stages: first, we would engage in a long period of despair over a lost future. Second, we would slowly begin to accept reality and begin to live in a more uncertain era. Third, we will create a new sense of purpose and begin to act to create a new future. This type of psychological shift will be needed on a mass scale amongst individuals, tribes, societies and the entire global civilization.

Hot: Living Through The Next Fifty Years on Earth
by Mark Hertsgaard

Mark Hertsgaard – California-based journalist, parent – begins his book by providing an account of how his personal journey led him to this point. As he met scientists at conferences who raised alarms based on emerging data from the field, their conclusions painted a bleak picture for the planet. His consciousness began to shift and it made him wonder about what lies in store for his young daughter and future generations. As climate change intensifies, it will change lives throughout the planet.

In this quest for answers, Mark Hertsgaard sought out solutions being tried around the world to cope with climatic changes that are already here. In order to understand how people with limited resources adapt to severe droughts – a future flashpoint – he traveled to Sahel in West Africa to learn how farming communities have changed their practices to better manage their land. In order to determine how communities cope with rising sea levels and greater storm activity, he traveled to Netherlands, Shanghai and the San Francisco Bay Area, to document the efforts of multiple governments as they erect new infrastructure to protect existing assets. To learn more about business driven adaptation techniques, he ventured to France and California to learn how the grape-dependent wine industry is learning to grow crop in a different environment. Through varied narratives, he provides a set of case studies that show different communities beginning to develop the capacity for adaptation. While some countries are slow in responding to upcoming changes, many local and municipal officials are looking ahead and getting prepared for what they see as inevitable reality.

In the author's view, developing a social context in which climate change is real and present is the key ingredient in taking action to prepare for a different world, no small task, but a crucial one. Without the right social context, adapting to climate change will be impossible. In order to develop a social context for change, we have to ask serious questions about how climate change will effect us, and tell different stories about ourselves and our collective future. We also have to engage a broader set of people to take an active role in developing and implementing solutions at various levels. For instance, businesses have a crucial role to play in solving adaptation problems at all levels around the world. The author suggests a dual strategy of dealing with climate change: avoiding the unmanageable (mitigation) and managing the unavoidable (adaptation).

Mark Hertsgaard posits that climate change is a moral issue and the countries who have created the problem should lead the charge in solving the problem. This is also an ethical issue and the

generations who have created the problem, and who are now in charge, need to take responsibility and take action in both mitigating and adapting to climate change.

Storms of my Grandchildren – The Truth About The Coming Climate Catastrophe and Our Last Change to Save Humanity

by James Hansen

In *Storms of my Grandchildren*, James Hansen – scientist, academic, grandfather based in Washington, D.C. – narrates his long-term struggle to bring the realities of climate science to the public and recounts the evolution of climate science in an era of hyper-partisan politics. He makes a personal appeal to readers to accept the reality of climate change, and to prepare for catastrophic changes that lie in store for us in the 21st century and beyond if no action is taken. With deep knowledge of the physical reality as projected by climate science, Hansen makes a strong case for taking action now and not waiting for further changes to take root in the system. Climate change is happening now, it is no longer a problem for future generations.

We are rapidly exceeding previously established tipping points and may have already gone beyond a point of no return for some natural systems. Without rapid action, the Earth could enter an era of runaway global heating which would lead to unexpected and severe climate changes. A reduction in Earth's albedo effect (the ability of the planet to reflect sunlight, caused by combinations of radiative forcings such as loss of polar ice cap or change in atmospheric composition) can cause a six-degree Celsius or higher rise in global average temperatures. Such effects can lead to global ice loss which could result in sea level rise of 70 meters. Some of these changes could affect Earth in ways we can't even imagine: biodiversity could be like it was 250 million years ago, marine ecosystems can completely collapse, and in worst case scenario, global runaway heating could turn Earth into Venus, with surface temperatures rising to hundreds of degrees Celsius. To avoid these types of calamities, we can deploy solutions that are simple and are already available. Technology doesn't need to evolve as much as our collective will and the capacity of our global institutions. Our lifestyles will be affected one way or the other; however, by taking action, we can leave a better future for our children and grandchildren. According to Hansen, climate change is an ethical issue, and leaving a better planet behind is our moral imperative.

Causes And Effects of Climate Change

One of the common themes throughout four books is the possibility of catastrophic level of climate change that will be unleashed if action is not taken to avert it. If climate change continues to intensify, its effects can be globally disruptive and long lasting. In addition, since these effects manifest in different ways, they will be felt disproportionately in different regions of the world. There is still some scientific uncertainty over the magnitude, duration and extent of changes that are in store for us. However, all the books assert that there is significant scientific certainty and remarkable consistency when it comes to the types of effects that are likely to occur over the next century.

Compounding the challenge of expertly following an evolving scientific matter, is the difficulty in having a useful conversation about climate change in the short term without invoking day to day weather fluctuations that may or may not be part of a long term trend. climate change is a

global problem that is best understood by taking the long-term view: by removing the noise and focusing on the signal. Each author understands this phenomenon and therefore avoids discussing a one-off issue unless it is very clearly part of a longer term global climatic pattern that can be explained by sound scientific theory and research. Thus, the authors talk about climate change and its effects on similar time scales with few exceptions.

In *Eaarth*, Bill McKibben focuses on several effects caused by increasing levels of green house gas (GHG) emissions that have already occurred, which then lead to an increase in atmospheric GHG concentrations, and increase in the rate of future emissions. These effects include the melting of vast polar ice sheets and land-based glaciers, the resulting rise in global sea levels, the accompanying change of hydrological cycle, and other related themes concerning large intra-planetary systems. The increase in emissions will result in higher global average temperatures which create the conditions for warming of the oceans, stronger and more intense hurricanes, increase in storm surges and the resulting inundation. Higher temperatures can also cause the loss of moisture in soil which increases desertification and can lower agricultural productivity. Lastly, the effects of climate change can be felt on various ecosystems resulting in loss of marine creatures, migrations of life forms away from the tropics and the loss of crucial support systems and ecological habitats like the Amazonian rainforests.

In *Requiem*, Clive Hamilton discusses many similar themes related to an increase in GHG emissions. They include increasing sea levels, stronger storm systems leading to more water surge, water inundation reaching farther inland, and the overall increase in extreme weather events. The increase in emissions will result in higher temperatures which can cause the Arctic and Siberian tundra to melt, thus creating a positive feedback loop of additional warming. Increasing temperatures that last a long time also poses severe threats to ecosystems some of which either adapt by moving to different locations, whereas others simply perish. If the latter state develops, species extinction rates will likely increase, which will put a stress on the larger global ecosystem. Increase in temperatures will also change rainfall patterns, which can cause a decline in productivity of rainforests and agricultural systems. Food and water shortages may become more frequent and more intense, thus affecting increasing percentage of the global population.

In *Hot*, Mark Hertsgaard similarly suggests the rise of GHG concentrations as a starting point and focuses on the effects it creates in various locations around the world. Once again, rise in emissions lead to an increase in global average temperatures, which results in melting polar ice and rising sea levels. In addition to sea level rise, intense storm activity would lead to water inundation around coastlines. Increasing temperatures also create a heating effect on land which can reduce soil moisture levels. Lowered soil productivity, coupled with unpredictable rainfall patterns and changing precipitation levels, lead to lessened food production and result in food shortages. As land productivity declines and multi-year droughts become more frequent, many species get affected by a rapidly changing climate. Climate change also leads to an increase in unmanageable extreme weather events which test the adaptive limits of various species, including humans. As species migrate to avoid the heat, so do diseases. In the long term, the cumulative stress created by climate change can become unmanageable.

In *Storms*, James Hansen presents a broader view of the changes taking place on Earth. Although

his starting point in the causal chain is a different scientific term – climate forcings and feedback – the underlying cause is the same; increase in global average temperatures as a result of high concentration of atmospheric greenhouse gases caused by increase in man-made GHG emissions since the Industrial Revolution. Hansen focuses on the entire system and discusses the role of feedback loops caused by heat trapping effects of various gases that ultimately can spin climate change out of control. In the most severe scenario, Earth loses all of its permanent ice at both poles which simultaneously lowers Earth's albedo and increases global sea levels. The result is a warming ocean that expands adding to sea level rise, and is simultaneously more acidic which makes it less hospitable to marine life such as coral reefs. Over a longer time span, there is a higher likelihood of extreme weather events and Earth's natural systems tipping beyond a point of no return.

Predictions of ecological disaster

The authors assert that climate change is a complex, evolving topic; it is difficult to make accurate predictions about what types of effects will materialize and even more difficult to interpret how effects will cause changes to Earth's systems. Broadly speaking, the types of effects mentioned in these books fall into four categories:

1. Direct effects from increasing atmospheric GHG concentrations
2. Second order effects from increasing atmospheric, oceanic and land temperatures
3. Third order effects from adaptive changes unleashed by Earth's natural systems
4. Fourth order effects to humans from changes caused by previous three possibilities

For these books, the most important predictions relate to third and fourth order effects. Third order effects include changes to crop and livestock production, migration of fish, animals and insects, and even trees and plants seeming to migrate as they propagate in changed ecosystems. Effects on humans include changes in the availability and price of food and water, and increased exposure to insect-borne diseases.

In *Eaarth*, Bill McKibben offers predictions about potential effects over the course of the 21st century. He discusses themes and predictions in the nearer term and is careful in not overstating his case by making firm predictions about exactly how the future will unfold. He discusses how natural and human systems will be affected on a global scale as climate change intensifies. He relays predictions about large scale collapse of crucial ecosystems such as the boreal forests and the mid-western farmlands. He also uncovers cases of animal and plant migration to places more hospitable than their current habitats. For humans, dangerous changes come in the form of more rain and more fire, less water and less food, and high heat and higher temperatures. McKibben paints a picture of *Eaarth* that is significantly less hospitable to most life forms than it was before.

In *Requiem*, Clive Hamilton mentions many of the same predictions as Bill McKibben does in *Eaarth*. For example, there are commonalities in the manner in which climate change can lead to ecosystem collapse. He also predicts changing migration patterns of both plants and animals who begin to move away from tropics to higher latitudes. Some of the differences include more specific predictions of coastal power plant disruptions as a result of rising sea levels and

increasing storm surges. Also, Hamilton relays a stark prediction that more than 75% of known species could go extinct within the next few centuries if positive feedback loops kick in and the global climatic system goes beyond the point of no return. Overall, Hamilton's predictions of the effects of climate change are starker than McKibben's.

In *Hot*, Mark Hertsgaard makes similarly dire predictions as McKibben and Hamilton, but his narrative is muted by the optimism born of the possibilities of adaptation similar to the ones being developed by communities around the world. His more nuanced explanations point to a more complete picture of stronger storms and more extreme climate events which can be managed by building more dikes and better storm drainage infrastructure. From an adaptation standpoint, he shows that it is possible to adapt to climate change up to a certain point. Beyond this point, the changes in climate system may be too strong and too frequent for animals, plants and even humans to adapt to. For example, rapid ice melt on long standing glaciers lead to a glacial lake phenomenon which wipes away everything in its path. Even though these types of events are contained within a few areas, the author stresses that the areas are numerous and widespread, and will increase in both number and intensity with intensification of climate change.

In *Storms*, James Hansen offers the gravest of predictions when it comes to runaway climate change. From a geophysics perspective, he extrapolates that Earth can become Venus-like if positive feedback loops cause runaway heating resulting in unstoppable planetary warming. In this scenario, Hansen predicts vanishing of all life, complete loss of water from oceans as they boil away, significant change in composition of the atmosphere and a completely different planet where surface temperatures hover over four hundred degree Celsius. According to Hansen, this future is not likely, but is a small possibility if we do nothing and allow for positive feedback loops to set in. In the more likely scenario, with increasing greenhouse effect, Earth's climate continues to change leading to a sea level rise of up to 70 meters, collapse of marine ecosystems, mass ecological extinctions, and large scale changes for human societies. While this future is avoidable, our current trajectory points to a much less hospitable planet by the end of the twenty first century. Compared to other climate scientists, Hansen takes a long view when he discusses the decrease in Earth's albedo effect and increase in solar irradiance. In Hansen's case, his public message is rooted in rigorous scientific inquiry of both present and future state of Earth.

Remedies

Even though the authors have written their books at more or less the same time, and have reviewed essentially similar research and covered similar themes, the solutions to the problem have been very different.

In *Eaarth*, Bill McKibben stresses the need for local solutions. His remedies include community-centered living in smaller locales with community-based energy and food production. It involves decentralization of key organizations and political systems. While traditional remedies like moving from fossil fuels to renewables and reducing physical mobility of people and things are mentioned, one unique addition is the continued upgrading of the internet based infrastructure as a way to enrich our lives in an era of global climate change. Additionally, the author suggests that it is important for us to live within nature while respecting and nurturing the rights of all

species, present and future. His overall remedy can be summarized as Go Local.

In *Requiem for a Species*, Clive Hamilton offers a different perspective by stressing the importance of accepting the science and being prepared to act according to the physical realities affecting the planet. Then, he takes an introspective view of how human systems – the way we think, act and live – need to change in order to prepare ourselves to survive in a different kind of world. His suite of remedies begins with evolving our economic model from one of growth to a more holistic model akin to a steady state economy. We need to become enlightened consumers and consider how materialism is affecting our sense of self. Our core identities of who we are have to shift to enable us to move past denying climate change. We need to appreciate, respect and look for meaning in nature. In addition to taking action to increase renewable energy, capturing carbon and possibly even geo-engineering, we need to begin reconstructing our future by reconstructing our current political systems. Climate change will create psychological uncertainty and fear for future generations, and the author suggests a way out of it by undergoing a three stage psychological process as a society: despair, accept and act. From a human evolutionary perspective, particularly in terms of how we view ourselves, Hamilton suggests thinking long term to consider both past and future generations, thus creating a sense of historical continuum in which our current generation fits in.

In *Hot*, Mark Hertsgaard focuses on how to adapt locally and globally by learning from early efforts already being conducted in various regions: from what already works. Once we realize that local solutions can be an effective tool in learning how to live with climate change, we have to realize that climate change is not just a physical or economic problem, it is also a moral and ethical problem. The depth of the problem compels us to create different stories about ourselves, our children and our future. We must take responsibility for our past and present actions in order to save the planet for future generations.

The combination of the fact that climate change is already occurring, with the author's focus on adaptation, means that most of the remedies are based on near-term effects. In some cases, the author forces the reader to take the longer term view because climate change adaptation efforts will increase in response to intensifying effects over the next two-to-three centuries.

In *Storms of my Grandchildren*, James Hansen focused on a more distinct planetary issue and therefore is concerned about how to solve the problem in a more systemic manner. He suggests that our political systems have to change in order to adjust to this new reality by enacting global treaties within the next few years. In order to bring GHG levels down to 350 PPM, he advises for a “carbon fee and dividend” approach as opposed to a “cap and trade” system which is more popular in economic circles. He also suggest a complete phase-out of fossil fuels and mass adoption of renewable energy technologies. If all else fails, geo-engineering may have to become an option in order to fine tune solar irradiance. In the realm of climate science, scientists must be free to do their work without political interference and without being pressured to abide by political realities that are not congruent with physical realities.

Conclusion

Each of these four authors felt compelled by overwhelming and dramatic evidence from a variety of scientists about the reality and potentially disastrous effects of global warming, at a time when various forces in the U.S. were promoting a skepticism about that science. In the time since these four books were published, more scientific evidence has affirmed the evidence for global warming.

In the past decade, individual technologies brought to market in thousands of cases has provided some hope for slowing the continued increase in the generation of green house gases. That approach, for seeking solutions based on commercial viability, is necessarily limited, in part because it does not get at the behavioral roots of patterns of consumption and production. Approaches based on geopolitical solutions, have also produced international convenings, such as those in Copenhagen and Cancun, which have failed miserably.

Each author presents a common set of dire scientific findings and a set of solutions, some of which can be implemented through commercial technology, some of which depend on international activity. But the unity of problems and solutions is propelled, and can only be achieved, by the central, morality-based imperative running through the books: to restore the Earth's balance.

This multi-book review can serve to illustrate some significant aspects of the necessarily ongoing measuring and coping with climate change: different authors, experienced at weighing scientific evidence, can agree on the facts, but offer complementary modes for addressing their consequences; and consideration of the human causes and human impacts of planetary imbalance cannot be left to a single, or even a few, disciplines. Broadening and deepening the multi-disciplinary approach will continue to be of crucial importance.

Books Reviewed:

McKibben, Bill. *Eaarth: Making a Life on a Tough New Planet*. First ed. New York: Times, 2010. Print.

Hamilton, Clive. *Requiem for a Species: Why We Resist the Truth about Climate Change*. London: Earthscan, 2010. Print.

Hertsgaard, Mark. *Hot: Living through the next Fifty Years on Earth*. Boston: Houghton Mifflin Harcourt, 2011. Print.

Hansen, James E. *Storms of My Grandchildren: The Truth about the Coming Climate Catastrophe and Our Last Chance to save Humanity*. Paperback 2011 ed. New York: Bloomsbury USA, 2009. Print.

APPENDIX A.

Authors' and Reviewers' Short Biographies

Authors

Bill McKibben

Bill McKibben is the author of more than a dozen books and the founder of environmental organizations Step It Up and 350.org. As a writer, journalist and environmental activist, McKibben has spent more than 25 years advocating for a more sustainable society that operates in alignment with natural systems. McKibben is also a scholar in residence at Middlebury College, and lives in rural Vermont. You can read more about him at http://en.wikipedia.org/wiki/Bill_McKibben

Clive Hamilton

Clive Hamilton is the professor of public ethics at the Centre for Applied Philosophy and Public Ethics at the Australian National University. He is a member of the Board of the Climate Change Authority of the Australian Government and was the Executive Director of The Australia Institute until 2008. He has held teaching positions and fellowships at Oxford, Cambridge and Yale University. As a writer, academic and activist, Hamilton advocates for overcoming the denial about climate change and to reflect upon issues concerning consumerism and overconsumption of resources. He lives in Australia. You can read more about him at http://en.wikipedia.org/wiki/Clive_Hamilton

James Hansen

James Hansen is the Director of NASA Goddard Institute for Space Studies and an adjunct professor in Department of Earth and Environmental Science at Columbia University in New York City. As the preeminent authority on global warming and climate change, Dr. Hansen is frequently called to testify in front of congressional committees and is the foremost keynote speaker at conferences related to climate issues. Dr. Hansen's background in both space and earth sciences allows a broad perspective on the status and prospects for Earth. Dr. Hansen holds a B.A in Physics and Mathematics, an M.S in Astronomy and a Ph.D. in Physics all from the University of Iowa. His recent work on radiative forcings and feedback has contributed greatly to the debate about future climate change. He is amongst the most well known and respected climate scientists in the world. He lives in Virginia. You can read more about him at http://en.wikipedia.org/wiki/James_Hansen

Mark Hertsgaard

Mark Hertsgaard is a writer and journalist who has written on many subjects including the environment. He is the author of five books including *Earth Odyssey: Around the World in Search of Our Environmental Future*. As a writer, Hertsgaard travels to conduct interviews and does extensive reporting to form unique narratives based on his own observations. His research and writing technique allows for numerous perspectives and solutions that have been tried to solve difficult problems. He lives near San Francisco.

Reviewers

Edward Church

Edward Church has had more than 30 years of wide-ranging experience in government, nonprofits and private business. He has served as the Executive Director of the Institute for Environmental Entrepreneurship since 2007. Ed Church received his Ph.D. in Sociology from the University of California at Berkeley.

Shripal Shah

Shripal Shah is an experienced strategist who has consulted for over 12 years with several large corporations on corporate finance and sustainable management. He received his MBA degree in Sustainable Management from Presidio Graduate School in San Francisco.

Jennie Richards

Jennie Richards has over 20 years experience building, launching, and leading new business and marketing initiatives. She received an M.B.A. in Sustainable Enterprise from Dominican University of California, and holds a B.A. in English Literature and B.A. in Advertising from the University of Washington in Seattle.

APPENDIX B.

Sources of Information

Each of the four books are well researched and are based on solid scientific findings from a wide range of researchers. In particular, there are numerous references to well known scientific journals and media sources, as well as interviews with experts, which enable the authors to craft a viable narrative about the state of the planet in this era of climate change.

Bill McKibben's *Eaarth* relies heavily on journalistic reporting from media as diverse as newspapers, blogs, websites, non-governmental organizations and magazines. In cases where scientific information was required, the author relied on data and reports from sources like NASA, NOAA, Scripps Institute of Oceanography and the U.S. Climate Science Program. He also consulted journals like *Open Atmospheric Science*, *Geological Society of America*, *Hydrological Research Letters*, and *Zoological Society of London*. To add depth to his own observations about climate change, the author referenced nearly two dozen books on topics ranging from oil depletion to geopolitics to globalization to local self reliance.

Clive Hamilton's *Requiem for a Species* relies more heavily on other author's books as well as science journals and the work of non-governmental research organizations. In addition to climate science, areas of research include mitigation and adaptation techniques and public's views about issues surrounding climate change. Journals such as *Environmental Research Letters*, *Technology Analysis and Strategic Management*, *Proceedings of the National Academy of Sciences* and *American Journal of Psychiatry* were consulted about the effects of climate change on both natural systems and human actions. In order to present his case for changing individual attitudes with respect to climate change, the author references nearly four dozen books that

provide a basis for moral and ethical considerations on how to live sustainably and conduct ourselves in accordance with what surrounds us.

James Hansen takes a different path in *Storms of My Grandchildren*, which is noteworthy given that the book is a personal appeal to take global action to avert climatic effects facing the planet. The merging of two key themes; climate change science relating to cause and effect and his personal history of dealing with politicians are supported by two main types of sources. One, journals like *Journal of Geophysical Research* and government organizations NASA, and two, his own website which contains research, findings and personal accounts of the past 25 years. While the author himself is considered a preeminent climate scientist, the base science of climate change is supported by similarly highly regarded scientists some of whom were his colleagues over the years.

For *Hot*, Mark Hertsgaard spent time interviewing and profiling the principals who are key figures in the narrative he has developed. In addition to his scientific source material, the author conducted his own research through numerous interviews and in-person visits with his subjects over a multi-year period. He also cites the work of other journalists. He also spent considerable time studying the work of institutions like NASA, the Intergovernmental Panel on Climate Change, and the National Academy of Sciences. Mark Hertsgaard presents the book as a gift to his daughter, who will become an adult in the year 2020. While some portions of the book discuss the future up to that point, most climate science is contained between years 2050 to 2100.