

Lessons learned from “The Skeptical Environmentalist”: an environmental health perspective

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Abstract

Few books about the environment have generated as much heated debate as Bjørn Lomborg’s ‘The Skeptical Environmentalist: Measuring the Real State of the World’, published by Cambridge University Press in 2001. A flavor of the controversy can be gleaned from a series of reviews and rebuttals published in ‘Scientific American’ (Rennie 2002). In general, most positive reviews appeared in the popular press (e.g., ‘The Economist’, ‘Washington Post Book Review’, ‘The Wall Street Journal’) and most negative reviews appeared in the scientific press (e.g., ‘Science’, ‘Nature’, ‘Bioscience’). Although ‘The Skeptical Environmentalist’ (TSE) addresses a number of environmental health issues, voices from the environmental health community have not been prominent among the participants in this debate. Now that the dust from the initial stampede to praise and condemn the book has settled, we will explore lessons to be learned from TSE and the associated debate from an environmental health perspective.

Key words: Environmental health – Skeptical Environmentalist – Bjørn Lomborg

Introduction to the debate

Writing as a statistician and political scientist at the University of Aarhus in Denmark, Bjørn Lomborg concludes that, by essentially all relevant measures, the state of the global environment, as well as the state of human welfare, has vastly improved in recent decades and will continue to do so (p. 4). The environment, he asserts, is in many cases improving as if guided by an invisible hand, independent of human agency; in those cases where improvement is the fruit of hard work, “we are on the right track” (p. 5) and need not question the direction of change. TSE concludes, “Children born today – in both the industrialized world and developing countries – will live longer and be healthier, they will get more food,

a better education, a higher standard of living, more leisure time and far more possibilities – without the global environment being destroyed,” (p. 352). TSE suggests that reported findings to the contrary from the scientific community are misguided, manipulative, or perhaps both.

The optimism of TSE has received laudatory reviews from the popular press. For example, ‘The Economist’ commends the work as “One of the most valuable books on public policy ... in the past ten years” (Anonymous 6 September 01). The ‘Washington Post Book Review’ admires “the most significant work on the environment since ... Rachel Carson’s *Silent Spring*” (Dutton 21 October 01). ‘The Daily Telegraph’ praises “probably the most

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important book on the environment ever written" (27 August 01). The book and its author have also received favorable coverage from influential publications such as 'The New York Times' (Wade 7 August 01), 'The Wall Street Journal', and 'The International Herald Tribune' (9 October 01).

Among those seeking to diminish concerns regarding environmental and social injustice, TSE has found a ready group of adherents. For example, in the United States, Lomborg has been embraced as an environmental expert by the Brookings Institution (BI) and the American Enterprise Institute (AEI). At the invitation of the Competitive Enterprise Institute, Lomborg, who dismisses the consensus views of the Intergovernmental Panel on Climate Change, addressed a US Congressional panel on climate change and reiterated his reassuring message. Presumably in confirmation of his conclusions, the new conservative Danish government appointed Lomborg as director of the newly established Institute for Environmental Evaluation, a multimillion-dollar agency charged with evaluating the cost-effectiveness of the country's environmental policies ('San Francisco Chronicle' 4 March 2002).

Not surprisingly, TSE has provoked a generous number of reactions from a diverse range of scientists. Critiques in respected journals such as *Science* (Grubb 2001), *Nature* (Pimm and Harvey 2001), and *Bioscience* (Pimentel 2002) sharply criticize the book's selective interpretation of environmental science and its panglossian vision of the state of the world. By way of introduction to a series of responses to TSE (Schneider 2002, Holdren 2002, Bongaarts 2002, and Lovejoy 2002), 'Scientific American' editor-in-chief John Rennie remarks, "... it is hard not to be struck by Lomborg's presumption that he has seen into the heart of the science more faithfully than have investigators who have devoted their lives to it; it is equally curious that he finds the same contrarian good news lurking in every diverse area of environmental science" (2002).

In early 2003, the controversy entered a new phase with the release of a report rebuking Lomborg of "scientific dishonesty" by the Committee on Scientific Dishonesty of the Danish Research Agency. Responses ranged from welcome by those who had heavily criticized TSE (Woodard, 2003) to cries of "censorship" by those who had praised it (Pielke, 2003).

Why should the environmental health community be concerned?

The initial attention and subsequent controversy surrounding TSE has catapulted the book into the

ranks of all-time best-sellers on the environment. Although the book's eventual impact on decision-makers and the wider public may not become consonant with its high sales figures, the discussion engendered by the book has become far-reaching, extending beyond academic disagreement and into public policy discourse. With major sections of TSE addressing environmental health issues, the environmental health community has compelling reason to engage the debate.

The debate between Lomborg and his adversaries raises disquieting questions about the integrity of scientific conduct. TSE intimates that it is not simply "environmentalists" but also environmental scientists who have been manipulating data in an effort to advocate an agenda. On the other hand, environmental scientists have expressed discontent that TSE could be published by a respected University press whose reputation is associated with sound peer review as a foundation of quality control. Both cases highlight the importance of subjecting scientific findings to the rigorous scrutiny of outside experts prior to publication. This requirement is arguably more critical when issues involving both science and policy are concerned since the findings often serve as a basis for environmental policy. Unfortunately, the intersection of science and policy is often overlooked by both academics and public health groups and subsequently claimed by special interest groups that do not necessarily represent the interests of the public.

The science-policy interface is particularly important at a time when the discipline of environmental health is shifting and expanding to address new arenas, even as many basic environmental health concerns, for example providing adequate nutrition, effective sanitation, and clean energy, remain to be effectively addressed for a large portion of the global population. In recent years the structural determinants of health, such as socio-economic development and healthcare access, have been joined by the fundamental concerns of equity, justice, democracy, and sustainability. As a result, environmental health science must contend with an array of challenges spanning old and new, planetary and molecular, acute and chronic. The debate surrounding TSE challenges the environmental health community to portray the significance and nature of these issues in a credible, clear, and convincing manner.

The substance of the debate

By his own account, Lomborg sought to objectively resolve discrepancies between the claims of so-called environmental optimists and environmental pessi-

mists using statistics (p. 3). In doing so, Lomborg uncovered to his alleged surprise the apparent falsehood of “the litany of our ever deteriorating environment” (p. 3). In writing TSE, Lomborg intended to debunk what he saw as doom and gloom sensationalism propagated not only by environmental activists but also by environmental scientists, often through a complicit mass media. Professing to be motivated by a moral imperative to communicate the most credible information for decision-making (p. 32), TSE claims to present the “best available facts” on an impressively broad, although not exhaustive, range of environmental topics, including human welfare (Part II: Health, food, and prosperity), natural resources (Part III: Agriculture, forests, energy, water, and other resources), pollution (Part IV: Air pollution, water pollution, and solid waste), and future dilemmas (Part V: Chemicals, biodiversity, and global warming). Almost three thousand footnotes and two thousand references in TSE are used to support its conclusions. Throughout, TSE accounts for apparent contradictions between the book’s conclusions and those of the wider scientific community by suggesting that environmental scientists have been omitting evidence, misrepresenting findings, and understating uncertainties. TSE concludes that “We are actually leaving the world a better place than when we got it and this is the really fantastic point about the real state of the world: that mankind’s lot has vastly improved in every significant measurable field and that it is likely to continue to do so.” (p. 351)

A superficial reading of TSE may lead the unreflective reader to agree. Yet the critical reader must examine the reasoning and sources employed in TSE to evaluate the book’s characterization of environmental problems and whether or not these problems are decreasing. Our analysis of TSE’s treatment of environmental health issues exposes a frequent and widespread series of biases, including: (1) omissions of evidence, (2) misrepresentations of findings, and (3) understatement of uncertainties – the very misconduct that TSE accuses its opponents of perpetrating.

The introductory section of TSE (Part I) contrasts the book’s methodology with an approach attributed to environmentalists and environmental scientists. In particular, the book decries the habit of making sweeping generalizations from a single example, condemning arguments made by Isaac Asimov, David Pimentel, the Worldwatch Institute, and the United Nations Environmental Program. Lomborg states that TSE seeks, instead, to portray the overall state of the world by relying upon

published statistics of global long-term trends that emphasize relative and average measures.

This methodology, as any approach, has both advantages and disadvantages; the book discusses the former, the latter are discussed here. TSE states that the official sources utilized are “widely accepted by the majority of people in the environmental debate,” (p. 31) although such global statistics are, in fact, widely contested. TSE fails to discuss the reliability of the published statistics upon which it depends, most of which come from sources that were not subject to peer review. As Peter Gleick notes, “Indeed, one of the greatest flaws in the book is his (Lomborg’s) failure to discuss data problems in general, including how to read and understand environmental data, the failure of governments to collect and disseminate adequate environmental data, how to tell good data from bad data, and so on” (2001).

As we shall demonstrate with respect to environmental health issues, TSE, on one hand, selectively presents data that bolster a specific perspective, and on the other hand, misinterprets and misuses data. TSE repeatedly chooses the most convenient time-scales for examining trends, conflates historical trends with predicted trends, and overlooks trends that are subversive to its arguments. Similarly, TSE inconsistently uses relative and absolute measures, as well as average and alternative statistics, depending on the option that best supports the argument at hand and fails to address conclusions that might have been supported on the basis of alternative measures. Curiously for a book written by a statistician, TSE overlooks the problems inherent in characterizing complex problems by average values, neglecting the important insights offered by distributions. That TSE fails to raise, much less contend with, questions of equity is irresponsible and negligent, particularly in discussions of global health.

We found TSE’s portrayal of “global” decidedly biased. Since the preponderance of the book’s data are drawn from the developed world, this pivotal bias is underscored by TSE’s repeated use of “we” and “our” to refer to circumstances valid for only the 15% of the world (Murray and Lopez 1996) that resides in established market economies (p. 87). The developing world is typically either disregarded, or, trends from the developed world are simply extrapolated to the developing world. Such extrapolation is highly problematic, particularly for environmental health issues such as air pollution, chemical exposures, infectious diseases, biodiversity, and global change.

In the following sections, we explore how the treatment of both classical and emerging environmental health problems has been tainted by the major forms of bias (i.e., omission of evidence, misrepresentation of findings, and understatement or neglect of uncertainties) mentioned. We conclude by addressing TSE's dismissal of the role of proactive environmental policy in stimulating positive change, as well as implications of and lessons to be learned from the debate.

Classical environmental health problems

TSE addresses many classical environmental health problems, such as ambient air pollution, allergies, asthma, and synthetic chemicals in the environment. However, TSE's portrayal of these long-recognized environmental health issues and current trends in critical links between human health and the environment is riddled with omissions, misrepresentations, and neglect of uncertainties.

Simplistically insisting that both "our surroundings" and human welfare are improving on most relevant measures, TSE misrepresents the role of environmental factors as determinants of disease. TSE fails to contend with a systematic, consistent analysis of environmental health burdens (Smith et al. 1999) based on the comprehensive database and well-defined methodology of the Global Burden of Disease Study (Murray and Lopez 1996). Instead, several pages (pp. 21–27) are devoted to disparaging a 1998 paper, which, through a series of ad hoc arguments, suggests the global fraction of disease associated with a deteriorating environment is about 40% (Pimentel et al. 1998). Although TSE notes many justifiable grievances with Pimentel et al.'s 1998 paper, its own arguments cannot stand solely on the weakness of, in its own words, "low-quality, individual claims" (p. 24). But apparently the reader is expected to accept the weakness of one carefully selected paper as evidence of the strength of TSE's counter-claims, without considering stronger evidence to the contrary. For example, Smith et al.'s (1999) conclusion that 25%–33% of global burden of disease is attributable to environmental factors goes uncited in a six-page discussion of the environmental burden of disease. It is disheartening that TSE repeatedly fails to cite, discuss or refute some of the stronger arguments that run counter to its claims.

In characterizing the "state of the world" with respect to air pollution in Chapter 15, TSE focuses on criteria pollutants in the ambient environment of

the developed world. TSE draws on anecdotal descriptions from several centuries past – when solid fuel combustion coupled with lack of sanitation infrastructure led to squalid cities – as a starting point from which to discuss trends and support its stance that (ambient) air pollution (in developed nations) is not a "new problem getting worse, but an old problem getting ever better" (p. 165). TSE extends this prognosis to the developing world, stating with no other justification than examples from developed nations that we can expect urban air quality problems to improve in developing countries as their economies grow. Although this speculation may prove true, it does not suffice to guide the environmental health community in safeguarding public health.

Several aspects of this analysis of the "global state" of urban air quality invite dispute. First, TSE portrays urban air pollution in developed nations not as a large problem, but as a situation so vastly improved that we should be content to laud our success in reducing ambient concentrations of criteria air pollutants. TSE, remarking that particle levels have fallen dramatically in the U.S. and UK, speculates that it is likely that extremely small particles (PM_{2.5}) have also fallen dramatically. Specifically, it points out that concentrations of PM₁₀ have fallen by 25% in the last 12 years. TSE asserts (albeit very cautiously) that if PM_{2.5} has "fallen at least by half", years of human life are added and lives are saved due to this decline. The reader is told that reductions in ambient concentrations of fine particles save more than 135,000 premature deaths per year in the United States (p. 169). However, there is no scientific basis for assuming extremely small particles' (PM_{2.5}) concentrations to decrease more dramatically than PM₁₀. In fact, there is evidence that technologies to reduce PM₁₀ concentrations may have relatively little impact on the concentration of smaller particles (Kleeman and Cass 1999). Furthermore, a widely-cited analysis of health impacts associated with outdoor exposures to PM₁₀ attributes 6% of all mortality, or 40,000 deaths per year in Austria, France, and Switzerland, to outdoor and traffic-related air pollution (Kunzli et al. 2000). Clearly, a sizeable public health challenge remains, regardless of the progress that has been made.

Second, TSE claims that "there is good reason to assume that air pollution in the developing world will also improve with time" (p. 163). It again speculates that, as suggested by select World Bank statistics, "it is possible to achieve high standards of living and still have an ever better environment" (p. 176). Although the arguments here are familiar and

widely subscribed to, there is no evidence indicating that such transitions will occur without supportive action. As noted earlier, hopeful and even plausible speculation does not serve as a basis for protecting the public health.

Third, TSE misrepresents both time trends and health effects associated with peak episodes of urban ambient ozone. Lomborg not only uses spatial averaging but also confuses correlation with cause and effect relationships to simplify and smooth out local and country specific differences. For example, in the section on ozone, Lomborg acknowledges that peak concentrations matter most for health and vegetation effects but then presents data that are spatially averaged over the entire U.S. continent (page 173–174). Clearly the adverse health impacts of the population in Los Angeles, California from ozone cannot be “canceled out” by the lack of such effects in Minneapolis and St. Paul, Minnesota. Moreover, aggregation of impacts at a scale that obscures harm done renders meaningless central principles of environmental rights, such as the ideas that the responsible party should be held accountable for damage and that people have a right to know what risks are being foisted upon them.

TSE explores indoor air pollution in Chapter 17 and deserves praise for recognizing the enormous and often overlooked public health problem of developing countries’ residential indoor air pollution, one of the largest single mortality risk factors in the world (WHO 2002). Unfortunately, this discussion is limited to three pages in which Lomborg indicates that although indoor air quality is a tremendous health problem for the several billion people who depend on indoor combustion of dirty fuels for household energy, this problem will disappear of its own accord as economies improve. Projections, however, indicate that the rate that households shift to improved fuels through economic growth will be relatively slow, perhaps not even keeping up with population growth (Smith et al., 2003). Positive economic trends suggest another set of tools for health promotion, but are not an alibi with which to justify doing nothing.

TSE also offers a brief discussion of the developed world’s indoor air quality, as indicated by four pollutants, namely, asbestos, radon, cigarette smoke, and formaldehyde. TSE uses the staggering magnitude of the developing world’s indoor air quality problems to dismiss indoor air pollution in the developed world as insignificant: rather than exhorting the reader to address developing countries’ indoor air pollution, the millions of annual air pollution attributable deaths in these countries are used to downplay the importance of indoor air

pollution in the developed world. Other problems with this short chapter on indoor air pollution are the neglect of CO and NO₂ as indoor air pollutants in the developed world and heavy reliance on non peer-reviewed reports (25 out of 31 citations), to the near exclusion of primary references.

Chapter 18 discusses allergies and asthma, a complex area of strong and growing concern. It is troubling that TSE relies on only a handful of studies. TSE argues that pollution cannot cause asthma and concludes, “...there is no reason to assume that the development of asthma is due to a deterioration of our environment, but rather because we have sealed up our homes, spend more time indoors and have more soft objects around the home” (p. 188).

The sole evidence offered is increased exposure to house-dust mites and the matter-of-fact declaration that “by far the majority of asthmatic patients are also hypersensitive to dust mites” (p. 187). As is unfortunately common throughout its analysis, TSE does not admit the uncertainty involved in a discussion of asthmatic disease, and omits evidence unresponsive of its views. To illustrate, contrary to what TSE reports, a number of studies on asthmatic patients have observed that less than half are sensitized to dust-mites. In a recent study from the U.S., Rosenstreich et al. (1997) find 34.9% to be sensitized to dust-mites, compared to 36.8% to cockroaches and 22.7% to cats. The fact that patients who are sensitized to dust-mites are often also sensitized to a number of other allergens at the same time makes it difficult to conclude that dust-mites are the actual causal agent for asthma (Rosenstreich et al. 1997). TSE fails to mention that sensitization is not the same as clinical asthmatic symptoms, and does not mention the fraction of asthma (20–30%) that has non-allergic causes (Eggleston et al. 1999).

TSE draws several perplexing conclusions related to environmental causal factors of asthma other than house-dust mites. It is paradoxical that TSE accepts that exposure to environmental tobacco smoke doubles children’s risk of getting asthma (p. 187), but finds it unthinkable that other environmental pollutants influence the causal pathway. On page 186, TSE states that “there generally seems to be more (asthma) in towns and cities...” and that we should resist the temptation to believe that this is caused by air pollution. There are a number of ecologic time trend-studies that lend support to this statement, indicating reduced pollution and increasing asthma over time. However, ecologic studies are inherently plagued by confounding, and in a multifactorial disease such as asthma, the effect of one risk

factor (such as air pollution) could be confounded by another, unmeasured risk factor (e.g. immune changes due to fewer microbial stimuli). In addition, some researchers argue that the smallest fraction of particles in air pollution (the ultrafine) have actually been increasing in the industrialized countries over the last decades, and may be an important causal risk factor for allergic disease (Grigg, 2002).

A number of panel studies have clearly shown increased acute asthma symptoms related to increased levels of air pollutants, but the issue of causal effects versus symptomatic effects is not clear (van der Zee et al. 1999). On the other hand, many associations between asthma and pollutants in occupational settings are quite clear, with over 200 known occupational causes (Chan-Yeung 1995).

TSE even doubts that the increase in asthma is real, and to support its views selectively quotes (p. 186) a "meta-study" review paper by Magnus and Jaakkola (1997). The 18 repeated cross-sectional prevalence studies referenced in this review paper unanimously report an increase in asthma prevalence. However, Magnus and Jaakkola (1997) state that no firm conclusions can be made from this study as to whether the increase is real, due to uncertainties inherent in the cross-sectional design and in their analysis. TSE misinterprets this uncertainty as evidence of no increased prevalence. Indeed, its dismissal of the environmental health community's widespread, strong, and growing concern about asthma is highly indicative of the way TSE fails to convey current issues accurately to its readers.

Chapter 22 considers "our chemical fears," which TSE interprets as cancer and synthetic chemical exposure. The central conclusions are that there is no cancer epidemic and that synthetic chemicals are more beneficial than burdensome to human health. As in other chapters, TSE relies on data for U.S. trends and U.S. risks to characterize a global situation.

In Figure 117 (p. 217), trends over the past 50 years in total U.S. cancer deaths are presented, using the world population as the standardized population. The use of total cancer deaths, as opposed to tissue-specific cancer deaths (leukemia, breast, stomach, etc.) reduces an array of information to a single number. An examination of trends in site-specific cancer mortality rates would reveal some rising and some falling trends, rather than a single overarching trend. Although the total cancer approach is not as elucidating as analysis of site-specific rates, for brevity we too will limit our discussion to the data presented on total U.S. cancer mortality standardized to the world population. The world population has a different age structure than

the U.S. population, and the U.S. population is, in general, an older population (Population Reference Bureau 2002). Although the choice of standardizing population is somewhat arbitrary, the Centers for Disease Control points out that this choice can have a large impact "when age-specific rates have divergent patterns" (Hoyert and Anderson 2001). Although TSE states that "cancer is almost exclusively a disease of old age" (p. 217), it chooses a younger population as the standard, thus de-emphasizing the changes in cancer deaths in older age groups and distorting the trend experienced by the U.S. population. Using the 2000 U.S. population as the standard, National Vital Statistics researchers report year 2000 cancer deaths per 100,000 to be 202.7, approximately 45% higher than the rate of 140 per 100,000 shown in Figure 117. The National Cancer Institute gives the age-adjusted cancer death rate in 1950 (standardizing to the 2000 U.S. population) as 195.4 per 100,000 (Ries et al. 2002). These rates are higher than those presented by TSE and show a slight increasing trend. The age-adjustments using 1970 world population data as presented by TSE mask and alter the overall trends in cancer mortality in the U.S. One would expect a statistician, such as Lomborg, to more carefully present such data, or at least to note the importance of choosing the age-distribution baseline.

TSE's major conclusion on cancer mortality is that since cancer mortality is declining for non-smokers, which is not directly measurable in the presentation of its data, then there is "no real cancer epidemic" (p. 218). The problem with this conclusion is that a decline in death rates from a specific cause does not indicate a decline in incidence. Although TSE presumes decreased cancer mortality to unambiguously imply decreased incidence, decreased cancer mortality in the U.S. and Western Europe is at least partly due to better and earlier screening techniques and improved treatment resulting in an overall increase in survivorship.

Further, we are troubled by TSE's treatment of and attitude towards synthetic estrogens in Chapter 22. In less than half a page, the possibility that mixtures of synthetic estrogens may combine in a non-additive way is introduced and dismissed (p. 241). TSE cites the anomalous experience of a group of researchers headed by McLachlan (1997) who withdrew their paper from *Science* after the results of their experiments with two weakly estrogenic compounds, which showed a large synergistic effect, could not be replicated. However, TSE omits discussion of any other articles published prior to 2001 that are germane to its discussion on synthetic estrogen synergies. An example is the result of experiments testing the synergistic response of two

polychlorinated biphenyls (PCBs), 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), or combinations of the single PCB congeners with TCDD for 13 weeks (Van Birgelen et al. 1996). These experiments demonstrated that the combination of synthetic estrogens produced a response in test rats which was higher than any of the single compounds alone. When compared to the control rats, the rats exposed to the individual compounds did not have an increase in response. When a representative PCB and TCDD were applied together, the response in the exposed rats was approximately 800 times higher than that in the controls. Unlike the McLachlan article, Van Birgelen’s article has not been withdrawn, nor has its validity been questioned. Other articles available prior to the 2001 publishing of TSE further substantiate a likely synergistic effect between estrogenic compounds (Bergeron et al. 1999, Vonier et al. 1996). TSE’s assertion on page 242 that “all the facts currently suggest that estrogens have no cocktail effect,” is directly contrary to a substantial body of evidence, and was so at the time of printing.

Lastly, TSE presents a range of studies, from the very small to meta-studies (NRC 1999) on a possible causal relationship between breast cancer and synthetic estrogens; one even reports a protective effect of DDT (van’t Veer et al. 1997). Clearly, however, breast cancer research does not lend itself to two-page summaries like the one TSE offers, especially given that the National Institutes of Health’s National Library of Medicine “PubMed” website returns over 17,000 references on breast cancer and estrogen (PubMed, 2002). Although TSE is correct in reporting that no consensus has been reached about synthetic estrogens’ causal role in breast cancer, it is incorrect to assume no debate exists; in essence it equates uncertainty with biological insignificance. It appears quite ready to put the subject to rest, stating “we now have the data, and they supply no evidence as to synthetic chemicals causing breast cancer” (p. 244). Few environmental health scientists would be so categorical.

Emerging environmental health issues

Although TSE’s answer to lingering traditional environmental risks is to promote global economic growth, it fails to acknowledge that this very economic development is associated with its own set of “modern” environmental issues. Traditional environmental risks – such as indoor air pollution, lack of sanitation infrastructure, and infectious

diseases – are typically characterized by local spatial scales, immediate temporal scales, and direct risk to human life. In contrast, modern environmental risks – such as global climate change, contamination of the ambient environment with persistent synthetic chemicals, and loss of biodiversity – are typified by global spatial scales, long time scales, and indirect risk to human welfare mediated by damage to ecosystem integrity (Smith 2001). Although traditional environmental risks, in aggregate, diminish with economic development, they cede not to a utopian absence of environmental health hazards, but to emerging modern risks (Figure 1). As this risk transition occurs, we must craft a coincident “sustainability transition” to ensure that those alive today meet their needs without endangering future generations’ welfare (McMichael et al. 2000). To its credit, TSE acknowledges the importance of sustainable practices, but TSE fails to point out that sustainable transitions neither occur spontaneously nor are an inevitable outcome of current trends (p. 91). Accordingly, the environmental health community cannot content itself with blindly promoting economic development, but must consider distributions and trends of environmental risks, both geographically and temporally (Figure 1).

After introducing global climate change as “the overriding environmental concern since the 1990s” (p. 258), TSE spends the first 29 pages of a 66-page chapter reviewing (and disparaging) basic climate science as well as scenarios explored by the United Nation’s Intergovernmental Panel on Climate

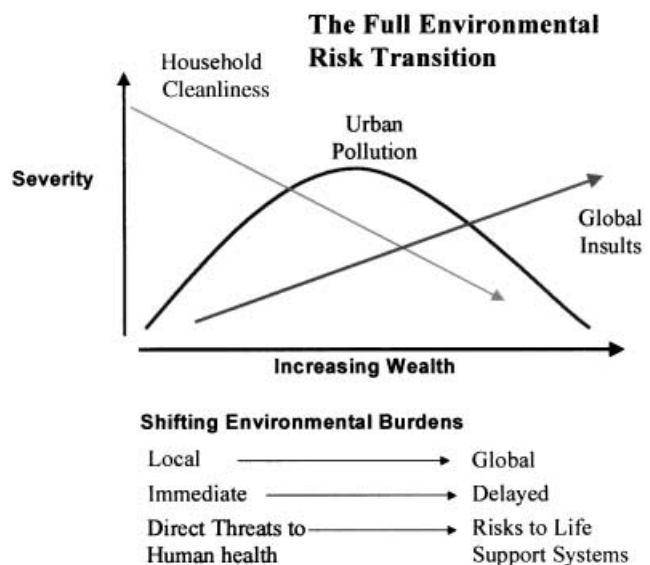


Fig. 1. A schematic of the environmental risk transition (source: Smith 2001).

Change (IPCC 2001). The next 14 pages of Chapter 24 address selected consequences of global warming, namely those associated with agriculture, sea level, human health, extreme weather, and present and future weather. Finally, it explores economic costs of global warming and mitigation strategies and concludes that (p. 317): “Global warming will not decrease food production, it will probably not increase storminess or the frequency of hurricanes, it will not increase the impact of malaria or indeed cause more deaths. It is even unlikely that it will cause more flood victims, because a much richer world will protect itself better.”

Although TSE acknowledges that “global warming will have serious costs,” which “will hit the developing countries hardest” (pp. 317–318), it asserts that investments in climate change curtailment are against the interests of the developing world because “we and our descendants” would “benefit far more from the same investment placed elsewhere” (p. 324).

TSE’s characterization of global warming is critiqued at length elsewhere; in particular, we refer the reader to Mahlman’s rebuttal in *Union of Concerned Scientists* (2001) and Schneider’s in *‘Scientific American’* (2002). TSE’s verdict regarding what is best for developing countries is not convincing as it is based on aggregate economic analysis with input from neither a human rights or equity orientation nor the literature of developing-country spokespersons. In agriculture, for example, TSE neglects consideration of particularly vulnerable regions (e.g., Sub-Saharan Africa, coastal mangrove communities) as well as populations particularly at risk for hunger (e.g., rural small holder producers, pastoralists, rural wage laborers, urban poor, refugees and displaced people, rural women, malnourished children, the handicapped, infirm, and elderly) (Downing et al. 1996).

The first human health risk explicitly discussed is thermal extremes, about which TSE concludes (p. 291) “it is unclear whether a warming world will all in all experience fewer or more deaths.” The first problem with this statement is that, on p. 317 (as quoted above) the reader is not presented with this reserved uncertainty, but with the flat conclusion that global warming “will not ...indeed cause more deaths.” The bases of TSE’s suspension of judgment (back to p. 291) regarding the aggregate direction of impact of thermal extremes are that local populations acclimate to increased temperatures, richer populations buy air conditioners, and fewer winter deaths offset more heat wave deaths. However, the acclimation study was for a European context. TSE neglects to discuss the implications for the many

regions of the world with mean summer temperatures exceeding the investigated range of 13.5 to 24.1 °C. Further, since the distribution of global warming’s impacts on mortality is never mentioned, it is hard not to conclude that TSE believes that distributions of effects do not matter. This would thus imply, for example, that it is acceptable for more people in poor countries to die in urban heat waves as long as sufficiently fewer people in rich countries die of winter-related illness. Such conclusions are suggested by TSE’s penchant for arguing as if global climate-change (and other environmental issues) can be understood by simply extrapolating the developed-world situation to the developing world, an approach that is incorrect from both physical and social standpoints.

The second – and final – issue discussed in TSE’s segment on human health consequences of climate change is malaria, about which the reader is told that “Actual malaria transmission shows ‘remarkably few changes, even under the most extreme scenarios’” (p. 292). Its sanguine stance is based upon the IPCC’s (2001) expectation that most additional exposure to malaria habitat would be in middle or high income countries, “where a well functioning health sector and developed infrastructure makes actual malaria unlikely” (p. 292). TSE neglects to mention the IPCC’s “particular concern... (of) reintroduction of malaria in the countries of the former Soviet Union with economies in transition, where public health infrastructure has diminished (e.g., Azerbaijan, Russia)” (IPCC 2001, sec. 9.7.1). Rather than categorically dismissing the threat of malaria in a warming world, a responsible scientist would emphasize the need to fortify public health infrastructures, as advised by sec. 9.15 of IPCC (2001). This need is especially strong given that, as “one of the world’s most serious and complex public health problems,” malaria is currently “undergoing a global resurgence because of a variety of factors, including complacency and policy changes that led to reduced funding for malaria control programs in the 1970s and 1980s, the emergence of insecticide and drug resistance, human population growth and movement, land-use change, and deteriorating public health infrastructure (Lindsay and Birley 1996)” (IPCC 2001).

Perhaps the most egregious shortcoming of TSE’s treatment of human health impacts is its silence on other climate-change-mediated health burdens discussed in IPCC (2001): extreme events and weather disasters, air pollution, infectious diseases other than malaria (dengue, other mosquito-borne viruses, leishmaniasis, schistosomiasis, chagas’ disease, plague, tick-borne diseases, rodent-borne diseases,

water-related infectious diseases, etc.), coastal water issues, food yields and nutrition, and demographic and economic disruption. TSE does not even mention that global warming’s largest health burdens may result from distal effects that stem from social phenomena induced or exacerbated by climate change (e.g., poverty, war, displacement of populations) (McMichael 1993, Myers 1993, 1994, Patz et al. 2000). In its discussion of human health impacts, TSE gives the reader no indication that such distal effects could occur, nor that their weight is expected to fall on those least responsible for climate change, namely the global poor (IPCC 2001), who already suffer a disproportionate burden of disease to environmental factors (Corvalan et al. 1999, Smith et al. 1999).

Another unsound strategy of TSE is the insinuation that biodiversity is not important. In discussing biodiversity’s obvious role as a medicinal stockpile, TSE irrelevantly focuses attention on the issue of cataloguing genetic information and does not report to the reader that 57% of the 150 most frequently prescribed drugs in the United States either contain or are patterned after compounds derived from non-human species (Grifo and Rosenthal 1997). Indirect but potentially vital linkages between human health and biodiversity have been given minimal attention by scientists, public health experts and physicians in the past (Chivian 2001), but scientists and health professionals now deem the loss of biodiversity a health-threatening global change (McMichael 2001). The interaction of species extinction, ecological health, and human health is not discussed by TSE, nor is the reader alerted that species extinction is not a simple, linear process by which one species can be removed without unpredictable effects on the rest of the system.

There is much concern regarding the connection between ecosystem health and human health, and recent international efforts to investigate these connections suggest that they are not so easily dismissed. For example, the World Health Organization (WHO) has established a Division of Healthy Environments and Sustainable Development. Similarly, an international project on biodiversity loss and health was jointly initiated by Harvard University and the WHO, and will publish its first comprehensive report regarding the human health consequences of species loss and ecosystem disruption in 2004.

Conclusion

TSE’s treatment of a multitude of global environmental issues ranging from climate change to biodiversity to indoor air quality has provided a rich forum for debate. We sought to determine if the author successfully met his stated objectives to provide the “best possible scientific information”, based on “comprehensive, accurate, unbiased and up-to-date figures.” From an environmental health perspective, we found that he fell short.

The central short-coming of TSE is failure to apply the scientific method in a rigorous, reliable, and logical manner. Firstly, there is no discussion of the reliability of the published statistics upon which the book depends; some of these statistics came from sources not subject to peer review. Without a base of reliable data, it is difficult to form meaningful conclusions. Second, the “global” perspective of TSE’s analysis is distorted and misleading. The book draws predominantly on characterizations from the developed world and frequently extrapolates data from the developed to the developing world without regard to the inherent differences in past and present modes of development, and differing economic and political climates, let alone ecology. There are several lessons to be learned from this book, though they are probably not the lessons intended. For one, an assessment of the “real state of the world” is perhaps too ambitious for an individual undertaking. Each chapter of this book would have benefited from the collective insights of expert collaboration and peer review.

TSE fails to acknowledge that those working towards further improvements – those who will not settle for “good enough” – are often motivated by optimistic visions of a better world, not by despair with the world as it is. Sadly, TSE mistakes global awareness and responsibility for pessimism. The perspective taken by some environmentalists (i.e., those labeled as “doomsayers” by TSE), is not so flatly pessimistic as TSE declares. Similarly, its apparent recommendation to maintain a business-as-usual course contains an inherent pessimism that a more equitable and healthy world is not possible.

We agree with TSE’s declaration that (p. 327) “The central point here remains: if we are to make the best decisions for our future, we should base our prioritizations not on fear but on facts. Thus we need to confront our fears; we need to challenge the litany.” However, this grappling must recognize the complexity, subtlety, nuances, and uncertainty associated with current environmental issues and concerns. The scale at which arguments are framed – i.e.,

the extent of aggregation, the construction of “global” perspectives – has tremendous impact on the flavor of prescribed policy responses. Hence, environmental health scientists must conscientiously present arguments and data in a way that lends itself to preservation of fundamental environmental rights, such as people’s right to know about environmental hazards and their right to hold polluters accountable for harm done. In the face of uncertainty, a pervasive characteristic of emerging environmental risks, environmental health professionals must learn to rationally apply the precautionary principle, which advises risk-averse behavior in the face of uncertainty. The reason that some environmental conditions have improved in the developed world is that policy makers and the public have acted cautiously and in accordance with environmental science. If environmental scientists had not, in the face of uncertainties and contrarians, made courageous recommendations, many of today’s environmental success stories would not have been realized.

The final lesson to be learned from TSE is that trouble ensues when publishers who enjoy the pedigree of producing responsibly peer-reviewed works seem to fail to operate in accordance with their reputation. Had TSE been published by a popular press, rather than an academic one, no such implicit “quality control” would have been assumed. In this case, however, the methods and reputation of a well-known university press are called into question. Indeed, the vitriolic nature of the debate over TSE in the scientific and popular presses, which so offended some observers, occurred primarily because there had apparently been no serious peer review before publication during which such frank discussion would have occurred in private.

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