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# Human Footprints on the Global Environment

Threats to Sustainability

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## Preface: Footprints Small and Colossal

During the Pliocene epoch, three early hominids walking across the Laetoli plains in East Africa were showered with ashes when the volcano Sadiman erupted. As they continued to walk, the light rain that was falling cast each of their footprints into a mixture of muddy ash. A little later, the impressions dried, leaving a fossil record of their trek. Three and a half million years later, archaeologist Mary Leakey discovered the prints.

These three sets of fossilized footprints found in what is now known as Northern Tanzania are remarkable because they have been preserved for so long. Literal footprints such as these are typically ephemeral, soon obliterated by wind, rain, or the trampling of later walkers. In the past much of the human ecological footprint was similarly ephemeral, absorbed by the natural cycles of ecosystem replenishment.<sup>1</sup>

Modern-day humans (*Homo sapiens sapiens*), like their ancient ancestors, leave traces of their presence wherever they roam or settle. But these footprints are not just temporary marks in ash and dirt. More than our ancestors, we, unavoidably leave durable footprints on the ecosystems we inhabit and exploit. Since primeval times protohumans and humans alike have impacted the ecosystems that sustain them (Redman 1999). But unlike their ancestors, modern humans have, with remarkable acceleration, expanded enormously the size and depth of their ecological footprints. The impact of these footprints in the contemporary period of twenty-first-century modernity can best be described as colossal; they dwarf by a considerable margin the footprints of all predecessors in recent or distant history. And colossal footprints are spreading around the globe, revealing such ostensible impacts as numerous species extinctions, deforestation on a grand scale, soil degradation and erosion, air and water pollution, and strong signs of a warming climate.

The growing impacts of modern human's colossal footprints now threaten the sustainability of the entire planet. Indeed, with remarkably few exceptions—for example, the political scientist Bjørn Lomborg (2001) and the science fiction writer Michael Crichton (2004)—there is widespread concern among all students of environmental change about the sustainability of the planet in the light of current trends in the use of nature's capital and services. Among scientists, policymakers, and other close observers, there is a virtual epistemic consensus over this concern. These communities have labeled the collection of these changes global environmental change (GEC) and have initiated worldwide coordinated research programs to better understand how the planet is changing and why.

What accounts for the colossal size of contemporary footprints? What are their key characteristics? What are the human forces driving their rapid growth? What can be done about curbing this rate of growth? Where does such growth most threaten the ecological sustainability of societies? What cultural and institutional practices are available for avoiding, mitigating, or managing ecological crises? These core questions summarize and frame the cumulative findings of the variety of sciences researching GEC.

But, ironically, they are questions not about the long expanse of historical time or the natural cycles and dynamics of GEC, but about the anthropogenic drivers of environmental change around the globe—the human causes of GEC. These human dimension questions are not the types of inquiries that researchers and scientists in the traditional global change sciences—rooted in physics, chemistry, and biology—are prepared to address. These are questions for the social sciences.

Yet a second irony is the fact that the social sciences, while better prepared to address these GEC-related questions, have been chary to do so, making them latecomers to GEC research. However, in the last few years, this reluctance has gradually given way to focused research. There are now major theoretical and empirical programs addressing key questions regarding the human dimensions of global change. The important goal of this volume is to collect the fruits of these labors, to organize them, and to present them in one place. Here we bring together core findings on the human dimensions of GEC to illustrate the advances that have been made in this critical area of study.

In this volume, chapters written by world-renowned experts on a wide range of environmental topics address key facets of the core

questions identified earlier. Together, these contributions not only cover the breadth of current work on the human dimensions of global environmental change, and provide well-articulated depth on the key findings from these research programs, but the chapters also point to the directions for fruitful human dimensions research.

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## Notes

1. There have been exceptions, of course. The Pleistocene era witnessed the extinction of megafauna everywhere except Africa (Martin and Klein 1984). In the case of the Americas, it remains a continuing debate as to whether the extinctions were caused by a precipitous change in climate at the end of the last glaciation (approximately ten thousand to thirteen thousand years ago), or by the appearance of human hunters in the new world. Not in dispute is the fact that Native North Americans sometimes substantially altered the ecosystems they exploited (Krech 1999). And much of the Amazon basin may have been reshaped by human action (Balee 1998). But despite these important events, the scale of the human footprint at present is without precedent in our history on the planet.

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