



## INTRODUCTION

# Conserving Global Nature

“Can we keep our planet habitable?” was the question that the *UNESCO Courier* posed to its international readership in January 1969.<sup>1</sup> The issue’s cover depicts an oil-covered bird—an auk that had been photographed near a Brittany beach during the Torrey Canyon oil spill of 1967. Its wings covered in sticky black slick, it tries to escape its sad and inevitable fate (figure 0.1). Since the picture was taken, images of oil-covered birds have become symbolic of mankind’s exploitive attitude toward nature and people’s devastating impact on the planet’s wild species. The concern of the Paris-based editors of the *UNESCO Courier*, however, did not involve French waterfowl or wildlife alone. Instead, their message extended to life on Earth in its totality, including their own human conspecifics.

For this reason, the editors of the *UNESCO Courier* had invited scientists and environmentalists from different international organizations to address the state of the global environment. In the January issue, all invited authors echoed similar global concerns and calls for international action. The message was perhaps expressed most clearly by the French zoologist Jean Dorst of the International Union for Conservation of Nature and Natural Resources (IUCN). Stressing the interdependence between the natural and the human world, Dorst explained, “The use of natural resources and nature conservation are two sides of the same problem. . . . The irrevocable disappearance of wildlife . . . would lead to serious disturbances in the overall productivity of the whole biosphere.”<sup>2</sup> The solution he proposed was global and based on science. It pertained to the maintenance of the balance between the preservation and use of the resources of the biosphere, the thin envelope around the planet that made life possible. As Dorst expounded, “The pursuit of optimum equilibrium leads logically to the idea of planetary “management” . . . which takes into account the particular uses to which different types of land are designed by their nature.”<sup>3</sup> The links between the protection of wild nature and the physical limits to the exploitation of natural resources for the improvement of society’s wellbeing were well established at the time. After the heights of postwar economic expansion and reconstruction, the world was confronted with the seemingly lethal combination of pollution, population pressure, and the limits of natural resources.<sup>4</sup>

2 Planning for the Planet

**Figure 0.1.** Cover image of the *UNESCO Courier*, January 1969. Reproduced from UNESCO, “Can We Keep Our Planet Habitable?,” *UNESCO Courier* 22, no. 1 (1969): 1–44.



The 1960s and 1970s marked a period in which our perception of the natural world and society's place in it was drastically reconceptualized. According to the political historian Jan-Henrik Meyer, our present-day understanding of the environment emerged between the years 1967, the year of the Torrey Canyon spill, and 1973, when a global oil crisis evoked fears of international dependencies and limits to natural resources.<sup>5</sup> Meyer refers to three developments that constituted this change in awareness: the rise of a widespread concern for the environment and its safeguarding, the emergence of new environmental groupings, and the integration of the environment as a political task field. Similarly, the environmental historian Sabine Höhler has called these two decades the beginning of the "environmental age," during which new concerns for global limits to growth emerged alongside new ideas on global environmental management by the means of science and international regulations.<sup>6</sup> Since the early 1960s, public intellectuals in Western society, such as Rachel Carson, Paul R. Ehrlich, Barry Commoner, and Garrett Hardin, spread messages of slow disaster in publications such as *Silent Spring*, *The Population Bomb*, *The Closing Circle*, and *The Tragedy of the Commons*.<sup>7</sup> In the same period, the growing public concern about the state of the environment in the global North presented a fertile breeding ground for activist groups and social movements. These grassroots movements exerted additional pressure, demanding the remodeling of existing structures of political organization and mechanisms for decision-making.<sup>8</sup>

With political changes came the quest for environmental expertise. Whereas environmental problems were conceived as global, and solutions seemed to lie in science, the international scientific community was far from working in unison. Adding to the existing institutions concerned with environmental protection, such as IUCN, the number of scientific groups or expert committees concerned with aspects of the environment grew significantly. New approaches from the late 1960s and early 1970s varied widely, ranging from surveys and environmental monitoring, to global networks of research reserves, to local resource development projects in the global South. In 1972, just a few months before the United Nations (UN) Conference on the Human Environment was held in Stockholm, the members of an independent international think tank called the Club of Rome published a much-discussed study: *The Limits to Growth*.<sup>9</sup> This scenario study, based on early computer calculations, predicted the collapse of global society if population growth and patterns of resource extraction continued at the existing rate. Yet the study's implicit suggestion that a single approach could capture and regulate societies and their use of natural resources, irrespective of local socioeconomic conditions and demands, was met with much criticism.<sup>10</sup>

In fact, questions on how to balance the protection of nature with the demands of a growing world population—and whom to trust or burden with the

responsibility—remain at the core of environmental policymaking even today. Still, we appeal to politically neutral and universal science to tackle global environmental problems, while solutions and expert roles remain intrinsically linked to political and often locally grounded decisions on how we want to live with nature. This paradox of global environmental expertise and its origins in postwar international science and policymaking is a core theme of this study. This book is concerned with the 1960s and 1970s, two decades in which global environmental ideas were high on the agenda of international science projects, while postcolonial politics and Cold War tensions made truly global solutions well-nigh impossible.<sup>11</sup> At the same time, these two decades marked the beginning of international environmental policymaking and the establishment of many of our present-day institutional mechanisms to investigate and address transnational environmental problems.

Despite the strong entanglement of the domains of knowledge and governance in the environmental policymaking of the period, for a long time historians' accounts have tended to keep the repertoires of science and politics separate.<sup>12</sup> Only recently have the interlinkages between science and politics in global environmental governance found more scholarly attention. Historians of the environment and environmental politics, such as Stephen Macekura, Michael L. Lewis, Bernhard Gissibl, and Etienne Benson, have shown that it is in the entanglement of political agendas and scientific arguments that we need to understand environmental policymaking since 1900.<sup>13</sup> Following a similar approach, this book is concerned with the history of internationally organized and science-based nature conservation since the 1960s.

Nature conservation, concerned with the preservation and management of the living environment in the form of threatened species, endangered habitats, or entire ecosystems, can be considered one of the longest-established, organized ways in which people have been concerned with what would become known as *the environment*. Although notions of what constituted the core activities of conservation have changed over time, as we will see in this study, nature conservation has often been marked off from the strict preservation of nature, aimed at shielding natural landscapes from human impact entirely. Instead, conservation, which emerged in the American context as part of the nineteenth-century National Park movement, has always allowed for a more active management of natural environments through human intervention. Conservation may entail preservation, but can also include a “wise use” of natural resources to some extent.<sup>14</sup> In the European context, in postwar Britain especially, the term “conservation” was closely linked to a more scientific understanding of nature protection and the management of natural resources, land, and landscapes.<sup>15</sup>

A group of leading nature conservationists at IUCN, and their strategies to influence decisions in the emerging field of international environmental

politics, present the focal points of this book. Since its foundation in 1948 in Fontainebleau, France, initiated by Julian Huxley of the United Nations Educational, Scientific and Cultural Organization (UNESCO), IUCN has been the biggest and most considerable international and science-based nature conservation organization. Initially called the International Union for the Protection of Nature (IUPN), the organization was created by representatives of twenty-three governments, 126 national institutions, and eight international organizations. In 2019, IUCN's website lists more than 1,300 members, including states, government agencies, scientific and academic bodies, nongovernmental organizations (NGOs), Indigenous Peoples' organizations, as well as business associations.<sup>16</sup> Nevertheless, as the self-proclaimed "best hidden secret in the conservation community," IUCN never reached the renown of its sister organization, the World Wide Fund for Nature (WWF, until 1986 World Wildlife Fund).<sup>17</sup> IUCN's unrenownedness presents perhaps sufficient motivation to dedicate this book to their role in postwar conservation policies. There are, however, other reasons why a focus on IUCN makes for a valuable contribution. This book is concerned with three of them. First, in the postwar period, IUCN continued and consolidated the loosely organized international conservation endeavors dating back to the early 1900s. As an organization, IUCN built on colonial networks of naturalists around the globe; as an epistemic platform, they were in the vanguard of a planetary concern for the global environment. By the 1960s, IUCN could rely on a far-reaching network with scientific members in many parts of the world. Deeply convinced they were the only organization concerned with all aspects of the environment—"all life," "not just those species that attract our eye,"—members offered their advice to policymakers.<sup>18</sup> As such, a focus on IUCN allows investigating a dominant player with a broad understanding of their own competences in the postwar period's international "environmental regime"—the body of institutions, principles, values, and beliefs that governed the conduct of scientific and political actors.<sup>19</sup>

Second, IUCN, insisting on science-based, global conservation guidelines, continued to promote ideas on scientific internationalism stemming from the early 1900s and the interwar period.<sup>20</sup> While UNESCO as a governmental agency with a UN mandate was subject to the changing international politics of decolonization and Cold War tension, IUCN held on to the idea of scientifically neutral and universally valid expert advice throughout the twentieth century. IUCN thus lends itself to an investigation of the postwar history of the "linear model" of expertise in the environmental sciences, which remains a contested issue in the context of present-day climate change policies.<sup>21</sup> This positivist idea that scientists should serve as politically neutral and value-neutral advisers, and that scientific evidence will cause political closure, has been presented as one of the persisting problems for global climate policy by scholars of environmental governance.<sup>22</sup>

Third, IUCN conservationists, as both advocates for nature protection and strong proponents of science-based approaches to environmental problem-solving, occupied an important position between environmental science, politics, and activism. In the miscellaneous international arena of environmental politics, new forms of advocacy, and diverse scientific programs that emerged at the time, IUCN experts were deeply involved in the interplay of scientific thought, new institutional structures for the environment, and the creation of expert roles. In this, IUCN conservationists had to interact not only with different groups of scientists, but also with diplomats, politicians, and heads of states. Such struggles, controversies, and negotiation between different scientific and political groups have played a crucial role in shaping environmental policy, institutions, and expert roles in general.<sup>23</sup> Therefore, a focus on IUCN conservationists allows for the study of the negotiation of environmental policy and a number of related concepts, such as *sustainable development* and *biodiversity*, that aim at reconciling nature protection and the development of natural resources among international organization and in the political sphere.

With a few notable exceptions, IUCN conservationists were scientists: trained naturalists with field experience in zoological and increasingly also botanical projects in remote places, often located in former colonial territories. This book follows IUCN's scientific and executive elites: naturalists affiliated with the organization who held high-ranking positions in IUCN's scientific commissions, executive board, and council during the 1960s and 1970s. At the time, these positions were in virtually all instances occupied by men, trained at leading universities in Europe and North America.<sup>24</sup> The scientists and administrators focused on in this book are the ones who represented the organization at conferences, published in IUCN's name, and were responsible for the scientific line taken by the organization. In particular, this book looks at six of them: the American zoologist Harold Jefferson Coolidge (1904–1985), who served as IUCN's president during the 1960s and early 1970s; Edward Max Nicholson (1904–2003), an English conservationist, head of the British Nature Conservancy, and one of the key figures behind the International Biological Program (IBP); Raymond Dasmann (1919–2002), American biologist and zoologist, who held the position of IUCN Senior Ecologist for most of the 1970s; the German-born Venezuelan agronomist and forestry specialist Gerardo Budowski (1925–2014), who served as IUCN Director General in the late 1960s and early 1970s; Duncan Poore (1925–2016), a British botanist who took over the post of IUCN Senior Ecologist in 1977; and Maurice Frederick Strong (1929–2015), a Canadian self-made businessman, who took on the position of Chairman of IUCN's Bureau in 1977.<sup>25</sup>

The book explores the involvement of these six leading IUCN members and their close colleagues in the shaping of scientific expertise in nature pro-

tection during this early period of international environmental concern, when issues such as global environmental degradation, resource development, and the need for nature protection entered discussions in international science and policymaking. In particular, the book seeks to answer three questions. First, it is interested in the changing object and the scientific foundations of nature conservation during the 1960s and 1970s. It therefore looks at how scientists in and outside of IUCN, as well as policymakers, determined what international nature protection was to entail. Building on this first question concerned with the content of nature protection, it then examines how scientific arguments on the scale and scope of conservation were translated into policy strategies for international environmental governance. Therefore, the second question that this book asks relates to how scientists and politicians decided on the methods and the implementation of conservation advice, *vis-à-vis* other forms of environmental measures. Along with the nature of conservation knowledge and implementation strategies for environmental protection, it looks at discussions on the authority of experts in international environmental politics. The third question that this book investigates is how scientists and policymakers negotiated the sociopolitical role of conservation experts at IUCN in the changing institutional settings of the time.

Exploring the history of global nature conservation through the arguments of IUCN, this book traces the origins of two closely related areas of tension, which continue to dominate environmental policy debates today. The first concerns the conflicting notions of scale between global environmental schemes and calls for locally implemented and community-based projects with a strong focus on the global South. The second polarization is the tension between demands for science-based and politically neutral expertise on the one hand, and the inclusion of a broad range of environmental knowledge and alternative voices on the other hand. By looking at the history of global nature conservation as promoted by IUCN, the book dates the origins of these paradoxes to the very beginning of international environmental politics during the 1960s and 1970s.

## **Ecosystem Ecology and the Politics of the Environmental Age**

With this focus on the interlinkages between the science and politics of global nature conservation, the book closely relates to two topic areas within the field of the environmental humanities. The first concerns the rise of ecology as the main environmental science of the postwar period. The term “ecology” goes back to the nineteenth-century naturalist Ernst Haeckel, originally designating a sub-branch of physiology that entailed both botany and zoology. Ecology has had a variety of interpretations in the life sciences. In the late nineteenth

century, ecology as an emerging field of research was supported mainly by antireductionist biologists objecting to the mechanical simplification of nature after the physical sciences, and those who sought to counterbalance the emerging emphasis on laboratory work remote from the field.<sup>26</sup> Since the 1920s, scientists pursuing ecological research studied the interactions of different organisms and their local environments.

Not yet a discipline proper, the research field attained a new boost in the 1960s when ecological thinking became inseparably linked to new ideas on environmental management.<sup>27</sup> Several authors, such as the environmental historians Anna Bramwell and Donald Worster, have associated more holistic ideas in ecology with the radical environmental protests of activist groups in the 1970s.<sup>28</sup> Yet ecology also inspired scientific research projects in which the exploitation of natural resources and the protection of the ecosystems in which these occurred were seen as closely related.<sup>29</sup> Some authors have focused particularly on this kind of system thinking, which linked the use and the safeguarding of natural resources. Historians of science, such as Peder Anker and Joel B. Hagen, have described how the work of 1960s systems ecologists such as the American brothers Howard and Eugene Odum blurred the boundaries between resource management, nature protection, and other forms of land use.<sup>30</sup> This new episteme was inherent to the ecosystem ecology of the 1960s, concerned with understanding the workings of natural systems, and improving and using them.

The term “ecosystem” had been introduced into the field of ecology during the 1930s and 1940s by British and American biologists, such as Arthur Roy Clapham and Arthur Tansley. The term was used as a heuristic tool to describe and study the physical-chemical processes between organisms and their environment. Since the mid-1940s, these closed systems, which could be mapped like food webs, appeared in studies of trophic cycles and the relationships between key stocks of biomass by authors such as Charles Elton and Raymond Lindeman. In the 1960s, in the context of growing concerns about human population growth and resource shortages, these studies gained broader recognition as means to investigate the productivity of different types of ecosystems.<sup>31</sup> Out of these productivity studies emerged in the course of the 1970s the idea—quickly taken up in political debates on environmental protection and economic development—of an existing interlinkage between social and biological systems. The different ideas of interconnectivity within and between ecological and societal systems are particularly important for the narrative of this book, as they built the scientific foundation of the conservation advice provided by IUCN scientists in the period. The notion of closed and manageable systems, determined by the interaction between organisms and their environments, seemed to provide a basic scientific framework and a set of general ecological rules for environmental and social engineering on large geographical scales.<sup>32</sup>



Another important aspect of the ecology of the 1960s and 1970s has been the globalization of the environmental sciences through new planetary thinking and transnational scientific projects. Having emerged from the physical sciences in a postwar military context in North America, “big science” projects were becoming increasingly multidisciplinary and transnational in the 1950s. Big science, although a fuzzy term, is usually used to describe the large-scale scientific inquiries that emerged in the physical sciences out of military-corporate applied research, starting in the 1940s with the Manhattan Project, which involved large and complex machines and forms of organization.<sup>33</sup> The historian of biology David Coleman has discussed how, in the 1950s, a number of influential environmental research groups and laboratories emerged in the United States out of postwar concerns about nuclear effects on the environment, and were funded by the Atomic Energy Commission and the National Scientific Foundation. Research laboratories, such as the Oak Ridge National Laboratory, the Savannah River Ecology Laboratory, or the Brookhaven National Laboratory, combined energy and ecological research, fostered research careers, and helped to establish ecology as a discipline in the American context.<sup>34</sup> The following decade was marked by a growing interest in international cooperation within the new environmental discipline. From the mid-1960s into the 1970s, the first big biology program, the IBP, brought together ecologists and plant and animal biologists from around the world to study both the productivity and vulnerability of natural systems in different regions.<sup>35</sup>

During the 1960s, international ecosystem research furthermore benefited from advances in technology, computer science, and cybernetics, which helped with collecting, sorting, and analyzing global environmental data for the first time.<sup>36</sup> Cybernetics and systems thinking had been developed in the late 1940s by two North American mathematicians, Norbert Wiener and Claude Shannon, who were working on engineering theories of control and communication applicable across the machine-human divide. In this context, information emerged as a key concept that described the messages and feedback loops used by machines as well as organisms to adapt to their environment.<sup>37</sup> Cybernetics and information theory, both seen as universal and interdisciplinarily applicable studies, thus emerged at roughly the same time as the ecosystem idea within the field of ecological research. Not only the systems thinking underlying cybernetics, but also the technological developments that came from advances in communication and information technology, such as computers and satellites, influenced an emerging view of the planet as a closed and manageable environmental system. As the historian of science Fernando Elichirigoity has explained, only these sets of technologies, which allowed monitoring and comparing environmental data on a planetary scale, made possible an apprehension of the environment as a global space.<sup>38</sup>

That the effect of new technologies was not confined to the scientific community alone has been shown by the media historian Robert Poole. The first photographs of Earth seen from space, such as *Earthrise* or *Blue Marble*, taken by the crews of the two Apollo space missions in 1968 and 1972, respectively, transformed public thinking about the global environment.<sup>39</sup> According to authors such as Jeremy Rifkin, Iris Schröder, and Sabine Höhler, in the 1970s all of this resulted in the uptake of a new intellectual paradigm of the global *biosphere*, the biological basis for life on Earth.<sup>40</sup> At the same time, cybernetic thinking in terms of system processes and structures blurred the boundaries between organisms and their environmental life-support systems, and between the natural and the manmade environment. As Höhler has pointed out, powerful metaphors such as “Spaceship Earth” suggested the relevance of not only ecological but also technological expertise to global environmental problems.<sup>41</sup> Discussions during 1960s and 1970s on the scope and focus of conservation advice, as well as environmental expertise more generally, are a core theme of this book.

Alongside the literature concerned with the scientific developments denoting the environmental age, this book adds to the work of authors who have studied the 1960s and 1970s as the birth moment of internationally organized environmental policymaking. This political conceptualization of the biosphere, often drawing on scientific concepts, was reflected in the emergence of international organizations and NGOs concerned with the global environment. The authors of a volume recently edited by Wolfram Kaiser and Jan-Henrik Meyer have shown how during the 1960s and 1970s international organizations, both governmental and nongovernmental, served as important platforms for both political discussions and expert advice.<sup>42</sup> IUCN’s own organizational history has been narrated by the British conservation veteran Martin Holdgate, who has mainly focused on internal developments and administrative changes.<sup>43</sup> In addition, several accounts have been concerned with the history of nature protection in intergovernmental organizations with which IUCN conservationists have liaised directly during the period under examination. These include, for instance, Glenda Slug’s international history of the role of UNESCO in environmental problem-solving, or the organizational history of the United Nations Environmental Program (UNEP) by historian of environmental law Bharat Desai.<sup>44</sup> In addition to the latter accounts, which focus on several of the institutions that will play a role in this book, there is a rich historiography on environmental NGOs that were founded in the 1960s and 1970s, and that operated alongside IUCN. The Swiss historian Alexis Schwarzenbach, for example, has reconstructed the early years of IUCN’s funding and partner organization, the WWF, established in 1961.<sup>45</sup>

Notwithstanding the universal aspirations of some international organizations, the environment emerged as a topic of global politics at a time when

the international community was intrinsically divided. Several authors, such as the historian Thomas Robertson, have particularly looked at how environmental politics during the 1960s and 1970s were complicated by fluctuating relations between the East and the West during the Cold War.<sup>46</sup> Others, such as the political historian Jacob D. Hamblin, have pointed to environmental negotiations across the Iron Curtain.<sup>47</sup> Besides Cold War tensions, another geopolitical conflict, related to the claims to independence and economic assistance by nations in the global South, has been discussed in the context of postwar environmental politics by authors such as Roderick Neumann and John McCormick. Here, the focus has often been on ideas about centralized, global environmental governance and decentralized, local claims to development.<sup>48</sup>

Despite political tensions, the 1960s and 1970s saw the emergence of intellectual compromises and concepts that helped bridge seemingly irreconcilable agendas. In this respect, several important studies have recently emerged across environmental and economic history that have looked at the discipline-spanning concept of *sustainable development*. Concerned with the origins of the notion, Stephen Macekura has traced the convergence of the environmental and economic policy discourse in the second half of the twentieth century.<sup>49</sup> Iris Borrowy, moreover, has pointed out the continued diversity of interpretations that were combined in the concept of sustainable development before it was officially adapted by the World Commission on Environment and Development, also known as the Brundtland Commission, in the mid-1980s.<sup>50</sup> In such policy agreements, scientists often had the role of gatekeepers or negotiators. Alessandro Antonello, for example, has studied the mediating role of individual experts in drafting conservation plans for Antarctic marine living resources during the 1970s.<sup>51</sup>

Scholars of environmental governance have analyzed the wide spectrum of global environmental expertise—ranging across ecology, engineering, and management—which emerged during the two decades this book examines. Authors have moreover highlighted the relevance of geopolitics for environmental problem-solving, for global aspirations often clashed with Realpolitik and existing local traditions in the management of the environment and natural resources. Likewise, they have pointed out the administrative, programmatic, and at times political contexts behind the different organizations and their thematic and geographic foci, demonstrating the differences in their approaches to protecting natural resources and threatened species and the ways they appealed to the public and policymakers.

Despite this rich body of literature on the environmental age, historians have only begun to look at the negotiations on environmental strategies between the promoters of different scientific approaches.<sup>52</sup> This book, then, adds to both literary traditions in the history of environmental sciences and the political history of global environmental governance by shedding light on the

thus far little-reflected history of IUCN's role in postwar conservation policy. It focuses on the organization's involvement in negotiations between groups of scientists and policymakers about what global conservation advice and environmental expertise were to entail. First, this book points to the changing scientific foundations of conservation and environmental expertise in general. Throughout the period in question, conservationists involved in IUCN based their claims to universal and globally applicable environmental expertise on ecosystem ecology. Within the ecological reasoning of IUCN elites, the protection and use of natural resources were never separate or irreconcilable objectives, and conservation expertise thus pertained not only to traditional topics such as the protection of threatened species but also to the management of natural resources in general. Based on ecosystem ecology, IUCN conservationists argued for a global conservation approach by linking local sites for protection to the research on universal ecological rules. Yet ecosystem ecology, at the time a young field of enquiry, was not a unified discipline, and various interpretations by conservationists or their opponents existed in parallel. These interpretations differed in their focus on natural or modified systems, functions or parts of systems, and local circumstances or universal rules. Even within single organizations, such as IUCN, different interpretations coexisted, bringing with them substantially different approaches to environmental management, program implementation, and expert roles that needed to be negotiated.

Resulting agreements on ecosystem ecology varied over time. Conservationists in IUCN were constantly adapting their scientific claims. In particular, they remodeled their claims according to the dominant environmental discourse at the UN when this intergovernmental forum became a stage for international environmental politics and diplomacy. With this reorientation, the object of nature conservation also changed. During the 1960s and 1970s, ecosystem ecology as the basis for conservation shifted its emphasis from cybernetics, with an abstract focus on system processes, to a renewed focus on species and wildlife with reference to biological diversity. Yet, discrepancies between local and global aspirations and diverging interpretations of environmental problems and concepts remained. This book aims to bring these controversies and negotiations, often hidden underneath a conflated or shared terminology, to the foreground.

The changing scientific foundations and objects of ecosystem conservation related to the way in which conservationists planned to protect parts of nature and how these plans were to be implemented. Based on a broad perception of ecosystem ecology, IUCN conservationists were actively involved in early debates on the limits of natural resources, resource exploitation, and management, as well as early ideas on sustainable development. Insisting on the universal applicability of ecosystem conservation, they demanded global environmental solutions. Yet, during the 1960s and 1970s, the ideal of uni-

versal validity and implementation of conservation guidelines was contested by postcolonial politics and policy changes related to the provision of international scientific and technological assistance. In the 1960s, many former colonial conservation areas, especially in sub-Saharan Africa and Southeast Asia, gained their independence and issued claims for national sovereignty in decisions concerning economic growth and development. Such local claims often seemed difficult to reconcile with calls for global conservation standards. During the course of the 1970s, the integration of nature conservation into the UN system demanded a more decentralized approach. These tensions between globally applicable, universal scientific standards and local priorities and particularities, between binding regulations and flexible interpretations, remained at the core of debates about implementation strategies and methods.

Controversies on the universality of ecological guidelines were linked to decisions on the roles and responsibilities of conservationists in new interorganizational alliances on the environment. With the emergence of environmental politics as a task field, expert roles became an important topic of discussion. Within the new plethora of organizations, conservationists were reformulating their scientific mandate, trying to attain authority as scientific experts while at same time protecting their interest in nature protection within a new geopolitical reality. Throughout the period, IUCN conservationists insisted on their political neutrality as scientific experts. However, decisions on what nature to protect and how to protect it always presupposed a particular and therefore political conceptualization of humankind's place in, and relation to, nature. In this, the global agendas and ideas on scientific neutrality of conservationists, concerned with the protection of nonhuman life, increasingly clashed with those of other groups of scientists or policymakers who promoted a focus on local communities in less developed regions. At the same time, their claim to scientific neutrality was not always compatible with the geopolitical tensions in international postwar politics.

## Conceptual and Methodological Approach

Conceptually, the historical research conducted for this book has been informed by the fields of science and technology studies (STS) and the sociology of expertise. Throughout the 1960s and 1970s, questions on what nature protection was to entail, how it was to be implemented, and what the socio-political role of the environmental experts was to be were the subjects of disagreement and negotiation. From the very beginning, STS, with its focus on controversies between groups of scientists, and scientists and policymakers, had a strong presence in environmental topics, in which it highlighted the variety of scientific and public opinions.<sup>53</sup> Scholars of STS have been concerned

with debates about the soundness of scientific claims and knowledge, and have demonstrated how controversies about science and expertise can function as a tool to better understand the different standpoints behind a scientific compromise or policy decision.<sup>54</sup> According to American sociologist of science Sheila Jasanoff, controversies therefore allow the study of policy agreements not just in terms of success or failure. Many controversies reveal the process of negotiations between opposing interpretations, claims, and aims. Controversies show how scientific identities and solidarities between scientists emerge, as well as the development of both cognitive and normative aspects of scientific theory and practice.<sup>55</sup> It is for this reason that the sociologist Ronald Giere has called controversies the “natural laboratory for studying operations of science and technology and their interactions with the surrounding society.”<sup>56</sup> Three controversies between IUCN elites, fellow scientists, and policymakers underlie the narrative of this book.

The three controversies chosen—IUCN members’ participation in the IBP (1964–1974), IUCN’s representation at the United Nations Conference on the Human Environment (1970), and the drafting of IUCN’s *World Conservation Strategy* (1980)—describe a chronological sequence and can thus help us understand how changes in the organizational structures and the argumentative strategies of science-based, internationally organized conservation efforts manifested themselves over time. Equally important are the different natures of these moments. In each controversy, IUCN elites negotiated their science and expert role vis-à-vis other types of environmental knowledge and experts.<sup>57</sup> In the two decades in question, however, with the rise of environmental politics and environmental coordination within the UN, the function and responsibilities of conservation experts changed drastically. Each of the controversies therefore has a different emphasis, allowing the study of the relationship between IUCN elites and the scientific community concerned with the global environment in the postwar period, IUCN’s position in the realms of the development politics and diplomacy of the early 1970s, and IUCN’s role in the negotiations on scopes of competences between international organizations of the 1980s.

These different types of negotiations often occurred behind the closed doors of expert meetings or in private exchanges between scientists or politicians. Therefore, I draw on the work of sociologist of science Stephen Hilgartner, who has made explicit the difference between public and closed debates. According to Hilgartner, in science policy, the deliberation of arguments within and between groups of experts often happens in meetings and correspondence that remain hidden from the public—“backstage,” as he calls it.<sup>58</sup> Respectively, I study the discussions between conservationists and policymakers, looking at both scientific lines of argumentation in front-stage publications for peers, politicians, and the public, as well as exchanges between experts behind the

scenes in the form of correspondence, memos, drafts of policy documents, and reports of closed meetings, in order to reflect the issue from all sides.

Yet, while Hilgartner has focused on scientific controversies as such, I am interested in the interlinkage of scientific and policy debates.<sup>59</sup> Overall then, this book is inspired by the notion that policy problems are “hybrids of the scientific and the political.”<sup>60</sup> In particular, I draw on the idea of *co-production* as coined by Jasanoff.<sup>61</sup> The concept describes the mutual shaping of science and governance—in other words, the close relationship between our ways of understanding the world and the way we want to live in it. Acknowledging that science is socially constructed, co-production grants a large role to the institutional and social environments in which expertise and approaches to environmental governance, or implementation strategies, evolve, making it particularly relevant for my study on environmental expertise in international organizations. As Jasanoff explains, besides controversies regarding the validity of scientific claims, scientific advisors in politics are involved to a large degree in negotiating different policy options that in themselves carry political weight.<sup>62</sup> Similarly, environmental policy scholar Roger Pielke has shown that when experts are stakeholders in the policy process—as conservationists were in environmental policymaking—they usually engage in policy options and implementation strategies.<sup>63</sup> In addition to negotiations on scientific content, I therefore look at the implementation strategies suggested by conservationists and their opponents. Another important dimension of the ways in which experts engage in the policy process is what historians of science such as Evert Peeters have called “expert performance.”<sup>64</sup> This includes the self-fashioning of experts as scientific authorities. The process in which these roles are constructed or accepted plays a crucial role in decisions on expertise, as Jasanoff and Hilgartner have pointed out.<sup>65</sup> After the science of conservation and suggested implementation strategies for the protection of nature, expert roles then form my third research focus. As I will show, discussions on conservation advice, its use, and the expert roles conservationists at IUCN could fulfill were inherently interlinked in the lines of argument of both conservationists and their negotiation partners.

To detect, disentangle, and explain the different conservation controversies, this book draws on a wide array of sources. The first body of studied material includes published documents on organizational projects and agendas; reports of meetings, workshops, conferences; and programmatic pamphlets in which scientific groups argued for the need to protect nature and presented scientifically sound ways of doing so. Aside from conference proceedings and policy documents, many scientists published their scientific opinions in individual publications that linked scientific conservation to the larger questions of humankind’s relation to the environment, resource usage, environmental justice, and global politics, and these, too, have been useful in this study. Additionally, in order to understand the developments pertaining to the self-understanding

of science-based conservation as a field, I have systematically studied several scientific and organizational periodicals. These include the *IUCN Bulletin* (issues from 1970 until 1985) and *Environmental Conservation* (issues from 1975 until 1985), which are available in various libraries. Further, I examined periodicals published by the organizations that IUCN conservationists tried to partner up with, such as the *UNESCO Courier* (issues from 1960 until 1985) and UN Food and Agricultural Organization's (FAO) major annual public report, *The State of Food and Agriculture* (issues from 1960 until 1985). This body of published sources has helped me to understand the ways in which conservationists and other scientific groups have addressed different audiences, defining their role for their scientific peers and for policymakers, as well as for the concerned public.

Next to these publicly accessible and official documents, the largest portion of the empirical material collected came from unpublished reports of conservation projects or surveys, minutes of meetings, drafts of publications, interview transcripts, and correspondence between different scientists and policymakers. These unofficial deliberations on the science of nature protection, implementation strategies, and claims to expert authority revealed where the controversies lay, where compromises could be made, and where differences persisted. I worked extensively with several archival collections, all of which hold a combination of the private and professional papers of former key conservation figures and high-ranking administrators. I spent the most time working with the papers of Harold Jefferson Coolidge at the Harvard University Archives, as well as the papers of Maurice Strong and Peter Thacher, both held by the Harvard Center for the Environment and Sustainability. Significant material was collected from the papers of Max Nicholson held at the Linnean Society and the Royal Geographical Society in London, at Aberdeen University, and at the Alexander Library for Ornithology in Oxford. Other important collections include the IBP papers at the Royal Society based in London, the IUCN Library in Gland, the papers of British IUCN conservationist Richard Fitter at the Weston Library, Oxford, the papers of British IUCN and WWF conservationist Sir Peter Scott at Cambridge University, and the small collection of UNEP and IUCN papers held by the library of the Royal Tropical Institute in Amsterdam. Where possible, these primary sources were complemented with semistructured interviews or written communication with relevant historical actors.<sup>66</sup>

## The Chapters

Based on the conceptual framework and source work described above, the rest of this book proceeds as follows. Chapter 1, "Old Hands, Pastures New:



International Nature Conservation and the Environmental Age,” examines the challenges that the well-established network of IUCN conservationists faced in the 1960s and 1970s as they entered a new intellectual and political discourse on the global environment. It draws attention to the negotiation between newly emerging environmental approaches, policy discourses, and groups of experts. It shows that IUCN conservationists had a long tradition of responding to new kinds of ecological research. However, among the multitude of new environmental approaches, they faced new challenges of non-ecological alternatives. The chapter also shows how IUCN conservationists, insisting on their scientific neutrality, were able to circumvent upcoming Cold War tensions that intergovernmental organizations faced. Nevertheless, their long-established network was challenged by criticism on the authority of Western expertise, linked to decolonization and development, demanding the inclusion of more experts from the global South.

The second chapter, “Classifying Ecosystems: The International Biological Program, 1964–1974,” looks at the reorganization of the field of conservation itself. This chapter discusses the controversy between different groups of high-level conservationists affiliated with IUCN about what the IBP meant for the future of conservation. One group of IUCN experts that formed around the British conservationist Nicholson pushed for the scientific and political recognition of their expertise by linking conservation to the emerging field of systems ecology and by using the IBP as a vehicle for top-down implementation. At about the same time, a second group that centered on IUCN Senior Ecologist Dasmann took shape at the executive center of IUCN. In contrast to Nicholson and his colleagues in the IBP, this second group based its notion of environmental expert roles on more descriptive ecological studies—in particular, landscapes as practiced by UNESCO. Their respective visions entailed different ecological philosophies as well as different political ideologies regarding the global implementation of conservation. I demonstrate that at the end of the IBP, scientific conservation within IUCN was based on a compound blend of the science and implementation strategies as brought forth by the two groups. In the years to come, IUCN conservationists would continue to promote ecosystem ecology and ecosystem conservation as the scientific endeavors that linked their work more closely to the regional ecological work of UNESCO and other UN agencies.

The third chapter, “Expertise and Diplomacy: Systems Politics at the UN Stockholm Conference, 1972,” explores what the advent of UN environmental politics meant for the role of IUCN conservation experts. Looking at the nature diplomacy of IUCN conservationists, the chapter draws attention to the diverse interpretations of the global environment and the different disciplinary approaches to solving environmental problems around 1970. As a reaction to emerging pessimistic voices related to Earth’s limited resources and physical

boundaries to growth, the conference organization began to formulate environmental problems in social and economic terms. For UN conference organizers, the best approach for environmental problem-solving involved the management and technological improvement of resource trade and distribution, not ecology. Within the UN's approach, the conservation expertise of scientists such as IUCN President Coolidge or Director General Budoŝwki was narrowly defined as wildlife preservation and the creation and maintenance of national parks. This demarcation granted very limited space to conservation and land-use measures based on ecological knowledge, entailed in the broader endeavors IUCN conservationists had in mind.

The fourth chapter, "Nature's Value: The Fault Lines in the World Conservation Strategy, 1975–1980," examines a controversy between conservationists at IUCN and experts in UNEP, the UN's new environmental agency. In the aftermath of the Stockholm Conference, ideas on environmental problems as pertaining to both nature and society became increasingly shared between different types of organizations inside and outside the UN system. This convergence of environmental discourses around the concept of sustainable development, however, only camouflaged persisting controversies between Mostafa Tolba and Peter Thacher at UNEP and acting Director General Poore and others at IUCN when it came to conservation approaches on the ground, their institutional foundation, and the roles of conservationists in solving environmental problems. In this respect, the *World Conservation Strategy* did not present a new, unifying conservation paradigm but rather, this chapter proposes, the final document manifested two different organizational profiles, including different scientific approaches, expert networks, and value-making practices, resulting in a continued conflict between those defending the innate value of biological diversity and those stressing the economic value of ecosystem processes.

The concluding chapter, "Global Nature Conservation and Environmental Expertise, 1960s–Present," links the main findings from the four chapters back to discussions on the legacy of the environmentalism of the 1960s and 1970s. It highlights the emergence of two polarizations that may help us understand the limited success of IUCN conservationists' appeal for global, ecosystem ecology-based schemes. These areas of tensions continue to exist on the one hand between a planetary concern and local development, and on the other hand between scientific neutrality and authority, and inclusive and politically sensitized environmental decision-making. By looking at conservation and environmental policy efforts of the 1980s and 1990s, including the development of national conservation strategies during the 1980s, the second *World Conservation Strategy* called *Caring for the Earth* from 1991, the UN Conference on Environment and Development, held in Rio in 1992, as well as the Convention on Biological Diversity issued at the conference, I show how these

tensions remain relevant beyond the early environmental years, continuing to shape international environmental discussion even today.

## Notes

1. At the time, the *UNESCO Courier* was printed in Arabic, English, French, German, Hebrew, Hindi, Italian, Japanese, Russian, Spanish, and Tamil, and read in more than 125 countries.
2. Jean Dorst, "A Biologist Looks at the Animal World (Beast and Men)," *UNESCO Courier* 22, no. 1 (1969): 17.
3. *Ibid.*, 17–18.
4. Mohammad Taghi Farvar and John P. Milton, *The Unforeseen International Ecologic Boomerang: Conference on the Ecological Aspects of International Development* (New York: American Museum of Natural History, 1969); Patrick Kupper, "Die '1970er Diagnose.' Grundsätzliche Überlegungen zu einem Wendepunkt der Umweltgeschichte," *Archiv für Sozialgeschichte* 43 (2003); Kai F. Hünemörder, *Die Frühgeschichte der globalen Umweltkrise und die Formierung der deutschen Umweltpolitik (1950–1973)* (Stuttgart: Franz Steiner Verlag, 2004); also see e.g., Rex Weyler, *Greenpeace: How a Group of Ecologists, Journalists, and Visionaries Changed the World* (New York: Rodale Books, 2004); Thomas Robertson, *The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism* (New Brunswick: Rutgers University Press, 2012).
5. Jan-Henrik Meyer, "Sammelrezension [Reviews]: Where Did Environmentalism Come From? Rome, Adam: *The Genius of Earth Day. How a 1970 Teach-In Unexpectedly Made the First Green Generation*. New York 2013 / Hamblin, Jacob Darwin: *Arming Mother Nature. The Birth of Catastrophic Environmentalism*. New York 2013 / Zelko, Frank: *Make it a Green Peace!. The Rise of a Countercultural Environmentalism*. New York 2013," *H-Soz-Kult*, 21 July 2016, <http://www.hsozkult.de/publicationreview/id/rezbuecher-22483>.
6. Sabine Höhler, *Spaceship Earth in the Environmental Age, 1960–1990* (London: Pickering & Chatto, 2015), 3; also see Joel B. Hagen, "Teaching Ecology during the Environmental Age, 1965–1980," *Environmental History* 13, no. 4 (2008); Frank Uekötter, *Umweltgeschichte im 19. und 20. Jahrhundert* (Munich: Oldenbourg Verlag, 2007), 73ff. For an in-depth study of the concept in postwar Western society, see Paul Warde, Libby Robin, and Sverker Sörlin, *The Environment: A History of the Idea* (Baltimore: John Hopkins University Press, 2018).
7. Paul R. Ehrlich, *The Population Bomb* (New York: Buccaneer Books, 1968); Barry Commoner, *The Closing Circle: Man, Nature, and Technology* (New York: Knopf, 1971); Garrett Hardin, *The Tragedy of the Commons* (Washington, DC: American Association for the Advancement of Science, 1968); Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin Harcourt, 1962).
8. E.g., Hünemörder, *Die Frühgeschichte der globalen Umweltkrise*.
9. Donella H. Meadows et al., *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe Books, 1972).
10. Other lines of criticism include the lack of data on which the model was built, as well as the presumed neutrality and lack of bias in computer models. For a detailed discussion

on how *The Limits to Growth* reflected a common sentiment of neo-Malthusian gloom and doom, see John McCormick, *Reclaiming Paradise: The Global Environmental Movement* (Bloomington: Indiana University Press, 1991), 75ff.

11. Timothy Luke has shown how discussions on environmental governance, including methods and strategies for its implementation, were an important realm of political power struggles during the 1960s and 1970s. Timothy W. Luke, "On Environmentality: Geo-Power and Eco-Knowledge in the Discourses of Contemporary Environmentalism," *Cultural Critique* 31 (1995): 149–51.
12. An observation of this kind has been made for the science and politics of nature conservation of the first half of the twentieth century: e.g., see Raf De Bont and Geert Vanpaemel, "Editorial Introduction to Special Section, 'The Scientist as Activist: Biology and the Nature Protection Movement, 1900–1950,'" *Environment and History* 18, no. 2 (2012). For recent calls to study politics and science as intertwined, see the work of STS scholars and STS-inspired environmental historians such as Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy* (Cambridge, MA: Harvard University Press, 2004); Dolly Jørgensen, Finn Arne Jørgensen, and Sara B. Pritchard, *New Natures: Joining Environmental History with Science and Technology Studies* (Pittsburgh: University of Pittsburgh Press, 2013); Sheila Jasanoff, ed., *States of Knowledge: The Co-Production of Science and Social Order* (New York: Routledge, 2004).
13. These authors have looked at vastly different subject matters, ranging from environmental science and politics in the history of postwar economics, across North American national ideologies of wilderness, and the role that science and politics played in the German East African colonies, to the role played by land use politics in scientific nature conservation measures after Ugandan independence. Still, all of them discuss to some extent the use of scientific arguments in natural resource and environmental politics between different groups of stakeholders. Stephen Macekura, *Of Limits and Growth: The Rise of Global Sustainable Development in the Twentieth Century* (Cambridge: Cambridge University Press, 2015); Michael L. Lewis, ed., *American Wilderness: A New History* (Oxford: Oxford University Press, 2007); Bernhard Gissibl, *The Nature of German Imperialism. Conservation and the Politics of Wildlife in Colonial East Africa* (New York: Berghahn Books, 2016); Etienne Benson, "Territorial Claims: Experts, Antelopes, and the Biology of Land Use in Uganda, 1955–75," *Comparative Studies of South Asia, Africa and the Middle East* 35, no. 1 (2015).
14. E.g., see Richard West Sellars, *Preserving Nature in the National Parks: A History* (New Haven: Yale University Press, 2009), 43ff.
15. David Evans, *A History of Nature Conservation in Britain* (London: Routledge, 1992), 10.
16. IUCN, "Members," n.d., accessed 15 March 2019, <https://www.iucn.org/about/members/iucn-members>.
17. These were the words of a senior IUCN member during the concluding discussion at the conference "Experts and the Global Environment in the 20th Century: A History of Coproduction and Negotiation," held at Maastricht University in January 2016.
18. Dasmann in *Second World Conference on National Parks: Yellowstone and Grand Teton National Parks* (Morges: IUCN, 1972); Martin W. Holdgate, *The Green Web: A Union for World Conservation* (Gland: IUCN, 1999), 40.

19. For a detailed discussion of the use of the regime concept in international environmental policymaking, see Oran R. Young, "Improving the Performance of the Climate Regime: Lessons from Regime Analysis," in *Oxford Handbook on Climate Change and Society*, ed. John S. Dryzek and Richard B. Norgaard (Oxford: Oxford University Press, 2011), 625–638.
20. For the internationalization of the scientific community in the life sciences and its role in peace diplomacy in the first half of the twentieth century, see Elisabeth Crawford, *Nationalism and Internationalism in Science, 1880–1939: Four Studies of the Nobel Population* (Cambridge University Press, 2002); Nikolai Kremontsov, *International Science between the World Wars: The Case of Genetics* (New York: Routledge, 2004).
21. Roger A. Pielke, *The Honest Broker: Making Sense of Science in Policy and Politics* (Cambridge: Cambridge University Press, 2007); Silke Beck, "Moving Beyond the Linear Model of Expertise? IPCC and the Test of Adaption," *Regional Environmental Change* 11, no. 2 (2011).
22. Sheila Jasanoff, "A New Climate for Society," *Theory, Culture & Society* 27, no. 2–3 (2010); Kari De Pryck and Krystel Wanneau, "(Anti)-Boundary Work in Global Environmental Change Research and Assessment," *Environmental Science and Policy* 77, no. 1 (2017).
23. Looking at the history of climate policymaking at the UN level, Clark Miller has shown how scientific bodies have often invested much work into a specialized language and organizational structure to underline their position as distinct from politics, while it was the very participation in political discourse and discussion that elevated them into expert roles. Clark A. Miller, "Climate Science and the Making of a Global Political Order," in *States of Knowledge: The Co-Production of Science and Social Order*, ed. Sheila Jasanoff (New York: Routledge, 2004), 48ff., 60ff.
24. I regret that this has turned the work into an almost all male narrative and hope that future research will continue to investigate the scientific work done by female companions and conservationists in their own right, following examples such as Anna-Katharina Wöbse, "Lina Hähnle (1851–1941): Vogelschutz in drei Systemen," in *Spurensuche: Lina Hähnle und die demokratischen Wurzeln des Naturschutzes*, ed. H.-W. Frohn und Jürgen Rosebrock (Essen: Klartext Verlag, 2017), 35–56; "Phyllis Barclay-Smith: Eine eigensinnige Naturschützerin," in *Vordenker und Vorreiter der Ökobewegung*, ed. Udo E. Simonis (Stuttgart: Hirzel, 2014), 103–110.
25. Short biographies of these individuals can be found in the section "Expert Biographies" in the appendix.
26. For an extensive discussion of the origins and the formation of ecology as a scientific field and discipline, see Robert McIntosh, *The Background of Ecology: Concept and Theory* (Cambridge: Cambridge University Press, 1986).
27. E.g., Joachim Radkau, *Die Ära der Ökologie: Eine Weltgeschichte* (Munich: C. H. Beck, 2011); Wolfram Kaiser and Jan-Henrik Meyer, "Introduction: International Organizations and Environmental Protection in the Global Twentieth Century," in *International Organizations & Environmental Protection: Conservation and Globalization in the Twentieth Century*, ed. Wolfram Kaiser and Jan-Henrik Meyer (New York: Berghahn Books, 2017); Ludwig Trepl, *Die Idee der Landschaft: Eine Kulturgeschichte von der Aufklärung bis zur Ökologiebewegung* (Bielefeld: Transcript Verlag, 2014), 231ff.

28. Anna Bramwell, *Ecology in the 20th Century: A History* (New Haven: Yale University Press, 1989); Donald Worster, *Nature's Economy: A History of Ecological Ideas*, Studies in Environment and History (Cambridge: Cambridge University Press, 1985).
29. Peter J. Bowler and Iwan Rhys Morus, *Making Modern Science: A Historical Survey* (Chicago: University of Chicago Press, 2005), 223.
30. Elena Aronova, Karen Baker, and Naomi Oreskes, "Big Science and Big Data in Biology: From the International Geophysical Year through the International Biological Program to the Long Term Ecological Research (LTER) Network, 1957–Present," *Historical Studies in the Natural Sciences* 40, no. 2 (2010): 200; Robert McIntosh, *The Background of Ecology: Concept and Theory* (Cambridge: Cambridge University Press, 1986); e.g., Andrew C. Isenberg, *The Oxford Handbook of Environmental History* (Oxford: Oxford University Press, 2014); Joel B. Hagen, *An Entangled Bank: The Origins of Ecosystem Ecology* (New Brunswick: Rutgers University Press, 1992), 144ff.
31. David G. Raffaelli and Christopher L. Frid, eds., *Ecosystem Ecology: A New Synthesis* (Cambridge: Cambridge University Press, 2010), 4ff.
32. Andrew Jamison, for instance, tracing the history of environmental systems thinking in the international and national context of the nineteenth and twentieth century, has discussed the attractiveness of the concept of the ecosystem for engineering and managerial purposes. Andrew Jamison, "National Political Cultures and the Exchange of Knowledge: The Case of Systems Ecology," in *Denationalizing Science: The Contexts of International Scientific Practice*, ed. Elisabeth Crawford, Terry Shinn, and Sverker Sörlin (Dordrecht: Springer Science and Business Media, 2013), 197ff.
33. For a comprehensive history of early big science in physics and engineering projects, see Peter Galison and Bruce Hevly, eds., *Big Science: The Growth of Large-Scale Research* (Stanford: Stanford University Press, 1992). A more recent discussion of the characteristics of different stages and phases in postwar big science can be found in Olof Hallonsten, *Big Science Transformed: Science, Politics and Organization in Europe and the United States* (London: Palgrave Macmillan 2016).
34. For a study on the uptake of big science thinking in the life sciences, see David C. Coleman, *Big Ecology: The Emergence of Ecosystem Science* (Berkeley: University of California Press, 2010). For the role of large and nationally funded ecological research laboratories in fostering disciplinary solidification during the 1950s and 1960s, see Stephen Bocking, *Ecologists and Environmental Politics: A History of Contemporary Ecology* (New Haven: Yale University Press, 1997).
35. Chunglin Kwa, "Representations of Nature Mediating between Ecology and Science Policy: The Case of the International Biological Programme," *Social Studies of Science* 17, no. 3 (1987).
36. Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Boston: MIT Press, 2010); Agatha C. Hughes and Thomas P. Hughes, *Systems, Experts, and Computers: The Systems Approach in Management and Engineering, World War II and After* (Boston: MIT Press, 2011).
37. For a detailed analysis of the rise and fall of cybernetics and information theory, as well as their remaining relevance for what we now call the information age, see Ronald R. Kline, *The Cybernetics Moment: Or Why We Call Our Age the Information Age* (Baltimore: Johns Hopkins University Press, 2015).

38. Fernando Elichirigoity, *Planet Management: Limits to Growth, Computer Simulation, and the Emergence of Global Spaces* (Chicago: Northwestern University Press, 1999), 32; Henny J. Van der Windt, *En dan, wat is natuur nog in dit land? Natuurbescherming in Nederland 1880–1990* (The Hague: Boom, 1995).
39. Discussing the imagined visions of the planet, as well as the difficulties of early planetary photography, Robert Poole shows what significance imageries can have on our world view. Robert Poole, *Earthrise: How Man First Saw the Earth* (New Haven: Yale University Press, 2008).
40. Jeremy Rifkin, *Biosphere Politics: A New Consciousness for a New Century* (New York: Crown, 1991); Iris Schröder and Sabine Höhler, *Welt-Räume: Geschichte, Geographie und Globalisierung seit 1900* (Frankfurt am Main: Campus, 2005).
41. Höhler, *Spaceship Earth in the Environmental Age, 1960–1990*; Riley E. Dunlap and Angela G. Mertig, *American Environmentalism: The U.S. Environmental Movement, 1970–1990* (New York: Taylor & Francis, 2014); Isenberg, *The Oxford Handbook of Environmental History*.
42. Wolfram Kaiser and Jan-Henrik Meyer, eds., *International Organizations & Environmental Protection: Conservation and Globalization in the Twentieth Century* (New York: Berghahn Books, 2017).
43. Holdgate, *The Green Web*.
44. Glenda Sluga, “UNESCO and the (One) World of Julian Huxley,” *Journal of World History* 21, no. 3 (2010); Bharat H. Desai, “UNEP: A Global Environmental Authority,” *Environmental Policy and Law* 36, no. 3–4 (2006); also see Natarajan Ishwaran, Ana Persic, and Nguyen H. Tri, “Concept and Practice: The Case of UNESCO Biosphere Reserves,” *International Journal of Environment and Sustainable Development* 7, no. 2 (2008); Chloé Maurel, “L’UNESCO, un Pionnier de l’Ecologie?,” *Monde(s)* 1, no. 3 (2013); James P. Sewell, *UNESCO and World Politics: Engaging in International Relations* (Princeton: Princeton University Press, 2015).
45. See Alexis Schwarzenbach, *Saving the World’s Wildlife: WWF—the First 50 Years* (London: Profile Books, 2011). Similarly, the political philosopher Robert Lampert has studied the first twenty-five years of Friends of the Earth International (founded in 1971), while the environmentalist Rex Weyler has published an insightful history of Greenpeace. Robert Lamb, *Promising the Earth* (London: Routledge, 2012); Weyler, *Greenpeace: How a Group of Ecologists, Journalists, and Visionaries Changed the World*.
46. Thomas Robertson, “‘This Is the American Earth’: American Empire, the Cold War, and American Environmentalism,” *Diplomatic History* 32, no. 4 (2008); Lisa M. Brady, “Life in the DMZ: Turning a Diplomatic Failure into an Environmental Success,” *Diplomatic History* 32, no. 4 (2008).
47. John W. Meyer et al., “The Structuring of a World Environmental Regime, 1870–1990,” *International Organization* 51, no. 4 (1997); Jacob D. Hamblin, “Gods and Devils in the Details: Marine Pollution, Radioactive Waste, and an Environmental Regime circa 1972,” *Diplomatic History* 32, no. 4 (2008): 540; John R. McNeill and Corinna R. Unger, eds., *Environmental Histories of the Cold War* (Cambridge: Cambridge University Press, 2010).
48. John McCormick, “The Origins of the World Conservation Strategy,” *Environmental Review* 10, no. 3 (1986); Roderick P. Neumann, “The Postwar Conservation Boom

- in British Colonial Africa,” *Environmental History* 7, no. 1 (2002). Also see Paul R. Greenough and Anna L. Tsing, *Nature in the Global South: Environmental Projects in South and Southeast Asia* (Durham, NC: Duke University Press, 2003); Dan Brockington, *Fortress Conservation: The Preservation of the Mkomazi Game Reserve, Tanzania* (Bloomington: Indiana University Press, 2002). In general, this tension between global and local ways of perceiving environmental risk or of planning environmental strategies has recently attained more attention, for instance in the work of the American science studies scholars Sheila Jasanoff and Marybeth Long Martello: Sheila Jasanoff and Marybeth Long Martello, eds., *Earthly Politics: Local and Global in Environmental Governance* (Cambridge, MA: MIT Press, 2004).
49. Stephen Macekura, *Of Limits and Growth. The Rise of Global Sustainable Development in the Twentieth Century* (Cambridge: Cambridge University Press, 2015).
  50. Iris Borowy, *Defining Sustainable Development for Our Common Future: A History of the World Commission on Environment and Development (Brundtland Commission)* (London: Routledge, 2013).
  51. Alessandro Antonello, “Protecting the Southern Ocean Ecosystem: The Environmental Protection Agenda of Antarctic Diplomacy and Science,” in *International Organizations & Environmental Protection: Conservation and Globalization in the Twentieth Century*, ed. Wolfram Kaiser and Jan-Henrik Meyer (New York: Berghahn Books, 2017). Similarly, policy scholar Peter Haas, in his work on the convention against pollution in the Mediterranean coastal area, has shown how the existence of expert regimes can explain the outcome of past negotiations concerning antipollution policies: Peter M. Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (New York: Columbia University Press, 1990).
  52. Important works to mention here include Michael Egan, *Barry Commoner and the Science of Survival: The Remaking of American Environmentalism* (Cambridge, MA: MIT Press, 2007); Jacob D. Hamblin, *Arming Mother Nature: The Birth of Catastrophic Environmentalism* (New York: Oxford University Press, 2013); Wolfram Kaiser and Jan-Henrik Meyer, eds., *International Organizations & Environmental Protection: Conservation and Globalization in the Twentieth Century* (New York: Berghahn Books, 2017). Haas, for example, who has employed the term “hybrid community,” has used it only to describe the complementary reliance and division of labor among experts of different disciplines within the epistemic community to understand aspects of the problem at stake. Peter M. Haas, “Banning Chlorofluorocarbons: Epistemic Community Efforts to Protect Stratospheric Ozone,” *International Organizations* 46, no. 1 (1992): 187–224.
  53. E.g., Dorothy Nelkin, *Nuclear Power and Its Critics: The Cayuga Lake Controversy* (New York: Cornell University Press, 1971); *Controversy: Politics of Technical Decisions* (New York: Sage Publications, 1979).
  54. E.g., Harry M. Collins, *Changing Order: Replication and Induction in Scientific Practice* (Chicago: University of Chicago Press, 1992).
  55. Sheila Jasanoff, “Genealogies of STS,” *Social Studies of Science* 42, no. 3 (2002): 339–40; Sismondo, “Science and Technology Studies and an Engaged Program,” 14–15.
  56. Ronald N. Giere, “Controversies Involving Science and Technology: A Theoretical Perspective,” in *Scientific Controversies: Case Studies in the Resolution and Closure of Dispute in Science and Technology*, ed. Hugo Tristram Egelhardt and Arthur L. Caplan (Cambridge: Cambridge University Press, 1987), 125–50.



57. In this book, I study expertise as something relational that is assigned by others, in this case policymakers and diplomats, who recognize the experts' authority. The claiming of expertise by disassociation from lay knowledge has been much discussed since Thomas F. Gieryn formulated the concept of boundary work in: "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists," *American Sociological Review* 48, no. 6 (1983). My research for this book, however, is less concerned with the study of the relationship between experts and different lay publics than with experts in policy decisions and international political debates between diplomats.
58. Stephen Hilgartner, *Science on Stage: Expert Advice as Public Drama* (Stanford: Stanford University Press, 2000).
59. Hilgartner has shown how in the 1970s and 1980s the unified and authoritative public voice of American scientists at the National Academy of Sciences kept from the public view hefty debates between committee members on the validity of nutrition claims. However, alongside scientists' disagreements on the correctness of scientific claims, I am equally interested in discussions on scientific policymaking and methods for environmental governance.
60. Wiebe E. Bijker, Roland Bal, and Ruud Hendriks, *The Paradox of Scientific Authority: The Role of Scientific Advice in Democracies* (Cambridge, MA: MIT Press, 2009), 30; Hilgartner, *Science on Stage*, 4; Bruno Latour, *We Have Never Been Modern* (Cambridge, MA: Harvard University Press, 1993).
61. Jasanoff, *States of Knowledge*; Miller, "Climate Science and the Making of a Global Political Order."
62. Sheila Jasanoff, *The Fifth Branch: Science Advisers as Policymakers* (Cambridge, MA: Harvard University Press, 1990), 247–50.
63. Roger A. Pielke, *The Honest Broker: Making Sense of Science in Policy and Politics* (Cambridge: Cambridge University Press, 2007), 14.
64. Evert Peeters, Joris Vandendriessche, and Kaat Wils, eds., *Scientists' Expertise as Performance: Between State and Society, 1860–1960* (London: Routledge, 2015).
65. For the self-fashioning of experts, see Hilgartner, *Science on Stage*. For the construction of expert roles, see Sheila Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Cambridge, MA: Harvard University Press, 2009); Arie Rip, "Constructing Expertise: In a Third Wave of Science Studies?," *Social Studies of Science* 33, no. 3 (2003).
66. During the course of this project, I had the chance to talk extensively to several historical actors about their firsthand experiences: Gina Douglas (18 and 19 October 2013) and Jennifer Norman (8 March 2014), who both worked closely with Max Nicholson during the IBP and who met with me in person, and IUCN veterans Lee Talbot and Duncan Poore, who responded to my questions in written form (Talbot: 6 and 8 July 2016; Poore, through Jennifer Norman: 13 March 2014).