

WHY ANIMAL WELFARE IS NOT BIODIVERSITY, ECOSYSTEM SERVICES, OR HUMAN WELFARE: TOWARD A MORE COMPLETE ASSESSMENT OF CLIMATE IMPACTS

KATIE McSHANE

Volume 13, Number 1, Winter 2018

URI: <https://id.erudit.org/iderudit/1055117ar>
DOI: <https://doi.org/10.7202/1055117ar>

[See table of contents](#)

Publisher(s)

Centre de recherche en éthique (CRÉ)

ISSN

1718-9977 (digital)

[Explore this journal](#)

Cite this article

McSHANE, K. (2018). WHY ANIMAL WELFARE IS NOT BIODIVERSITY, ECOSYSTEM SERVICES, OR HUMAN WELFARE: TOWARD A MORE COMPLETE ASSESSMENT OF CLIMATE IMPACTS. *Les ateliers de l'éthique / The Ethics Forum*, 13(1), 43–64. <https://doi.org/10.7202/1055117ar>

Article abstract

Taking the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) as representative, I argue that animal ethics has been neglected in the assessment of climate policy. While effects on ecosystem services, biodiversity, and human welfare are all catalogued quite carefully, there is no consideration at all of the effects of climate change on the welfare of animals. This omission, I argue, should bother us, for animal welfare is not adequately captured by assessments of ecosystem services, biodiversity, or human welfare. After describing the paper's assumptions and discussing the role of the IPCC's Assessment Reports in climate policy, I consider the presentation of climate impacts in the IPCC's Fifth Assessment Report, noting the aspects of animal welfare that are (and are not) considered there, and comparing the report's treatment of animal welfare to its treatment of human welfare. Next, I argue that the concepts of ecosystem services, biodiversity, and human welfare do not adequately capture the welfare of animals. Finally, I discuss concerns about human responsibility for animal welfare and the practicality of including considerations of animal welfare among the climate impacts studied by the IPCC.



WHY ANIMAL WELFARE IS NOT BIODIVERSITY, ECOSYSTEM SERVICES, OR HUMAN WELFARE: TOWARD A MORE COMPLETE ASSESSMENT OF CLIMATE IMPACTS

KATIE McSHANE
COLORADO STATE UNIVERSITY

ABSTRACT:

Taking the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) as representative, I argue that animal ethics has been neglected in the assessment of climate policy. While effects on ecosystem services, biodiversity, and human welfare are all catalogued quite carefully, there is no consideration at all of the effects of climate change on the welfare of animals. This omission, I argue, should bother us, for animal welfare is not adequately captured by assessments of ecosystem services, biodiversity, or human welfare. After describing the paper's assumptions and discussing the role of the IPCC's Assessment Reports in climate policy, I consider the presentation of climate impacts in the IPCC's Fifth Assessment Report, noting the aspects of animal welfare that are (and are not) considered there, and comparing the report's treatment of animal welfare to its treatment of human welfare. Next, I argue that the concepts of ecosystem services, biodiversity, and human welfare do not adequately capture the welfare of animals. Finally, I discuss concerns about human responsibility for animal welfare and the practicality of including considerations of animal welfare among the climate impacts studied by the IPCC.

RÉSUMÉ :

En prenant le Cinquième Rapport d'évaluation du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC) à titre de cas représentatif, je soutiens que l'éthique animale a été négligée dans l'évaluation de la politique climatique. Alors que les effets sur les services écosystémiques, la biodiversité et le bien-être humain y sont tous soigneusement recensés, les effets du changement climatique sur le bien-être des animaux n'y sont aucunement pris en considération. Je soutiens que cette omission devrait nous préoccuper, étant donné que l'évaluation des services écosystémiques, de la biodiversité et du bien-être humain ne rend pas compte adéquatement du bien-être des animaux. Après avoir décrit les présupposés de l'article et réfléchi au rôle des Rapports d'évaluation du GIEC quant à la politique climatique, j'examine la présentation des effets climatiques dans le Cinquième Rapport du GIEC, en indiquant les aspects du bien-être animal qui y sont (ou n'y sont pas) pris en considération, tout en comparant le traitement que fait le rapport du bien-être animal à celui qui est fait du bien-être humain. Ensuite, je soutiens que les concepts de services écosystémiques, de biodiversité et de bien-être humain ne reflètent pas adéquatement le bien-être des animaux. Enfin, je traite des problèmes potentiels liés à la responsabilité humaine relativement au bien-être des animaux ainsi que de la faisabilité d'inclure des considérations liées au bien-être animal parmi les effets climatiques étudiés par le GIEC.

1. INTRODUCTION

While the rift between animal ethics and environmental ethics is beginning to mend, one legacy of the conflict between the two fields is that certain areas of policy are still exclusively dominated by one set of concerns or the other.¹ This paper is about one of those areas: climate policy. Taking the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) as representative, I argue that animal ethics has been neglected in the assessment of climate policy. While effects on ecosystem services, biodiversity, and human welfare are all catalogued quite carefully, there is no consideration at all of the effects of climate change on the welfare of animals. This omission, I argue, should bother us, for animal welfare is not adequately captured by assessments of ecosystem services, biodiversity, or human welfare. In what follows, I first lay out a number of assumptions and discuss the role of the IPCC's Assessment Reports in climate policy. Then I consider the presentation of climate impacts in the IPCC's Fifth Assessment Report, noting the aspects of animal welfare that are (and are not) considered there, and comparing the report's treatment of animal welfare to its treatment of human welfare. Next, I argue that the concepts of ecosystem services, biodiversity, and human welfare do not adequately capture the welfare of animals. Finally, I discuss concerns about human responsibility for animal welfare and the practicality of including considerations of animal welfare among the climate impacts studied by the IPCC.

Before beginning, I want to note four crucial assumptions of this paper. First, I take it for granted that there are at least some nonhuman animals with a welfare that is of direct moral importance. While this might have once been a controversial claim, thanks to the careful and well-argued work of animal ethicists, there is now widespread agreement even within mainstream ethics that this is true.² There is, of course, still disagreement about exactly which nonhuman animals have morally important interests, and there is disagreement about how those interests ought to be weighed against human interests.³ But that there are morally significant interests that exist outside of the human species is widely accepted as true. The arguments in this paper require that only the most uncontroversial versions of such a claim be true—for example, that adult mammals typically have some interest in not suffering, and that this interest has some moral importance.

Second, I take it for granted that, if one is choosing among courses of action, some of which are likely to have significant effects on the interests of others, one ought to take those likely effects into consideration in weighing one's options. All other things equal, one ought to avoid courses of action that are harmful to the interests of others. Again, this claim is not controversial within ethics.

Third, I take for granted the basic scientific consensus about climate change: that human activity is largely responsible for causing it, and that our current choices and policies, at least on a global scale, will affect how and how much the climate changes.

Fourth, I take it for granted that climate change is likely to have a very significant effect on the welfare of animals. While I will not argue for this claim here, it is worth saying a bit about why such a claim is nonetheless plausible. Consider the projected impacts of climate change. Generally speaking, temperatures are expected to rise, temperature extremes are expected to be more frequent, and extreme weather events (hurricanes, floods, fires, droughts) are expected to happen more often. Even under very moderate warming projections, monthly heat records will be more than twelve times more common by the 2040s (IPCC, 2014a, p. 109, citing Coumou, Robinson, and Rahmstorf, 2013). There are many negative effects we can expect from this. Higher heat will cause more frequent wildfires, which will lead to severe problems for air and water quality (IPCC, 2014a, citing Pechony and Shindell, 2010). As warmer temperatures change habitats, some animals will move into new areas that they hadn't previously occupied; others won't be able to move fast enough and will die.⁴ Even those who relocate are likely to have many problems to deal with: needing to find new food sources, compete or cooperate with members of different species, protect themselves from new predators, fight off new diseases, and adjust to new seasonal cycles. Even in a hospitable habitat, extreme weather events can displace animal populations just as easily as they can displace human populations. There are also positive effects, at least for some animals, that we might expect. Some will see new food sources move into their territory, former predators die off, or former disease vectors disappear.

In addition to the direct effects just listed, there are also indirect consequences of climate change that are likely to affect the welfare of animals. Climate change is expected to cause significant disruption to human social and economic systems, and human responses to these disruptions might affect the way humans treat animals and their habitats. Sea level rise and extreme weather events will cause population dislocation and change land-use patterns. Frequent droughts and floods will impact human agriculture and increase food insecurity in vulnerable human populations. Economic shocks will further disrupt agricultural markets. Increased migration and economic deprivation will make violent conflict among humans more likely. These disruptions and conflicts among humans are likely to cause harm to many nonhuman animals. Disrupted agricultural markets and economic shocks can affect the way in which humans treat food animals. War can endanger animal populations as well as human populations. Again, in addition to the indirect harms just mentioned, there might also be indirect benefits for some animals. For example, unfarmed land might revert to better habitat for animals; at least some food animals might lead better lives if they escaped human captivity.⁵

There are also impacts on animals that might be caused by certain strategies that humans might adopt for mitigation of or adaptation to climate change. Increased reliance on biofuels, for example, is likely to change land-use patterns and cause human incursions into current habitats. Some actions we might take to adapt to variability in water supply (for example, building more and larger dams and reservoirs) might take away resources and habitats needed by animals (IPCC,

2014a, p. 276, 277). Some strategies for preventing extinctions, such as assisted colonization (moving organisms to new locations where they have a better chance of surviving) or more traditional forms of ex situ preservation (moving organisms to zoos or preserves to protect them) might have important impacts on the welfare of the animals so moved, on the animals who inhabit the environments they were moved out of, or, in the case of assisted colonization, on the animals in the new location. Again, these consequences are unlikely to be uniformly negative; at least some animals are likely to benefit from these changed arrangements.

Finally, as Oscar Horta has argued, climate change may well affect how many animals are born, in part by affecting the reproductive strategies that animals pursue.⁶ Horta claims that most animals' lives involve more suffering than pleasure, in part because most animals reproduce by having many offspring, very few of whom survive to adulthood (in technical terms, they are r-strategists rather than K-strategists). If this is true, then, if climate change increases the number of animals who reproduce this way, as Horta argues it will, or if it simply increases the number of animals who exist at all (by increasing available food resources, for example), this is a bad consequence from the point of view of animal welfare. More lives containing mostly suffering would be brought into existence with climate change than without it.⁷

We can see from these considerations that there is likely to be a significant effect on animal welfare from climate change. In fact, it would be very surprising if significant changes to the Earth's climate did not affect the lives of animals. However, what exactly the effects of climate change on the welfare of animals will be and how our climate policies might affect those levels of welfare clearly require more study. While it is clear that there will be many harms and possibly some benefits resulting from climate change, we need to know more about what they will be, what their magnitudes will be, and what the tradeoffs among them might look like.

The four assumptions described above leave us with something like the following argument: There are creatures besides humans whose welfare matters morally. If our choices might have a significant effect on their welfare, we ought to take that into consideration in deciding what to do.⁸ The choices we make now about climate policy are likely to have a significant effect on animal welfare. Thus, considerations of animal welfare ought to be taken into consideration when we make choices about climate policy.

2. CLIMATE POLICY: ROLE OF IPCC ASSESSMENT REPORTS

Prior to any discussion about the way in which animals are considered in climate policy, it is important to understand the general framework in which discussions of climate impacts take place. International discussions of climate policy have shifted considerably in the last two decades. In the earliest days of international negotiations about climate change, the focus was entirely on mitigation—that is

to say, how to reduce greenhouse-gas emissions in order to prevent climate change. In those days, to talk about adaptation—that is, about how to live within a changed climate—was taboo. The assumption was that only those who didn’t want to pursue mitigation talked about adaptation.⁹ However, as international agreements failed to reach mitigation targets year after year, it became clear that some level of harmful climate change was inevitable, and people began talking about adaptation. Today talk of adaptation is common among policymakers; in fact, adaptation is now the so-called second pillar of climate policy. Most recently, policymakers have begun to talk about “loss and damage”—that is, about the harm that will be caused by those climate changes that cannot be prevented or adapted to. Again, such talk was previously taboo—a sign of one’s lack of commitment to successful mitigation and adaptation.¹⁰ But now policymakers seem to be acknowledging that some loss and damage from climate change is inevitable, and they are trying to assess how much and what kind it will be.

Central to current policy discussions about climate change are assessments of the likely impacts of various courses of action. Policymakers need to know what the effects will be of mitigating to various levels (for example, what the effect on agriculture will be if warming reaches the four-degree mark); they need to know what impacts various strategies for adaptation will have (for example, how a shift to clean energy will affect the transportation sector or freshwater ecosystems); and they need to know which losses are likeliest to occur, which are still preventable, and what their magnitude will be. This means that a tremendous effort is going into assessing the good consequences and the bad consequences of various choices we might make regarding climate change. Much of the IPCC’s latest Assessment Report, in fact, is devoted to this task.

The Fifth Assessment Report, like all IPCC Assessment Reports, is an aggregation of smaller sections, each written by a different group of authors. It therefore might not have the same degree of unity and consistency as a work written in its entirety by the same group of authors. While this means that we should be wary of taking the report to express a single, unified view, it also means that omissions from the work as a whole—since they occur across the work of so many different authors—are particularly notable.

The aim of the IPCC’s Assessment Reports is to provide information to policymakers about the current state of knowledge concerning climate change, including knowledge about the likely impacts of various policy choices. Much of the most recent report, particularly the over-1 800-page section on “Impacts, Adaptation, and Vulnerability,” is written using the language of risk assessment. In these terms, the report describes its own mission:

[This report] evaluates how patterns of risks and potential benefits are shifting due to climate change. It considers how impacts and risks related to climate change can be reduced and managed through adaptation and mitigation (IPCC, 2014a, p. 3).

This is a very broad description of what the report aims to assess, and it is worth noticing that nothing in this description would rule out the inclusion of consequences for animal welfare among the “impacts and risks” of climate change that are to be “reduced and managed.” Definitions of key terms within the report are also very broad. For example, impacts are defined as “effects on natural and human systems”; risk as “the potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values”; and adaptation as “the process of adjustment to actual or expected climate and its effects” (IPCC, 2014a, p. 5). Nothing in these definitions would suggest that impacts on animal welfare are to be excluded; in fact, given the broad language in these definitions, such an exclusion would be strange. For a report that aims to assess the impacts and risks related to climate change, with the goal of managing them through mitigation and adaptation, the omission of impacts on and risks to the welfare of animals is puzzling.

3. FIFTH ASSESSMENT REPORT: IMPACTS ON ANIMALS

And yet, considerations of animal welfare are almost entirely excluded from the 3 300 pages devoted to assessing the potential impacts of various mitigation and adaptation strategies. This isn’t to say that the report ignores the effects on animals altogether; rather, it looks at impacts on their existence or nonexistence, their diversity, and their ecosystemic function rather than impacts on the quality of their lives as lived. This is very different from the way the report assesses impacts on humans. In the case of humans, effects on quality of life are central to the assessment of impacts.

Let us consider first how impacts on animals are assessed. In the report, impacts are usually described as impacts on species, biodiversity, or ecosystem services. In the discussion of impacts on species, which we might think of as a concern about a particular type of biodiversity, the closest that the assessment of climate impacts comes to considering effects on animal welfare is considering effects on “species range, abundance, and extinction” (IPCC, 2014a, p. 294). Welfare-related problems (for example, starvation) are sometimes discussed, but only in terms of their effect on range, abundance, and extinction. Consider the following fairly typical descriptions:

Some corals and temperate fishes experience disturbances to behavior, navigation, and their ability to tell conspecifics from predators.... However, there is no evidence for these effects to persist on evolutionary time scales in the few groups analyzed (IPCC, 2014a, p. 130).

There is, however, broad agreement that land use, and habitat fragmentation in particular, will pose serious impediments to species adaptation to climate change as it is projected to reduce the capacity of many species to track climate.... These considerations lead to the assessment that future species extinctions are a high risk because the consequences of climate change are potentially severe, widespread, and irreversible, as extinctions constitute the permanent loss of unique life forms (IPCC, 2014a, p. 299).

Even species whose populations are not projected to decline rapidly over the next century can face a substantial ‘extinction debt,’ that is, will be in unfavorable climates that over a period of many centuries are projected to lead to large reductions in population size and increase the risk of extinction (IPCC, 2014a, p. 301).

Surely the events that are being described in the above quoted passages will be miserable ones to live through for many animals. “Disturbances to behavior, navigation, and [the] ability to tell conspecifics from predators” will make for a very difficult life. If what we care about is what these events will be like for the animals who experience them, it is no consolation that these circumstances won’t persist on an evolutionary timescale. Likewise, the inability of many species to “track climate”—i.e., to continuously migrate to a more hospitable habitat as the changing climate makes their current habitat impossible to survive in—is a problem not just because of its effect on risk of extinction and the loss of “unique life forms,” but also because of the terribly difficult lives animals will live as they try to make such adjustments. Being in “unfavorable climates” isn’t bad just because of the “extinction debt” (i.e., increased risk of extinction over the longer term) that befalls the species, but also because of what it is like for the lives of living, sentient creatures. An “unfavorable climate” is one where there isn’t enough to eat, where what kept you safe from predators and diseases in the past no longer works, where you are increasingly watching your offspring and fellow group members suffer and die, and where the scarcity of resources leads to increased conflict, destabilizing group structures and increasing violent confrontations.

The report also assesses impacts in terms of the effect on biodiversity—understood more broadly than range, abundance, and extinction of species, to include also diversity at genetic and ecosystem levels—and on ecosystem services. Biodiversity and ecosystem services are typically discussed together, and biodiversity is often described as important because of its effect on ecosystem services. For example, the report notes that “global marine-species redistribution and marine-biodiversity reduction in sensitive regions will challenge the sustained provision of fisheries productivity and other ecosystem services” (IPCC, 2014a, p. 17). In a section titled “Impacts Key on Ecosystem Services,” there is a subsection entitled “Habitat for Biodiversity,” which notes that “many species could be outside of their preferred habitats within the next few decades” (IPCC 2014a, p. 319), a problem in virtue of its effect on biodiversity and risk of extinction. In measuring impacts of various “transformation pathways,” (i.e., pathways toward stabilizing greenhouse-gas concentrations), the only way in which effects on nonhumans are considered is in terms of consequences for biodiversity (IPCC, 2014b, ch. 6).

What the report seems to care about when it comes to animals is diversity among the kinds that exist and their functional role in ecosystems—or, at least, those aspects of ecosystems that humans care about. Animals having to find a way to live in an inhospitable climate is understood to be a problem because it might

lead to decreased abundance of those animals or even to the extinction of their species. Species extinction is presumed to be a problem for two reasons: first, because those species' members might have provided important services to humans (for example, the nutritional and economic benefits that humans get from catching fish); and second, because species are "unique life forms" (which are valuable either in their own right or, again, because they provide important services to humans).

In sum, the report implies that the climate impacts on animals that matter are those that affect the types of animals still in existence, the numbers of each existing type, and the quality of the services that they provide to humans. These are the relevant impacts and risks that the report considers when it comes to animals, and it is facts about these impacts and risks that are meant to inform discussions of mitigation, adaptation, and risk management in general.

4. FIFTH ASSESSMENT REPORT: IMPACTS ON HUMANS

It is important to notice that the way in which the report treats the impacts of climate change on animals, described in the preceding section, is very different from the way in which the report treats impacts on humans. For humans, effects on welfare are amply described, and careful attention is paid to the role that existing disadvantages might play in making some communities more vulnerable to climate change than others. Below are some typical descriptions of impacts on humans. Notice how different they are from the concerns about risks to species, biodiversity, and ecosystem services that we saw in the case of animals, even though many of these effects on humans are also ones that will be suffered by animals in some way.

Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change (high confidence). Examples include greater likelihood of injury, disease, and death due to more intense heat waves and fires (very high confidence); increased likelihood of under-nutrition resulting from diminished food production in poor regions (high confidence); risks from lost work capacity and reduced labor productivity in vulnerable populations; and increased risks from food- and water-borne diseases (very high confidence) and vector-borne diseases (medium confidence). Positive effects are expected to include modest reductions in cold-related mortality and morbidity in some areas due to fewer cold extremes (low confidence), geographical shifts in food production (medium confidence), and reduced capacity of vectors to transmit some diseases (IPCC, 2014a, pp. 19-20).

Impacts of such climate-related extremes include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, morbidity and mortality, and consequences for mental health and human well-being" (IPCC, 2014a, p. 6).

Climate-related hazards affect poor people's lives directly through impacts on livelihoods, reductions in crop yields, or destruction of homes and indirectly through, for example, increased food prices and food insecurity. Observed positive effects for poor and marginalized people, which are limited and often indirect, include examples such as diversification of social networks and of agricultural practices. Violent conflict increases vulnerability to climate change (medium evidence, high agreement). Large-scale violent conflict harms assets that facilitate adaptation, including infrastructure, institutions, natural resources, social capital, and livelihood opportunities (IPCC, 2014a, pp. 6-8, reference omitted).

Climate-change impacts are expected to exacerbate poverty in most developing countries and create new poverty pockets in countries with increasing inequality, in both developed and developing countries. In urban and rural areas, wage-labor-dependent poor households that are net buyers of food are expected to be particularly affected due to food price increases, including in regions with high food insecurity and high inequality (particularly in Africa), although the agricultural self-employed could benefit. Insurance programs, social protection measures, and disaster risk management may enhance long-term livelihood resilience among poor and marginalized people, if policies address poverty and multidimensional inequalities (IPCC, 2014a, p. 20).

The report also explores risks to “normal human activities, including growing food or working outdoors,” and to agricultural incomes; displacement and migration (and social responses to them); economic shocks; extreme weather such as heatwaves, floods, droughts, and fires (and social responses to them); heat-related deaths; gender inequality; access to education; damage to property; ability to maintain infrastructure and provide social services; psychological well-being and sense of security; individual, household, and community coping capacities and need for external assistance; social upheaval; “generalized anxiety, depression, aggression, and complex psychopathology[,]... chronic psychological distress and increased incidence of suicide”; solastalgia (“a distressing sense of loss...that people experience when their land is damaged”); risks to human security; and threats to the freedom and capacity to live with dignity (IPCC 2014a, p. 20, 49, 94, 105, 550, 713, 732 [citing Albrecht et al., 2007], 759)).

For humans, impacts on the quality of our lives plays a prominent role in the discussion of risks to be avoided. This is appropriate. We do not care only about how many and what kind of humans will remain in existence; we do not care only about the benefits (economic or otherwise) that they will provide to others. We also care about the effects on the quality of human lives as they are lived and experienced. We do not care only about how things work out over the evolutionary long-term for our species; we also care about the human lives that will be lived during that time.

Before further discussion, it is worth noting that there are two exceptions to the generalizations I have just given. First, there is a discussion of ethics in the Working Group III report. That discussion tries to make room, at least in some places, for the existence of morally important animal welfare. The authors divide ethics into two categories: claims about justice and claims about value. While justice is defined in a way that rules out animals (as a matter of whether “people and nations...receive what they are due, or have a right to”), value is defined in such a way that it could be applied to animals (IPCC, 2014b, p. 213). The report states: “All values may be anthropocentric or there may be non-human values” (IPCC, 2014b, p. 213). Most important is the following claim:

If animals, plants, species, and ecosystems do have value in their own right, then the moral impact of climate change cannot be gauged by its effects on human beings alone. If climate change leads to the loss of environmental diversity, the extinction of plant and animal species, *and the suffering of animal populations*, then it will cause great harms beyond those it does to human beings (IPCC, 2014b, p. 220, emphasis added).

Unfortunately, this claim seems to have had no impact on the rest of the report, even within the ethics section. Value is subsequently discussed in economic terms (i.e., use value and nonuse value), and well-being is discussed as if it applied only to humans. There are occasional admissions that this kind of assessment is incomplete. For example, there is the claim that “non-market values[,] such as the existence of species, natural environments, or traditional ways of life of local societies,” are not well captured because the quantification methodology for them is not yet well developed (IPCC, 2014b, p. 225). The report also mentions in passing the possibility that nature may have value beyond what is attributed to it by humans (IPCC, 2014b, p. 221). However, these possibilities are not explored further, nor are these values included in any assessment of impacts elsewhere in the report.

The second exception, which occurs in the discussion of sustainable development, is the statement that “the ultimate end result, for sustainability assessment, is the wellbeing of all living beings” (IPCC, 2014b, p. 322). However, all that is said about the well-being of nonhuman beings is that “it still remains difficult to assess” (IPCC, 2014b, p. 322). In the assessments of impacts that follow, no effort to assess it is made.

If we read the claims in these two exceptions against the background of the rest of the report, the conclusion we are left with is this: animals might (or do) have a welfare that might (or does) matter to the goals of climate policy, but no one is going to investigate the matter further, and the impacts of climate policy on this welfare will not be included in our attempts to manage climate risks. From the point of view of ethics, this position is unsatisfactory.

5. THE RELATION BETWEEN ANIMAL WELFARE AND ECOSYSTEM SERVICES, BIODIVERSITY, AND HUMAN WELFARE

One might attempt to justify the IPCC's approach by claiming that in fact the authors *are* assessing animal welfare. While they might not be measuring how much a particular elephant or family of elephants will suffer from drought, for example, they are assessing the impact of drought on all elephants by looking at how it will affect the existence and abundance of elephants. When measuring the global effects of a phenomenon such as climate change, one might argue, we cannot investigate the quality of each individual life that is affected. We need metrics that can be applied to large-scale problems. There are good ways of measuring impacts on ecosystem services, biodiversity, and human welfare at the necessary scale, and these can serve as proxies for measurements of animal welfare.

However, to measure the impact of climate change on ecosystem services, biodiversity, or human welfare is not to measure its impact on animal welfare. While these might be measures of large-scale phenomena, they are not in fact measuring the same thing as, nor are they good proxies for, animal welfare. Consider the case of ecosystem services. Ecosystem services are defined as “the benefits that people derive from ecosystems,” or, more formally, “ecological processes or functions having monetary or non-monetary value to individuals or society at large” (IPCC, 2014a, p. 319; IPCC, 2014b, p. 1259). To measure the benefits that people derive from an ecosystem is not to measure the benefits that animals derive from an ecosystem. Ecosystems may provide benefits to people that they do not provide to animals (opportunities for scientific study, for example), and ecosystems can also provide benefits to people that come at the expense of animals (opportunities for hunting and fishing, for example).¹¹

Biodiversity might seem better positioned to capture animal welfare. After all, measurements of biodiversity are often used to assess the state of nonhuman communities. In discussions of this issue, it is important to note that biodiversity is a notoriously vague concept. It is defined formally in the Assessment Report as follows: “The variability among living organisms from terrestrial, marine, and other ecosystems. Biodiversity includes variability at the genetic, species, and ecosystem levels” (IPCC, 2014b, p. 1253). The problem is not simply that there are different levels at which we could look for variability. It is also that there are different ways in which things at that level might vary. Take, for example, biodiversity at the species level, in keeping with the report's focus on species, discussed above. If what we care about is diversity among the species in some region, we first need to be clear about what kind of variability we are looking for. Do we just want there to be as many species present in that region as possible? Or do we also want those species to be as different from one another as possible (e.g., in terms of morphology, genetics, etc.)? Do we care how many members of each species there are—how abundant the species is? There is a large and technical literature on this topic, and there are many different definitions of biodiversity that have emerged from it.¹²

Yet there are problems with using any of these definitions of biodiversity as a proxy for animal welfare. Biodiversity is essentially a measure of variety, even if different definitions of biodiversity involve different types of variety. Variety is not the same thing as flourishing. Among humans, this is very clearly true: I can work in a very diverse department (in terms of nationality, gender, philosophical style, etc.) where everyone is miserable. We see the same thing among nonhumans. A region with high biodiversity is full of lots of different *kinds* of individuals. They might be suffering; their lives might be barely worth living. But if they are alive, they count positively toward biodiversity. The only time welfare will affect biodiversity at all is when it affects either reproduction or mortality to such an extent that the relevant kind of variability in the population is diminished—for example, when a species goes extinct. However, significant effects on welfare happen to species members long before their species goes extinct. To care about biodiversity, then, is to care about the existence or presence of the kinds, not about the welfare of the individuals belonging to those kinds.

From an ethical perspective, the difference between caring about the existence of kinds and caring about the welfare of individuals is significant. The point of the claim that animals have a welfare of direct moral importance is that harms or benefits to them matter morally. It matters not just whether certain kinds of them exist, but also what their quality of life is. To see the force of this point, consider what difference it would make if we thought the aim of human morality was only to ensure that certain kinds of people exist, but with no attention to the quality of their lives. If we thought that we simply needed to keep a variety of kinds of people in existence and nothing more, it would not matter if those people were imprisoned or forced to breed, so long as this strategy did not diminish the relevant kind of diversity. If millions of people suffered terribly and died, there wouldn't be a moral problem so long as they were replaced by other people of the same kind. This attitude would obviously be intolerable in the case of humans. To say that human welfare matters is to say that the suffering and death alone would be a great tragedy, that imprisonment, rape, and other violations of basic human rights and dignity are themselves great wrongs. One needn't think animal welfare matters in the same way as human welfare to see that considerations of mere existence or diversity aren't adequate replacements for considerations of welfare.

Finally, and perhaps most obviously, human welfare is not the same as animal welfare. Humans still regularly benefit themselves at the expense of animals. We test medicines on them to find cures for our diseases, we eat and wear their bodies, we destroy their homes to build our own, and we kill them for recreation or decorations that please us. While, ultimately, we might all be better off if we found a way to harmonize human and animal interests, this doesn't mean that our interests are the same thing as their interests. They remain creatures with a good of their own, whose lives can go better or worse for them independently of whether our lives go better or worse for us.

Conceptually, then, ecosystem services, biodiversity, and human welfare are distinct from animal welfare. Further, given what ecosystem services, biodiversity, and human welfare are, it is not guaranteed that improvements to them will produce improvements to animal welfare.¹³ Indeed, there are many ways of protecting each of these three things that would be detrimental to animal welfare: we could kill off populations of animals who are interfering with ecosystem services provided by plants; we could choose *ex situ* biodiversity conservation programmes—breeding in captivity—that offer miserable lives for the animals involved; we could improve our own access to food or fresh water by moving to new places and displacing animal populations. If we think animal welfare matters, then using ecosystem services, biodiversity, or human welfare as measurements of it will not suffice.

6. MATTERS OF RESPONSIBILITY

So far, I have argued that we ought to consider the welfare of animals in assessing the impacts of various policy choices we might make about climate change. But one might object at this point that, at least for nondomesticated animals, their welfare is not our responsibility. We do not consider it to be our moral responsibility to protect wild rabbits from wild eagles or from the consequences of an early winter or a dry season, one might argue, so why should we think that their welfare is our responsibility now that the climate is changing?

In reply, three points are worth making. First, the IPCC report aims to understand the impacts of various choices about climate policy for the purpose of managing and reducing risk. Nothing in this very broad description limits the impacts or risks it considers to those that we are responsible for, whether the “we” refers to all or to some subset of humans, and there is no attempt in the document to sort out which impacts responsibility attaches to. The question of responsibility, therefore, is not relevant to the question of which impacts of climate change should be included among those catalogued by the report.

Second, when policymakers choose policies that affect others, they thereby acquire responsibility at least to consider the interests of those affected by their policies. We needn’t think that humans in general are responsible for the suffering of wild animals in general to think that, when our climate policies might do great harm to animals, that fact ought to matter to us.

Finally, it is also worth reminding ourselves that climate change isn’t a problem that nonhuman animals have brought upon themselves, nor is it simply a matter of the vicissitudes of nature—it has been caused by the choices of human beings. Thus, if assessments of responsibility were to be made, at least some humans and/or human institutions would clearly bear at least some responsibility for this harm. To sum up, then, the fact that these harms might befall nondomesticated animals is not an excuse for ignoring the impact of our policy choices on their welfare.

7. PRACTICAL CONSIDERATIONS

However, one might wonder whether considering animal welfare is at all realistic given the state of international policy negotiations on climate change. Surely negotiators have enough to disagree about without adding debates over the importance of animal welfare. However, while agreement has certainly been difficult to achieve in international negotiations, it is important to recognize that studying the impacts of climate change on animals is not the same thing as requiring the consideration of these facts in international negotiations. The IPCC's role is not to set the agenda for negotiations, but rather to provide information about the impacts of climate change so that policymakers can make informed decisions. Policymakers are free to use or ignore that information as they choose. If that information is not made available, however, it will be difficult for policymakers to take it into account, even if it is an area of great concern for them.

Additionally, there does seem to be an opening for broader assessments of the impacts of climate change among policymakers at the moment. There has been a lot of criticism recently of narrow, reductive assessments of human welfare—treating a country's GDP, for example, as a proxy for the well-being of its citizens.¹⁴ In the human realm, insisting on easily measured and quantified proxies for human flourishing has not gone well. These narrow, reductive accounts of human welfare are slowly being replaced with richer, more pluralistic accounts.¹⁵ The same is true for values. The idea that all value is economic value has been under fire for decades, and richer understandings of value are replacing it. For example, the Warsaw International Mechanism for Loss and Damage took as one of its first tasks the study of noneconomic values. This was in response to many criticisms of prior discussions that treated economic value as a proxy for human welfare. Studying the economic losses produced by climate change, critics argued, was not enough. Many losses (social, cultural, psychological) are not well captured by economic measures, so better ways of including these goods in our assessments are urgently needed. The resulting technical paper on noneconomic losses catalogues a number of different methodologies that can be used to assess the value of noneconomic goods, many of which can be useful for assessing the welfare of animals (UNFCCC, 2013). This is only the beginning of a solution: no measure of animal welfare is actually proposed in the technical paper. However, the report insists on a broadening of what would count as “measurement,” and proposes a number of nonaggregative, qualitative, and multidimensional methodologies for achieving it. This broadening leaves room for precisely the kinds of considerations that assessments of animal welfare include.¹⁶

Within environmental ethics, there have also been discussions lately about the difference between caring about biodiversity or ecosystem resilience in general, and caring about the fate of certain creatures or places in particular.¹⁷ While biodiversity and the state of ecosystems and their services might be valued by many people, this value is not the same as that which they place on particular

places and creatures. For example, many people in the Pacific Northwest region of the United States would not accept losing their coastal forests, even if they knew that an equally diverse and functional ecosystem would take its place. It's the loss of *this* forest that would be grieved, even if something equally ecologically robust replaced it. The focus on biodiversity and ecosystem services has thus been criticized for being too abstract a description to capture the particularity of human moral concern, even in the case of things like ecosystems. Again, we see a pushback on the use of biodiversity or ecosystem services as a way of capturing all that is valuable in the nonhuman world. Animal welfare advocates might do well to join forces with these critics, as they seem to be pushing for theories that would be more inclusive of animal-welfare considerations.

Finally, it is worth noting that coming up with assessments of the impact of climate change on animal welfare is not an impossible task. It is true that policymakers want data, but in part because of the above-mentioned critiques, the IPCC is increasingly open to what might count as data. The section "Impacts, Adaptation, and Vulnerability" describes the basis of its assessments as follows: "Assessment of risks...relies on diverse forms of evidence. Expert judgment is used to integrate evidence into evaluations of risks. Forms of evidence include, for example, empirical observations, experimental results, process-based understanding, statistical approaches, and simulation and descriptive models" (IPCC, 2014a, p. 11). Data on animal welfare is needed, and this requires coming up with measureable aspects of animal welfare for a wide variety of animals. Some aspects of animal welfare (e.g., mortality) are uncontroversial and are already being used to assess the effect of climate change on certain animals (IPCC, 2014a). More comprehensive measures have been developed and are already in use for farm animals and for animals in captivity (in zoos, for example).¹⁸ Broad attempts to come up with rubrics for assessing different aspects of human welfare have already been developed: lists of human capabilities, the "happiness index," and so on.¹⁹ It is not a stretch to think that a combination of animal ethicists, wildlife biologists, veterinarians, and ethologists could come up with a happiness index for different animals, or at least for those most uncontroversially believed to experience suffering. Some efforts in this direction are already underway.²⁰

8. CONCLUSION

Climate policy is one area where animal welfare considerations are almost entirely absent, and where this absence is unjustified. In the case of humans, we don't just care that many different kinds of humans exist, that they contribute to the ecosystems they participate in, or that they provide benefits to others. We also care about how their lives go, about whether these lives are full of satisfaction or misery. The same is true for animals. We care not just about biodiversity, ecosystem services, and human welfare, but also about the quality of life for animals. We should think carefully about what kinds of policy choices we would favour by omitting animal welfare from the list of impacts we include in our assessments, and by treating biodiversity as the only nonanthropocentric value at stake in our decisions.

In the area of climate policy, concerns about species and ecosystems from environmental ethics, concerns about animal welfare from animal ethics, and concerns about human welfare from human ethics should all play a role in our decisions about how to deal with climate change. Together these considerations can provide a more complete analysis of the risks we are trying to manage in responding to this particularly urgent and difficult problem.

ACKNOWLEDGEMENTS

The author wishes to thank participants at the Convergence and Divergence: Between Animal and Environmental Ethics Conference, at which an earlier version of this paper was presented, for their astute comments and criticisms. She also thanks Mark Budolfson, Hanna Moerland, Jeff Kasser, Jen Teeple, and Gwendy Reyes-Illg for helpful discussions in other fora of the ideas presented here. Two anonymous reviewers also provided excellent suggestions that greatly improved the quality of the paper.

NOTES

- ¹ For the rift, see, e.g., Singer (1990); Regan (1983); Callicott (1980); Callicott (1989); and Sagoff (1984). For those lamenting it, see, e.g., Callicott (1988a); Jamieson (1998); and Callicott (1988b).
- ² For examples of acceptance within mainstream ethics, see consequentialists Broome (2006, p. 43); Hooker (1995, p. 23); Kagan (2016); Norcross (2004); and Tooley (1972); deontologists Garthoff (2011); Korsgaard (2004); Kriegel (2013); and Wood and O'Neill (1998); virtue ethicists Baier (1995, p. 269); Driver (2011); Hursthouse (2006); and Swanton (2005, p. 38); feminist and care ethicists Noddings (2013, pp. 148-158); Slote (2007, p. 31); and Walker (2007, pp. 267-268); and contractualist Scanlon (1998, pp. 177-188).
- ³ Here I follow the convention within ethics of treating the terms "welfare," "well-being" and "interests" as interchangeable.
- ⁴ Projected rates of warming involve latitudinal shifts of up to hundreds of kilometers per decade. See IPCC (2014a, p. 47).
- ⁵ See IPCC (2014a) for discussions of these effects on humans. For a further discussion of the impacts on animals, see Marchant-Forde (2015, pp. 4-5) and Shields and Orme-Evans (2015). For the impacts on nonhuman nature more broadly and the ethical significance of these impacts, see Palmer (2011) and Nolt (2011).
- ⁶ See Horta (2018, this volume); see also Horta (2010); Horta (2015).
- ⁷ As an anonymous reviewer points out, resolving this question is crucial to the practical project of determining the effect of climate change on animals. Whether some/many/all animal lives contain more suffering than happiness and, if so, under what circumstances is ultimately an empirical question—as it would be in the case of humans. However, the fact that this empirical question has not been adequately investigated (aside from Horta's important efforts) does not justify ignoring animal welfare. In cases where important ethical issues rely on empirical assumptions in need of further study, the conclusion to draw is that more investigation is needed, not that we can ignore the ethical matter.
- ⁸ This paper refers to those who must make choices about climate policy in some places as "policymakers" and in other places as "we" or "us." While the IPCC explicitly addresses its reports to policymakers and seems to have in mind those who make official governmental climate policy, it is also true that a much broader group (possibly all humans) must make decisions about what to do about climate change, which will involve policies, choices, and actions that might have no formal legal status. The "we" is thus meant to designate all of us who face such decisions.
- ⁹ See, for example, Pielke, Prins, Rayner, and Sarewitz (2007) for a description of this situation.
- ¹⁰ See, for example, Gupta (2016) and Huq (2014) for a description of this situation.
- ¹¹ From the point of view of ethics, it is strange that ecosystem services are defined anthropocentrically, since ecosystems benefit many other creatures besides humans. The reason for the anthropocentrism is that ecosystem services were meant to be goods that could be valued economically. For example, we would assess the value of the water-filtering service provided

by wetlands by asking how much it would cost us to build a water-treatment plant to filter the water instead. Whatever it would cost to do it ourselves, then, would be the value of the water-filtering service provided to us by the wetlands. The concept of ecosystem services comes from a broader attempt to put a price on environmental goods so that they can be adequately represented in our economic assessments of costs and benefits. Notice that even though the wetlands might filter water in a way that is also good for birds, we cannot ask “How much would it cost the birds to build a water-treatment plant to filter the water themselves?” Birds are not market participants, and they do not build water-treatment plans. While drinking clean water clearly is beneficial to them, it isn’t clear how to capture that benefit economically. If the ultimate aim is the economic assessment of costs and benefits, then anthropocentric assumptions make the value of ecosystem services much easier to discern.

¹² For discussion, see Sarkar (2005) and Garson, Plutynski, and Sarkar (2017).

¹³ An anonymous reviewer argues that it is nonetheless reasonable to think that areas with high biodiversity will have high levels of animal welfare—i.e., that the two are correlated. I am unconvinced that this is true, as high levels of biodiversity can be produced in many ways (in some flourishing, stable ecosystems, but also in areas where a lot of species pass through on their way northward to find a more hospitable climate). Furthermore, there are Horta’s concerns about the correlation of r-selection with high levels of suffering to take into account. In any case, it is an empirical question. Rather than assume that this correlation is probably true, we should investigate whether it is.

¹⁴ For discussion, see Bergh (2009).

¹⁵ See, for example, McGillivray (2007); OECD (2015); Sen (1993); Diener, Lucas, Schimmack, and Helliwell (2009); and Ura, Alkire, Zangmo, and Wangdi (2012).

¹⁶ For a recent attempt to assess the impacts of climate change on animal welfare using standard economic methodology, see Hsiung and Sunstein (2007). I would argue that animal welfare is not well measured by assessing human preferences for the existence or protection of those animals, a concern the authors acknowledge.

¹⁷ See for example, the discussion of caring about biodiversity (as opposed to caring about particular species) in Maier (2013); see more generally the distinction between “caring for” and “caring about” in Tronto (1989). For further discussion of this issue in ethical theory and environmental ethics, see McShane (2014).

¹⁸ For discussion and references, see Place and Mitloehner (2014); Fraser, Weary, Pajor, and Milligan (1997); and Broom (2011). For examples of welfare indices and their use, see Farm Animal Welfare Commission (2013) or any of the Welfare Quality Assessment Protocols developed by the European Welfare Equality project (e.g., Welfare Quality Consortium (2009b); Welfare Quality Consortium (2009a)). While the welfare of farm animals is important, there are many more nondomesticated animals on earth than domesticated ones. Exact numbers are difficult to come by, but estimates put farm animals at 77 billion (Humane Society International, 2017), and wild mammals alone at 1 trillion (Tomasik, 2017, citing Matheny and Chan, 2005).

¹⁹ See, for example, Nussbaum (2000); Ura et al. (2012). For Nussbaum’s application of the capabilities approach to animals, see Nussbaum (2007).

²⁰ See, for example, the discussion of elephant welfare in Pearce (2015) or the discussion of chimpanzee welfare in Fritz and Howell (1993).

REFERENCES

Albrecht, Glenn, et al., "Solastalgia: The Distress Caused by Environmental Change," *Australasian Psychiatry*, vol. 15, no. suppl. 1, 2007, p. S95-S98.

Baier, Annette, *Moral Prejudices: Essays on Ethics*, Cambridge, MA, Harvard University Press, 1995.

Bergh, Jeroen C. J. M. van den, "The GDP Paradox," *Journal of Economic Psychology*, vol. 30, no. 2, 2009, p. 117-135.

Broom, Donald M., "A History of Animal Welfare Science," *Acta Biotheoretica*, vol. 59, no. 2, 2011, p. 121-137.

Broome, John, *Weighing Lives*, Oxford, Oxford University Press, 2006.

Callicott, J. Baird, "Animal Liberation: A Triangular Affair," *Environmental Ethics*, vol. 2, no. 4, 1980, p. 311-328.

———, "Animal Liberation and Environmental Ethics: Back Together Again," *Between the Species*, vol. 4, 1988a, p. 163-169.

———, "'Back Together Again' Again," *Environmental Values*, vol. 7, no. 4, 1988b, p. 461-475.

———, "Review of Tom Regan, 'The Case for Animal Rights,'" in J. Baird Callicott (ed.), *In Defense of the Land Ethic*, Albany, NY, State University of New York Press, 1989, p. 39-47.

Coumou, Dim, Alexander Robinson and Stefan Rahmstorf, "Global Increase in Record-Breaking Monthly-Mean Temperatures," *Climatic Change*, vol. 118, no. 3-4, 2013, p. 771-782.

Diener, Ed, et al., *Well-Being for Public Policy*, Oxford, Oxford University Press, 2009.

Driver, Julia, "A Humean Account of the Status and Character of Animals," in Tom L. Beauchamp and R. G. Frey (eds.), *The Oxford Handbook of Animal Ethics*, Oxford, Oxford University Press, 2011, p. 144-171.

Farm Animal Welfare Commission, "Farm Animal Welfare in Great Britain: Past, Present, and Future," London, Farm Animal Welfare Commission (UK), 2013.

Fraser, David, et al., "A Scientific Conception of Animal Welfare that Reflects Ethical Concerns," *Animal Welfare*, vol. 6, 1997, p. 187-205.

Fritz, Jo and Howell, Susan Menkhus, "Psychological Wellness for Captive Chimpanzees: An Evaluative Program," *Humane Innovations and Alternatives*, vol. 7, 1993, p. 426-434.

Garson, Justin, Anya Plutynski and Sahotra Sarkar, *The Routledge Handbook of the Philosophy of Biodiversity*, London, Routledge, 2017.

Garthoff, Jon, "Meriting Concern and Meriting Respect," *Journal of Ethics and Social Philosophy*, vol. 5, no. 2, 2011, p. 1-28.

Gupta, Joydeep, "Loss and Damage, Here and Now," *The Third Pole*, New Delhi, India, July 13, 2016, available at <https://www.thethirdpole.net/2016/07/13/loss-and-damage-here-and-now/>.

Hooker, Brad, "Rule-Consequentialism, Incoherence, Fairness," *Proceedings of the Aristotelian Society*, vol. 95, 1995, p. 19-35.

Horta, Oscar, "Debunking the Idyllic View of Natural Processes: Population Dynamics and Suffering in the Wild," *Télos*, vol. 17, no. 1, 2010, p. 73-88.

———, "The Problem of Evil in Nature: Evolutionary Bases of the Prevalence of Disvalue," *Relations*, vol. 3, no. 1, 2015, available at <http://www.ledonline.it/index.php/Relations/article/view/825>.

Hsiung, Wayne and Cass R. Sunstein, "Climate Change and Animals," *University of Pennsylvania Law Review*, vol. 155, no. 6, 2007, p. 1695-1740.

Humane Society International, "Animal Agriculture & Climate Change", accessed September 25, 2017, available at http://www.hsi.org/issues/climate_change/

Huq, Saleemul, "Loss and Damage: A Guide for the Confused," *Climate Home*, October 20, 2014, available at <http://www.climatechangenews.com/2014/10/20/loss-and-damage-a-guide-for-the-confused/>

Hursthouse, Rosalind, "Applying Virtue Ethics to Our Treatment of the Other Animals," in Jennifer Welchman (ed.), *The Practice of Virtue: Classic and Contemporary Readings in Virtue Ethics*, Indianapolis, IN, Hackett, 2006, p. 136-155.

IPCC, "Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment of the Intergovernmental Panel on Climate Change," Cambridge, Cambridge University Press, 2014a.

———, "Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change," Cambridge, Cambridge University Press, 2014b.

Jamieson, Dale, "Animal Liberation is an Environmental Ethic," *Environmental Values*, vol. 7, no. 1, 1998, p. 41-57.

Kagan, Shelly, "What's Wrong with Speciesism?," *Journal of Applied Philosophy*, vol. 33, no. 1, 2016, p. 1-21.

Korsgaard, Christine M., "Fellow Creatures: Kantian Ethics and Our Duties to Animals," in Grethe B. Peterson (ed.), *The Tanner Lectures on Human Values*, Salt Lake City, University of Utah Press, 2004.

Kriegel, Uriah, "Animal Rights: A NonConsequentialist Approach," in K. Petrus and M. Wild (eds.), *Animal Minds and Animal Ethics*, Transcript Verlag, Bielefeld, 2013.

Maier, Donald S., *What's So Good about Biodiversity? A Call for Better Reasoning about Nature's Value*, Dordrecht, Springer, 2013.

Marchant-Forde, Jeremy N., "The Science of Animal Behavior and Welfare: Challenges, Opportunities, and Global Perspective," *Frontiers in Veterinary Science*, vol. 2, no. 16, 2015, p. 1-6.

Matheny, Gaverick and Kai M. A. Chan, "Human Diets and Animal Welfare: The Illogic of the Larder," *Journal of Agricultural and Environmental Ethics*, vol. 18, no. 6, 2005, p. 579-594.

McGillivray, Mark (ed.), *Human Well-Being: Concept and Measurement*, New York, Palgrave MacMillan, 2007.

McShane, Katie, "The Bearers of Value in Environmental Ethics," in Avram Hiller, Ramona Ilea, and Leonard Kahn (eds.), *Consequentialism and Environmental Ethics*, London, Routledge, 2014.

Noddings, Nel, *Caring: A Relational Approach to Ethics and Moral Education*, Berkeley, University of California Press, 2013.

Nolt, John, "Nonanthropocentric Climate Ethics," *Wiley Interdisciplinary Reviews: Climate Change*, vol. 2, no. 5, 2011, p. 701-711.

Norcross, Alastair, "Puppies, Pigs, and People: Eating Meat and Marginal Cases," *Philosophical Perspectives*, vol. 18, no. 1, 2004, p. 229-245.

Nussbaum, Martha C., *Women and Human Development: The Capabilities Approach*, Cambridge, Cambridge University Press, 2000.

———, *Frontiers of Justice: Disability, Nationality, Species Membership*, Cambridge, MA, Harvard University Press, 2007.

OECD, *How's Life? 2015: Measuring Well-Being*, Paris, OECD Publishing, 2015.

Palmer, Clare, "Does Nature Matter? The Place of the Nonhuman in the Ethics of Climate Change," in Denis G. Arnold (ed.), *The Ethics of Global Climate Change*, Cambridge, Cambridge University Press, 2011, p. 272-291.

Pearce, David, "A Welfare State for Elephants? A Case Study of Compassionate Stewardship," *Relations*, vol. 3, no. 2, 2015, available at <http://www.ledonline.it/index.php/Relations/article/view/881>.

Pechony, Olga and Drew Shindell, "Driving Forces of Global Wildfires over the Past Millennium and the Forthcoming Century", *Proceedings of the National Academy of Sciences*, vol. 107, no. 45, 2010, p. 19167-19170.

Pielke, Roger, et al., "Climate Change 2007: Lifting the Taboo on Adaptation," *Nature*, vol. 445, no. 7128, 2007, p. 597-598.

Place, Sara E. and Frank M. Mitloehner, "The Nexus of Environmental Quality and Livestock Welfare," *Annual Review of Animal Biosciences*, vol. 2, no. 1, 2014, p. 555-569.

Regan, Tom, *The Case for Animal Rights*, Berkeley, University of California Press, 1983.

Sagoff, Mark, "Animal Liberation and Environmental Ethics: Bad Marriage, Quick Divorce," *Osgoode Hall Law Journal*, vol. 22, no. 2, 1984, p. 297-308.

Sarkar, Sahotra, *Biodiversity and Environmental Philosophy: An Introduction*, Cambridge, Cambridge University Press, 2005.

Scanlon, T. M., *What We Owe to Each Other*, Cambridge, MA, The Belknap Press, 1998.

Sen, Amartya, "Capability and Well-Being," in Martha C. Nussbaum and Amartya Sen (eds.), *The Quality of Life*, Clarendon Press, Oxford, 1993, p. 30-53.

Shields, Sara and Geoffrey Orme-Evans, "The Impacts of Climate Change Mitigation Strategies on Animal Welfare," *Animals*, vol. 5, no. 2, 2015, p. 361-394.

Singer, Peter, *Animal Liberation*, new revised edition, New York, Avon Books, 1990.

Slote, Michael, *The Ethics of Care and Empathy*, London, Routledge, 2007.

Swanton, Christine, *Virtue Ethics: A Pluralistic View*, Oxford, Oxford University Press, 2005.
Tomasik, Brian, "How Many Wild Animals Are There?", accessed September 25, 2017, available at <http://reducing-suffering.org/how-many-wild-animals-are-there/>

Tooley, Michael, "Abortion and Infanticide," *Philosophy & Public Affairs*, vol. 2, no. 1, 1972, p. 37-65.

Tronto, Joan, "Women and Caring: What Can Feminists Learn about Morality from Caring?," in Alison M. Jaggar and Susan R. Bordo (eds.), *Gender/Body/Knowledge: Feminist Reconstructions of Being and Knowing*, New Brunswick, NJ: Rutgers University Press, 1989, p. 172-187.

UNFCCC, "Non-Economic Losses in the Context of the Work Programme on Loss and Damage: Technical Paper", 2013, available at <http://unfccc.int/resource/docs/2013/tp/02.pdf>.

Ura, Karma, et al., *A Short Guide to Gross National Happiness Index*, Thimphu, Bhutan, Center for Bhutan Studies, 2012.

Walker, Rebecca L., "The Good Life for Non-Human Animals: What Virtue Requires of Humans," in Rebecca L. Walker and Philip J. Ivanhoe (eds.), *Working Virtue: Virtue Ethics and Contemporary Moral Problems*, Oxford, Oxford University Press, 2007, p. 173-189.

Welfare Quality Consortium, "Welfare Quality Assessment for Cattle", Lelystad, Netherlands, 2009a.

———, "Welfare Quality Assessment for Poultry (Broilers, Laying Hens)," Lelystad, Netherlands, 2009b.

Wood, Allen W. and O'Neill, Onora, "Kant on Duties Regarding Nonrational Nature," *Proceedings of the Aristotelian Society*, Supplementary Volume 72, 1998, p. 189-228.