

The Social Cost of Carbon: Ethics and the Limits of Climate Change Economics

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Oxford University Press, 2025

Preface

Climate change economists have called it “the most important number you have never heard of” ([Ackerman and Stanton 2010](#), p. 2), “the single most important variable for [climate] policy analysis” ([Pearson 2011](#), p. 78), the “holy grail of climate economic analysis” ([Wagner 2020](#)), and “the one number that rules them all, the one number that every government across the globe should use” ([Auffhammer 2017](#), at 4m26s). William Nordhaus concurs, calling it “[t]he most important single economic concept in the economics of climate change” ([Nordhaus 2017](#), p. 1518). It is the *social cost of carbon dioxide*, and its purpose is to reflect in one dollar figure the total amount of harm caused by emitting an additional ton of carbon dioxide into the earth’s atmosphere. Many people just call it “the social cost of carbon”—hence the title of this book.

Economists use the social cost of carbon (SCC) in cost-benefit analyses of climate change mitigation projects. If the cost to abate a ton of carbon dioxide is larger than the monetized harm done by that ton, then from a standpoint of weighing costs against benefits, it is better to let the damage be done. But if the harm caused by an extra unit of greenhouse gas emissions is greater than the costs of preventing that unit, then the benefits of abatement exceed the costs of prevention, and cost-benefit analysis should rank abatement above the status quo. In other contexts, the SCC has been used as an indicator of the optimal level of atmospheric CO₂ concentrations, as well as the optimal level of the tax that should be imposed on each ton of carbon dioxide that humans emit into the atmosphere.

Partially in response to a 2008 ruling by the United States Ninth Circuit Court of Appeals that stated “the value of carbon emissions reductions is certainly not zero,” the Obama administration established the federal Interagency Working Group on the Social Cost of Carbon (IWG) to establish a standardized range of SCC figures to be used in federal cost-benefit analyses ([U.S. Ninth Circuit Court of Appeals 2008](#)). In 2016, the IWG’s “central” SCC estimate for 2020 was \$42 (in 2007 dollars). Shortly after taking office, however, President Trump issued an executive order that dissolved the IWG, barred federal agencies from using the Obama-era SCC figures, and permitted these agencies to make profound changes to the federal SCC methodology. As a result, the Trump administration authorized the use of SCC values as low as \$1 ([Armstrong 2017](#)). This diminished the chances that climate change-related regulations would pass a federal cost-benefit analysis. In President Biden’s first month of office, a reconstituted IWG reinstated the Obama-era numbers, adjusted for inflation. Most recently, the U.S. Environmental Protection Agency finalized its own range of updated SCC figures in November 2023 ([EPA 2023](#)). EPA’s headline central SCC estimate for 2020 came in at \$190 per ton of CO₂ (in 2020 dollars).

Prior to becoming a political football in the U.S., the academy hosted some rather acrimonious battles over the SCC's theoretical foundations. In response to Nordhaus's criticism of a 2007 UK government report for which John Broome served as a consultant, Broome (a former economist turned leading moral philosopher) told a journalist:

I actually got rather angry...it is so obvious that these economists are applying ethical principles without noticing. Something needed to be done about it, they shouldn't get away with this. It was no longer a sideline [in my own research], this is a challenge. (Miller 2013)

And in a bitter exchange with the economist-cum-political philosopher John Roemer over discount rates, which are key components of any SCC calculation, the doyen of environmental economics, Partha Dasgupta, wrote in the journal *Environmental and Resource Economics* that "'Social discount rates' often bring out the intellectually worst among moral and political philosophers writing on the subject" (Dasgupta 2011, p. 489).

Nor is this just economists versus philosophers. For it is hard to name a higher-profile intra-disciplinary debate than the one in climate economics between Nordhaus and Nicholas Stern on the theoretical foundations of social cost of carbon calculations. Quite possibly, no academic debate has ever been more consequential for the future of life on this planet than the Stern-Nordhaus debate. Stern is a former World Bank chief economist and lead author of the report Broome consulted on, viz. *The Economics of Climate Change: The Stern Review* (Stern 2007); and Nordhaus won the 2018 Nobel Prize in economics for his trailblazing work in climate economics. What is remarkable about this debate is that each participant has declared that the other's *whole approach* to climate economics is flatly irrelevant to the problem it aims to address (see Nordhaus 2007, p. 692; and Stern 2010, p. 51).

The Stern-Nordhaus dispute is only the most extreme version of a general trend: virtually everyone writing on the theoretical foundations of the social cost of carbon believes that virtually all the others are badly mistaken on crucial matters. This makes it hard to persuade others of one's own idiosyncratic views. And as Dasgupta's remark suggests, the hill is perhaps steeper if one is—like me—a moral philosopher, rather than a card-carrying economist.

Nevertheless, I aim in this book to bring new conceptual clarity to debates over the SCC, and over the foundations of climate change economics more generally. Although I became interested in the SCC in part because of the high-profile debates I have referred to, the book is not organized around those debates. Instead I proceed analytically, by disentangling four distinct SCC concepts and sorting them into two families. The families correspond to the two main branches of welfare economics, social choice theory and general equilibrium theory. In the course of explaining each SCC concept and its theoretical basis, I shall relate each to the distinct analytical task in climate economics that it is best suited to address.

At a fundamental level, none of the four SCC concepts conflicts any of the others: each can be linked to one of four distinct analytical tasks. This does not mean that each is *well-suited* for the task it has been used to address; nor does it mean that philosophers, economists, and other analysts have avoided using the various SCC concepts in problematic ways. For example, whereas two of the SCC concepts are often treated as bearing on the topic of efficient CO₂ pollution taxation, in fact only one of these concepts can properly serve in that role. Likewise, a different pair of SCC concepts has been treated as relevant to the question of whether a marginal

abatement project is a good thing from the standpoint of aggregate social welfare, when in fact only one member of this pair can properly serve in *that* role. The good news is that these conflation and confusions can be cleared up, and that three of the four SCC concepts really do have an important role to play in climate change policy analysis. The bad news is that the fourth, policy-*irrelevant* SCC concept is the concept that largely underlies the SCC estimates that have been produced by the federal government in the United States. As chapter 8 discusses, there is reason for hope that this could change in the future. But as of this writing it seems unlikely to change very soon. This book is in part an argument for making that change.

I hope, therefore, to show that three of the four SCC concepts I identify are theoretically well-founded and relevant to ethically responsible climate change policy analysis. The real difficulty is that it is hard to say exactly *how* or *to what degree* these concepts are relevant. This is because none of the three SCC concepts can justify carbon dioxide mitigation policies on its own. Each is, as I shall put it, *normatively abridged*: however theoretically sound these SCC concepts are, there are important policy-relevant ethical values and principles that are external to—and thus abridged from—the theoretical frameworks underlying them. The normative abridgement that afflicts the three defensible SCC concepts severely limits the evaluative power climate change economics—hence the subtitle of this book. Even if their SCC figures were impeccably derived, and even if these were combined with an infallible schedule of marginal abatement costs (MAC), economists still should not conclude that we ought to mitigate right up until the SCC (i.e. the benefit of mitigation) equals the MAC (i.e. the cost of mitigation). In other words, quantitative cost-benefit reasoning cannot justify climate policies all on its own. Or so I shall argue.

I should note that the types of normative abridgement I will focus on do not concern the intrinsic value of nature or the well-being of non-human animals. It is true that these two considerations are typically ignored in SCC estimates, and that is absolutely an important limitation that I do not wish to downplay. But I shall principally be concerned with different limitations, and with the question of whether and how to rectify these additional limitations in calculating SCC values. This latter question would arise even if nature and animal welfare were somehow adequately included.

Finally, this book is also a study of the basis and analytical role in climate change economics of ethics generally, and of utilitarianism more specifically. Climate change economists often invoke a framework they call *discounted utilitarianism*, which virtually no moral philosopher accepts. Meanwhile, philosophers engaged with climate economics often endorse a *non-discounted* utilitarian framework, which climate change economists routinely criticize for having absurd policy implications. This certainly looks like a disagreement, but in fact it need not be. Instead, these two frameworks—economists' discounted utilitarianism and philosophers' utilitarianism—can arise from distinct and mutually consistent theoretical foundations. Moreover, if my claims concerning normative abridgement are correct, neither framework on its own entails anything decisive about the proper targets of climate policy. I shall argue that the economists should not reject utilitarian climate economics if they do so because of its putative policy implications, and the philosophers should not reject economists' discounted utilitarianism if they do so because they assume it is at odds with their philosophical utilitarianism.

The book is structured as follows. After the introductory chapter 1, the rest of Part I explains each of the four SCC concepts, their theoretical bases in either social choice theory or general

equilibrium theory, and the respective analytical tasks they address. Part II then examines more deeply the ethical foundations of social choice climate change economics and the two SCC concepts that belong to it. This branch of climate economics is, at bottom, an applied branch of moral philosophy. Part II argues that while social choice SCC concepts are genuinely relevant to climate change policy, there are good reasons to treat them as normatively abridged and therefore as offering incomplete answers to climate policy questions. If this is right, then a comprehensive analysis of climate policy must take account of considerations that are external to the social choice framework that gives rise to the SCC concepts.

The sole chapter in Part III then puts normatively abridged climate economics to work. First, I explain why one of the normatively abridged social choice SCC concepts offers important and practicable improvements over the normatively *irrelevant* SCC concept that is currently used by the U.S. federal government to evaluate greenhouse gas regulations. Second, one of the normatively abridged general equilibrium SCC concepts is important because it is an essential component in the design of greenhouse gas abatement policies that could be undertaken without anyone's having to make a sacrifice. Whether the world *ought* to pursue sacrifice-free climate policy is not something that climate economics alone can establish. Nor will I examine that question in detail. But in light of the roadblocks that still impede climate action, the possibility should be taken seriously.¹

Of course I expect and welcome pushback on my claims concerning the various SCC concepts' relevance for climate change policy analysis. With respect to the social choice SCC concepts in particular, I certainly cannot claim to have proved my normative abridgement thesis beyond all reasonable doubt. Doing that would require a much longer book, and I wanted to write a philosophy book that non-philosophers might read in full. Yet even if I am mistaken that a theoretically correct social choice climate economics will be normative abridged, there is an important further reason to take the phenomenon seriously in this context. The reason is that the most important institution for which a social choice SCC concept might make a difference, the United States federal government, is (at best) decades away from being comfortable with unabridged social choice SCC figures. Indeed, it is already official U.S. policy to treat SCC figures as theoretically incomplete and in need of supplementation by ethical considerations that are excluded from the SCC estimation process. So even if my arguments for normative abridgement in social choice climate economics are mistaken at the level of theory, it remains important to examine the implications of abridgement for applied climate change policy analysis of the sort undertaken by federal agencies in the U.S. That is a main task of Part III.

I am much more confident about the importance of disentangling the four different SCC concepts and then mapping each to the task it addresses in climate economics. I have sometimes had economists respond to this project by noting that, barring outliers, published SCC estimates do not differ much, even when the studies' methodologies clearly focus on different SCC concepts. (This is one of the findings of the recent meta-analysis by Tol (2023a, see p. S7, p. S25).) On this basis, these economists have suggested that the conceptual distinctions I stress in this book are not important enough to fuss over. But this is a bad argument. The correct approach would compare SCC figures that have been constructed by those who grasp and are

¹ For further discussion and advocacy on this point, see Posner and Weisbach (2010), Foley (2009), Broome (2012), Broome and Foley (2016), and Kotlikoff et al. (2021).

responsive to the relevant conceptual distinctions. Moreover, if some of the SCC concepts are inherently normative, then at least some models in climate economics should be informed by philosophical argumentation and analysis. Yet philosophers are rarely central members of a modeling team or otherwise meaningfully consulted by the economists who construct and run the models. And even when philosophers *are* consulted and heeded, as was the case with the *Stern Review*, the analysis becomes liable to economists' ridicule as one that "takes the lofty vantage point of the world social planner, perhaps stoking the dying embers of the British Empire" (Nordhaus 2007, p. 691), or one that is "paternalistic and at risk of intolerance, authoritarianism and totalitarianism" (Tol 2019, p. 152). When conceptually and ethically important aspects of a quantitative indicator are dismissed or jeered at within climate economics, one cannot draw inferences from published figures to what SCC levels *would be* if those aspects were taken seriously.

This book is principally addressed to numerate philosophers and economists, and to the graduate students they train. I have come to believe that much disagreement between climate economists and moral philosophers (and between economists themselves) stems from the fact that two radically different analytical frameworks can give rise to exactly the same mathematical formalism. To explain this, and to explore its implications for climate economics, I have had to explain the conceptual and mathematical bases of two fundamentally different branches of welfare economics. The result is a more technical book than I had expected to write on an already technical topic. Much as I tried, I could find no way around this. Still, I hope much of the book will be comprehensible and useful to any patient reader who is not immediately put off by the symbols and formulae.²

² Two excellent primers for those entirely new to welfare economics are Feldman and Serrano (2006) and Adler (2019). But again, I hope my exposition will be accessible even to the uninitiated.