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Response to Commentaries on “Ethical and Technical Challenges in Compensating for Harm  
Due to Solar Radiation Management Geoengineering”

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We thank the commentators for their interesting and helpful feedback on our previously published target article (Svoboda and Irvine, 2014). One of our objectives in that article was to identify areas of uncertainty that would need to be addressed in crafting a just SRM compensation system. The commentators have indicated some possible ways of reducing such uncertainty. Although we cannot respond to all their points due to limitations of space, we wish to address here the more pressing criticisms the commentators have offered.

Response to Reynolds

Jesse Reynolds suggests that the “primary problem” in our paper is that we treat “the shortcomings of SRM and of compensation for its potential negative secondary effects as if they were *sui generis*.” But it is not our view that SRM compensation is a *sui generis* problem, nor do we state that it is in our paper. Setting aside the technical challenges, it may well be true that the ethical challenges faced by SRM compensation are already faced in other domains, such as socially organized responses to complex problems, other instances of providing compensation, and climate change (to take Reynold’s examples).

Our claim was that providing compensation for SRM-related harm faces some difficult challenges. If Reynolds is right, many or all of these same challenges arise in other domains. Our argument is not undermined by the fact (if it is one) that there are parallels among these different

domains, for the challenges to SRM compensation remain challenges even if they are not unique to SRM. Reynolds writes that “SRM might be especially complex, in large part of its global nature, but that does not make it entirely novel.” We can agree with this, because we did not claim that SRM is entirely novel. Moreover, since the issue of SRM compensation is particularly complex, it is worth investigating whether we can disentangle the many issues involved and reduce uncertainty regarding them.

Reynolds also suggests that we “stack the deck against SRM” by focusing too much on the potential harms of SRM (Horton raises a similar concern), but we think this is due to a misunderstanding of what our paper aims to do. Although we noted throughout the paper that SRM could have many benefits, we did not emphasize these potential benefits because the issue under investigation was compensation provision for harms due to SRM. This focus will tend to emphasize potential harms, since our primary question was how such harms should be remunerated. Given that question, it would be odd to emphasize the potential benefits of SRM, although we certainly acknowledge them.

Likewise, it is important to note that we were not addressing whether some form of SRM should be deployed in the future. As we wrote, “We conclude that establishing a just SRM compensation system faces severe difficulties. This does not necessarily imply that SRM ought never to be deployed, as there might be satisfactory ways to resolve these difficulties. Furthermore, even if these difficulties are not fully surmounted, it does not necessarily follow that SRM deployment would be impermissible.” We certainly don’t think the challenges of SRM compensation should create “paralysis among policy makers,” as Reynolds implies, but we do think these challenges are worth considering.

### Response to Horton

On the basis of recent modeling studies, Joshua Horton suggests that SRM deployment might make no region of the world worse off relative to pre-industrial conditions, in which case there would not be regional “losers” as a result of SRM. But regions themselves are not moral patients, so it does not strictly matter for ethical purposes whether some region itself is made better or worse off. What matters is whether persons are harmed or benefited. Even if there are no regional “losers” due to SRM, it is virtually certain that there will be individuals made worse off within those regions, and such individuals may deserve compensation.

Horton suggests more than once that the benefits of SRM might outweigh its costs. He notes that “historically, societies have adopted systems of compensation for hazardous activities precisely because the benefits are believed to outweigh the costs” (Horton, 2014: 176). While the overall balance of costs and benefits of SRM and attendant compensation is no doubt important, justice also concerns the distribution of costs and benefits among persons. That being the case, even if SRM in tandem with compensation passes a cost-benefit test, it does not follow that SRM would be just (although it could be). We are not suggesting that Horton would deny that justice involves more than the balance of overall costs and benefits, but he seems to overlook the importance of how costs and benefits are to be allocated among persons rather than regions.

Finally, Horton thinks we imply that ethical certainty is required “for compensation to be regarded as just” (Horton, 2014: 176). This is not our view. First, certainty or uncertainty regarding whether some compensation system is just is an epistemic matter, and this is distinct from whether some compensation system actually is just. Some compensation system could be just, and correctly regarded as such, even if we are not certain of that fact. Second, our goal in

flagging cases of ethical uncertainty regarding SRM compensation was to identify points regarding which further consideration may be worthwhile, but this does not entail that ethical certainty is a necessary condition for just SRM compensation. We are only committed to the view that, all else being equal, it would be better to reduce such uncertainty, for that puts us in an improved position to judge what sorts of SRM compensation would be just or unjust.

### Response to Garcia

Robert Garcia focuses on a small part of our paper, in which we raise some questions regarding whether the polluter pays principle (PPP) is the appropriate ethical principle for determining who ought to provide SRM compensation. If successful, Garcia's commentary would show that PPP is somewhat more promising than we explicitly recognized. To clarify, we did not take ourselves to be offering "allegations" to the effect that PPP is not a reasonable principle. We think Garcia succeeds in showing that reasonable responses are available to some of our questions, but his responses can also be reasonably contested.

To take one example, we noted that it would seem unfair for an impoverished state that is part of an SRM coalition to be required to pay compensation, as PPP would seem to do. Relying on a macro-version of PPP, Garcia replies that a party is responsible for providing an amount of compensation that is proportionate to the amount of pollution it has caused, which can be measured by the financial contribution of each party to the polluting activity. Since an impoverished state's financial contribution to SRM is likely to be small, that state will likely be responsible for providing a proportionately small amount of compensation, and Garcia argues that this does not appear to be unfairly burdensome.

However, we still think that PPP could render unfair verdicts even here. Since the direct costs of some SRM techniques appear to be low (Barrett, 2008) but the damages *could* be quite high (e.g., due to abrupt termination of SRM), paying an amount of compensation that is proportionate to a relatively low financial contribution to SRM may nonetheless be debilitating and perhaps unfairly burdensome. This is because the total compensation required might be far greater than the total direct costs of deployment. This is not to *deny* that PPP should be used to determine who ought to provide SRM compensation. Our point was only that PPP is controversial, and this engenders uncertainty regarding whether it should be used as part of an SRM compensation system.

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