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GLOBAL CLIMATE CHANGE GOVERNANCE: A RETHINKING

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Abstract: *The decades of increased Green House Gas (GHG) emissions have increased global average temperature to 1.1 degrees over pre-industrial levels. In order to hold the global average temperature rise below 2 degrees Celsius and, if possible, 1.5 degree Celsius, the governments signed various treaties. However, countries' collective agreements to reduce their emissions were never kept. This study outlines why the method of mitigating global climate change has failed. The main problem was the inability to enforce goals and timelines. Ideas for even tighter emission limits will be ineffective unless they solve the enforcement gap. Trade restrictions are one method, but they introduce significant complications, particularly when used to enforce economy-wide carbon reduction agreements. The applied methodology is qualitative. This study proposes a novel strategy to unpack the climate challenge, targeting various gasses and industries with various instruments. It also illustrates how failing to address the climate problem fundamentally would generate incentives for various solutions, offering new problems for climate change governance.*

Keywords: *Climate change; Developing Countries; Governance; Sustainable Development; Global*

INTRODUCTION

By every reasonable standard, the efforts to combat climate change have failed. Participants at a quasi-political meeting in Toronto in 1988 agreed that global carbon dioxide (CO2) emissions should be decreased by 20% from 1988 levels by 2005. Even though two climate accords had gone into effect and other unilateral objectives had been set, global emissions grew by 32% through 2004. This large disparity (50 percent) growing up quickly should cause negotiators to reconsider their strategy. So, too, should the finding that air concentrations have risen year after year since monitoring began in the late 1950s. As the Kyoto Protocol is implemented, neither trend will alter.

So far, the strategy has been to set economy-wide objectives and timelines. This technique would be excellent if it were feasible to manage global greenhouse gas emissions from the top down. Unfortunately, the world's governing structures must operate from the ground up. There is not just one government globally; there are roughly 200. A deal to cut emissions must be appealing, not simply for the sake of the global good. It must also be something individual countries choose to accede and adhere to. In this paper, we have attempted to depict why the current strategy has failed and how an alternative approach may perform significantly better.

BACKGROUND

What should the purpose of climate policy be? Inaction on climate change will have consequences for present and future generations, but so will act on climate change. Economics attempts to balance both sides of this equation. Economists generally agree that emissions should be lowered today below the "business as usual level" (there is controversy about the specific amount of emissions reduction that is warranted). There is also widespread agreement that greenhouse gas concentrations should finally be stabilized (opinions differ on what this degree of stability should be and when it should be attained) (Nordhaus 2007).

Chemical equilibrium in the atmosphere and seas is required for stabilization. As emissions decrease, ocean take-up will decrease over time. Net emissions must fall to zero in equilibrium if concentrations are to be stabilized. There is only one method to accomplish this in a fashion acceptable to most of any country's voters. There must be a technological revolution at some point (Hoffert et al. 2002). A future treaty agreement must keep this long-term goal in mind. So far, the strategy has been to concentrate on a goal represented in terms of concentration levels (perhaps with the further goal in mind of limiting temperature change). Because net emissions influence concentrations, negotiators have expressed short-term goals regarding individual nation emission limitations.

Regrettably, because each country's emissions constitute such a small proportion of the total, the incentives for countries to act alone are limited. To make matters worse, when some nations cut emissions, competitive advantage in greenhouse gas-heavy businesses will migrate to other countries, leading their emissions to rise. To businesses, this means a loss of "competitiveness". To environmentalists, it signifies "leakage" of emissions. International collaboration is required for both reasons: to discourage free riding and to avoid leaking. This will have to take the shape of a treaty or even a series of treaties.

A treaty must meet three characteristics to be successful: first and foremost, it must elicit widespread engagement. A pact to control emissions must, at the very least, include the United States, the European Union, Japan, Russia, China, and India. Second, it must verify conformity. Finally, it must do both while asking its parties to alter their conduct significantly. A treaty can easily fulfill one or two of these requirements. It is quite difficult for a treaty to accomplish all of these. Kyoto falls short of all of them.

KYOTO'S PROTOCOL

Kyoto has failed to elicit widespread engagement. It has, in particular, failed to get the United States to join. This is to blame on the Bush administration. However, before Kyoto was negotiated, the US Senate passed a non-binding resolution stating that the US should not be a signatory to any treaty that "would result in serious harm to the economy of the United States" (Committee on Foreign Relations, United State Senate 1998) or that did not mandate "new specific scheduled commitments to limit or reduce greenhouse gas emissions for Developing Country Parties within the same compliance period" (Committee on Foreign Relations, United State Senate 1998). This non-binding vote was carried 95-0. As a result, even before Kyoto was negotiated, it was evident that the United States would not approve it.

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Kyoto also failed to assure that the countries who approved it would follow through. Canada is a signatory to the Kyoto Protocol, which requires it to cut emissions by 6% below 1990 levels between 2008 and 2012. However, Canada's emissions were 30% higher than this objective in 2005, and the country's current administration has abandoned the notion of attaining the Kyoto target. Its goal is to slow the pace of the rise in emissions, with the hope that emissions will peak around Kyoto's midpoint in 2010. Even this basic aim sounds optimistic; a government-funded discussion found that the government's measures will fall short of even this modest target.

Kyoto's parties have failed to take significant action. The Framework Convention on Climate Change is nearly at capacity (the only non-participants are Andorra, the Holy See, Iraq, and Somalia). Furthermore, compliance with this agreement is flawless. Nevertheless, this agreement does not force countries to cut their emissions. The Framework Convention is an example of a treaty that meets two of the three success criteria.

Kyoto sought to do more but succumbed to the same forces that weakened the Framework Convention. China and India are both signatories to the Kyoto Protocol, and both will completely comply with the accord, but only because Kyoto does not oblige them to lower their emissions. Russia and the transition economies were granted an excess of emissions, which environmentalists call "hot air". The emission limits do not affect them. Getting these nations to participate in Kyoto is far from a success.

Other nations are obliged under Kyoto to cut their emissions, but the pact does not compel them.

Canada will not comply because Kyoto asks Canada to decrease its emissions significantly. Compliance will also be tough for New Zealand, which has yet to adopt a policy for achieving its responsibilities, and Japan, which claims to have done much to decrease emissions but is still far from meeting its objective. Although the government has not admitted it, there is a significant probability that Japan, the host of the Kyoto discussions, would not comply.

Compliance by certain European Union members looks to be difficult as well. Spain has the widest disparity of any country. Denmark has fallen well short of its individual goal. However, because of the European "bubble" and significant reductions by other EU nations (for reasons unrelated to their climate change policy), these countries are not constrained by their individual restrictions as long as the original 15 EU Member States fulfill their aggregate limit. Australia just accepted the Kyoto Protocol, but because of the provision for land use, land-use change, and forestry (known as LULUCF to climate insiders), Australia is already within its Kyoto limit; Australia will have to do so very little, if anything, to comply.

A review of the discussions after 1997 reveals a similar trend of countries attempting to alleviate their duties or the necessity to fulfill their obligations. Following the announcement by the United States that it would not ratify Kyoto, Canada and Japan insisted on a liberal accounting of their "sinks" (that is, LULUCF) as a prerequisite for ratification. Russia, which had already received "hot air", hoped for more. Furthermore, Russia insisted on getting EU backing for its World Trade Organisation entry.) This treaty renegotiation succeeded in putting the agreement into force, but at the expense of decreasing the pact's environmental effectiveness - an example of one success criterion being traded for another.

Today, because of post-1997 talks that lifted trade barriers, compliance with the Protocol's "flexible procedures" is still quite simple (again, following the decision by the US not to ratify). If compliance is accomplished by purchasing "hot air", emissions may not be reduced. Under these conditions, it is difficult to understand why a government would choose this option to comply (why pay to conform when the money does not assist the two climate accords in achieving their goals?) - another reason why some countries' compliance is in peril.

Within their Kyoto constraints, nations tend to portray themselves as more effective at meeting their responsibilities. However, the Kyoto limitations were calculated using 1990 as the base year, which favored certain nations over others. The discrepancies between nations would be less apparent if attention were focused on the activities states have done rather than whether or not they have kept within their Kyoto boundaries. More significantly, from the climate standpoint, individual state emissions are meaningless. Climate success should be judged in terms of global emissions (or, better still, atmospheric concentrations), and these trends, as previously said, are in the wrong direction.

THE UNITED STATES LEADERSHIP FAILURE

The United States' lack of leadership has also stymied global growth. As previously stated, seeing the US' non-participation in the Kyoto Protocol as unusual is simple. Simultaneously, the US has failed to give leadership, which has been a global setback. To be more explicit, the United States has failed to (1) draft a pact that might be approved; (2) pass important domestic climate legislation; and (3) present an alternative to Kyoto. Although George W. Bush's administration championed R&D and assisted in the formation of the Asia-Pacific Partnership on Clean Development and Climate (which includes Australia, Canada, China, India, Japan, and South Korea), none of these initiatives have yielded results. The Bush government, for example, recently canceled plans for its FutureGen pilot "clean coal" facility, claiming $900 million in cost overruns. A superpower has every right to expect more from the rest of the globe. This matter will be taken seriously by the future administration. However, US leadership is merely a required condition for progress on this issue; it is insufficient. The most significant roadblock to progress is enforcing a future climate change deal.

THE IMPORTANCE OF ENFORCEMENT

The following example illustrates the necessity of enforcement: in 2002, the United States put tariffs on steel imports. The European Union filed a complaint with the World Trade Organisation (WTO), which found that the US tariffs violated WTO norms. Should the US refuse to withdraw its duties, the EU can "rebalance" the effect of the levies under those regulations. Because the United States failed to comply with the WTO judgment, the EU devised a tariff package to offset the US tariff. The EU tariffs were to be implemented in December 2003, less than a year before the next US presidential election (recall that Florida was a "battleground" state in the contentious 2000 election). President George W. Bush lowered duties on steel imports just before the EU penalties were about to go into effect. The EU never slapped tariffs on the United States; the credible threat of doing so was enough to persuade the US to comply

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with the WTO verdict. This trade pact is effective; it alters the behavior of states. It was in the EU's best interests to penalize the US, and it was in the US's best interests to cooperate while facing this penalty. Both nations were also enticed to stay in the pact by the accord. The Kyoto Protocol provides neither type of incentive. Rather than focusing on incorporating such systems, negotiators have sought to negotiate tighter emission restrictions in response to previous failures. The EU campaigned for wealthier nations to reduce their emissions by 25-40% in Bali (Arga 2007). This suggestion aligns with the belief that Kyoto's problem is that the caps are too liberal. Emissions must undoubtedly be lowered significantly, but would Kyoto have been more effective if the caps had been more difficult to meet? Is it possible that this would have increased the likelihood of the United States participating? Would Canada have been more likely to cooperate if this had been the case? Kyoto's flaw is in its design rather than (primarily) in its objectives. The difficulty of implementing emission limitations is one example of the problem.

Kyoto's caps were agreed upon in December 1997, but critical specifics were still being worked out for years. In 2001, a compliance method was agreed upon. However, any system for ensuring compliance "with binding consequences" must be authorized by modification, according to Article 18 of the Kyoto Protocol. An amendment functions similarly to a new agreement. It would only be binding on the countries who approved it, assuming that at least three-quarters of the Kyoto Protocol parties also ratified it. No such amendment has been passed so far. As a result, the method agreed upon in 2001 is non-binding.

It would have no effect even if the mechanism were binding. The mechanism's key component is a 30 percent penalty. A nation that emits 100 tonnes more than the treaty permits in the first "commitment period" (2008-2012) must make up the difference by decreasing emissions by an additional 130 tonnes in the next term (2013-2017). This decrease is "extra" to the next-period cap for this nation. This cap, on the other hand, is contingent on the permission of the country that must pay the penalty. As a result, that country can demand a liberal limit as a condition of participation and avoid incurring a "phantom" penalty. Alternatively, it may ratify the new pact and fail to comply again - the existing system effectively drags the punishment forward indefinitely. Because the sanctions must be self-inflicted, this penalty system cannot dissuade non-compliance. Of course, this is not the case with WTO sanctions.

However, there is one exception. Other nations can also suspend a country's trading rights under Kyoto's non-binding compliance mechanism. Is this a fair punishment? Is this a sentence that other countries would impose? There is a strong reason to think they would not (Kellbakken and Hovi 2007).

If a significant seller of permits were to lose its trade powers, international permit prices would rise, damaging net importers; these governments may be hesitant to enforce the punishment. International permit prices would decrease if a significant buyer of permits were penalized in the same way, damaging net exporters; these nations may be hesitant to implement the punishment. In other words, the threat of retaliation may not be believable. In each scenario we just named, some countries would benefit from implementing the consequences (net exporters in the first instance, net importers in the second). However, with some nations benefitting and others losing, the sanction's implementation may generate strife among the countries who had obeyed.

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It should be noted that the situation described here is comparable to the difficulty that Eurozone countries had in implementing the Stability and Growth Pact. This agreement's enforcement mechanism was not trustworthy (Barrett 2005).

Because, as previously stated, trade restrictions are used to enforce the WTO, should trade restrictions be used to enforce Kyoto's successor? The concept is appealing. France's President Sarkozy has recommended that trade restrictions be examined. Nobel laureate economist Joseph Stiglitz has advocated for its adoption (Greenwald and Stiglitz 2006).

Trade restrictions may serve two purposes: preventing leakage and encouraging participation (deterring free riding). A "border tax adjustment" would support the former goal while helping the latter. A blunter tool would be meant to increase involvement, but if it successfully maintained full participation, it would minimize leakage.

Unfortunately, border tax modifications would be difficult to implement. They must be based on the emissions produced while manufacturing traded items. It would be tough to calculate these quantities. Two identical items made in the same nation might have vastly different "carbon footprints" (depending, for example, on how the electricity used as an input was generated). Cruder computations may be considered, but sector-specific taxes would be extremely difficult to calculate (Hoel 1996). Furthermore, as trade restrictions got more stringent, they would be less successful in controlling leakage.

Blunder penalties may also fail. Punishments are designed to compel participation to raise additional issues. The limits would have to be severe and credible, and sanctions often grow less credible as they become harsher (Barrett 2005).

This is what caused the Stability and Growth Pact to fail. Of course, as previously stated, the World Trade Organisation's enforcement system is successful. Conversely, trade is a bilateral activity, but climate change is a worldwide public good. Trade barriers were also employed to compel the provision of another global public benefit. A trade restriction implements the Montreal Protocol on Substances that Deplete the Ozone Layer. However, the nature of this threat differs from that of climate change.

Montreal, for example, controls consumption more than just output (production plus imports minus exports) (Kyoto restricts only the emissions released by production). Furthermore, while the Montreal Protocol allowed countries to impose trade restrictions on whether ozone-depleting compounds were produced during product manufacturing, experts judged this was unworkable. It was also, thankfully, unneeded. As previously stated, such limits are necessary to combat climate change. They would also be extremely difficult to compute for the reasons stated above.

It is also possible to doubt the legality of a trade agreement enforced via trade restrictions. Who should decide what a country is bound to do? Who should decide on the appropriate punishment if a country fails to meet its obligation? Legitimate trade restrictions may only lead to retaliation - a trade war. The United Kingdom's decision to address the issue of climate change before the United Nations Security Council hints at the likely reaction to a climate change treaty that includes economic sanctions. The other three permanent members of, China, Russia, and the United States, were unfazed by Britain's choice. Other nations who were not represented on the Security Council responded strongly, believing that the problem should have been resolved by the General Assembly, where each country has one vote. The

meeting ended without a single declaration, much less a resolution. If one group of nations tries to force a climate deal on another by threatening trade sanctions, a greater response is feasible, if not likely.

Finally, in addition to participation, trade restrictions must ensure compliance. Participation would otherwise become a way to avoid having to decrease emissions. Will parties accept this in a future climate treaty? Would the Kyoto Accord parties agree to this, given that several are currently in jeopardy of failing to comply? Negotiators must be prepared to examine other possibilities if effective measures of implementing a post-Kyoto deal of the same type cannot be established.

SUGGESTIONS FOR A BETTER APPROACH

The emission of both ozone-depleting chemicals and their alternatives, as well as stratospheric ozone, have varied effects on climate change. The accounting was done recently, and the total effect of the Montreal Protocol on greenhouse emissions was found to be beneficial. Indeed, even assuming that Kyoto is implemented precisely and with full involvement, the analysis calculates that the Montreal Protocol has been and will continue to be far more beneficial in tackling climate change than the Kyoto Protocol. According to this report, the Montreal Protocol has already decreased greenhouse gas emissions by four times what the Kyoto Protocol aimed for. HFCs, a strong greenhouse gas banned by Kyoto, have been engaged in most emission reductions under the Kyoto Clean Development Mechanism (CDM). Unfortunately, "buyers" have overpaid significantly under the CDM. According to one estimate, the CDM's phase-out of HFCs will cost €4.6 billion more than required (the actual cost should be less than €100 million) (Wara 2007).

Manufacturers gain more money under the CDM by lowering HFC emissions than by manufacturing HCFCs. As a result, developing-country manufacturers have increased their manufacturing of HCFCs to profit from the reduction in HFCs generated as a consequence. Notably, a pact with no intention of addressing climate change has shown to be more effective than the Kyoto Protocol. This shows that it might have been more effective if Kyoto had been constructed differently. The Kyoto gases, namely hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulpharhexafluoride (SF6), are also among the Montreal Protocol's restricted substances (they are also used as refrigerants for expanding foam, and for insulation). That implies they could have all been managed and finally eradicated using a strategy similar to Montreal's. This strategy will not work for the other greenhouse gases included by Kyoto. However, because Kyoto bundles all of the gases together, the possibility of cutting the three industrial gases' emissions cost-effectively and internationally was overlooked. The lesson is that reducing greenhouse gas emissions may need more than one treaty and many treaty designs.

As previously said, solving climate change necessitates a technical revolution, i.e., basic research, development, and diffusion. Kyoto provides just a small amount of "pull" incentives for innovation. However, even if these incentives were stronger, they would not be enough to spark a technological revolution. To accomplish so, it will need fundamental knowledge - the type that cannot be trademarked. Basic knowledge will require government-funded research and development - a "push" motivation.

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On the other hand, the benefits of investing in basic knowledge will be contingent on the spread of technologies that represent this new understanding. As a result, technological R&D initiatives must be strategic. They must be aimed at widely disseminated technology. Some R&D can be done independently (when the technology offers national benefits in addition to those related to climate change mitigation). Some research and development will necessitate international collaboration. The International Thermonuclear Experimental Reactor, now under construction in France, is an example of the latter type, with an unclear and long-delayed payback.

R&D also solves another issue with the Kyoto strategy. Short-term emission objectives do not stimulate a long-term investment. They also do not make accomplishing long-term goals any simpler. R&D has a distinct impact. It decreases the future expenses of decreasing emissions. As a result, doing R&D today increases the abatement that will be done later. In other words, a post-Kyoto climate deal must provide both push and pull incentives for research and development.

Changes brought about by a new treaty must also be long-term. Kyoto's limits are set to expire in 2012. Even Kyoto's parties are not obligated to reduce their emissions after that. Not only does this method fail to foster innovation. It also raises the possibility of reversal. The incentives must be different if the long-term goal is to spark a technological revolution. A pact should ramp up the required activities while avoiding backsliding. This is exactly what the Montreal Protocol accomplished. If the goals are articulated as emission limitations, it may be impossible for a climate pact to achieve this. It may be simpler if the objectives are stated differently, such as through technological standards. Technology standards, it is frequently alleged, have the opposite problem: they lock people in. The evidence, on the other hand, shows differently. A series of technical agreements have expertly safeguarded the waters from oil spills. Climate negotiators should consider how this method would work in a post-Kyoto accord. A new deal must also provide incentives for major, fast-growing companies to take steps to reduce their emissions. The Bali Action Plan cites the developing nation's ability to take "nationally relevant mitigation activities (...) backed and facilitated by technology, money, and capacity building" (Arga 2007). This should be a top priority. It must be a top priority, partially due to political considerations. Europe has constantly stated that it will decrease emissions even further if the United States and other OECD nations agree to attain the same goals. The United States, on the other hand, has stated that it will only intervene if fast-growing emerging countries follow suit. The political task is to bring these contradictory pledges together. They have merely been used as justifications for little, if any, action thus far. Meeting any global objectives would also require getting fast-growing emerging countries to decrease their emissions.

These countries' emissions are increasing at a faster rate than those of developed countries. China is presently the world's greatest carbon dioxide emitter. It has massive coal reserves and puts one to two coal-fired power facilities online weekly. China has added more coal-fired power production capacity in a year than the United Kingdom's installed capacity. China's new coal-fired power facilities have a 40-50 years lifespan. It may be essential to retrofit these (and other) facilities with carbon capture and storage technology to considerably cut world emissions throughout these plants' lifespan. That technology has not been perfected yet.

R&D is required not only to create the technology but also to illustrate how it may be applied in certain circumstances (local geology, CO2 pipeline construction, etc.) and to assess its hazards (as regards escape but also ecosystem damage for ocean storage). Of course, international financing will be required, and securing this will be another collective action issue. However, developing technical standards with finance for "incremental costs" may be easier than alternative techniques like the CDM. The Montreal Protocol Fund has transferred over $2 billion using this method.

The Bali Roadmap offers a chance for significant change. The developed nations, according to Bali, either agree to "quantified emission restriction and reduction targets" (Arga 2007), as in Kyoto, or they can agree to "actions". Carbon levies, sectoral methods, and technological standards are likely to be included in the latter. It is crucial to take action. Targets and schedules are only useful if they motivate governments to achieve them (Joseph and Stavins 2012). The Bali Roadmap laid down a plan for discussions that concluded between 7-18 December 2009 at the Copenhagen Conference of the Parties. Delays in drafting a new agreement (or a series of accords) increased pressure on Kyoto (making compliance even more unlikely). However, it became more vital to develop a regime that includes the United States than to act swiftly.

The Senate must approve by a two-thirds majority to ratify a treaty in the United States. This equates to 66 votes. Domestic legislation has a lower approval bar, requiring only 60 votes. Treaties are seldom rejected by a vote of the people (the last treaty to be voted down was the Comprehensive Nuclear Test Ban Treaty at the end of the Clinton administration). Should the administration fear rejection, they are more likely never to be sent to the Senate (as was the case with Kyoto during the Clinton administration, though it should be noted that the accord terms were not finalized until after George W. Bush took office).

The mechanics of the US system suggest that, rather than negotiating an emissions-reduction treaty and then expecting the US to ratify it, it might be preferable for the US to pass domestic legislation first and then ratify a treaty that incorporates the emission limits (or actions) already approved by domestic legislation. However, the US Senate may ratify a different type of treaty. As stated previously, other types of treaties (such as research and development or technical standards agreements) may be required to meet the basic problem of climate change.

CONCLUSION

This study is concentrated on the necessity to minimize emissions. Other acts, such as adaptation, are, of course, required. However, adaptation has received increased attention recently because the world has failed to manage global emissions. This serves as a reminder that whether we succeed or fail in reducing emissions will not automatically result in "climate calamity", as is sometimes asserted. Other modifications will result as a result of this. Adaptation will be favored since it helps the country. The most difficult aspect of adaptation is persuading affluent countries to help developing countries finance adaptation.

Another option that may be preferred is "air capture", which refers to technology directly removing CO2 from the atmosphere. These technologies do not currently exist, even as pilot projects, and developing and using them will be costly, but they offer two benefits. They can be

separated from energy systems, for starters. The second advantage is that they may be completed as a massive job. These technologies, on the other hand, provide the world with a new issue. Because air capture may lower atmospheric concentrations rather than restrict their growth, it poses a governance challenge: which nations should be permitted to decide on the "optimal" level of atmospheric concentrations?

Geoengineering is another option that will become increasingly appealing. Lowering the quantity of solar energy that touches the Earth helps mitigate the warmth caused by growing concentrations. It may be done as a single project, similar to industrial "air capture" (Khosroabadi et al. 2021). However, unlike "air capture", certain geoengineering solutions are low-cost. They may also have a short-term impact on the climate. As a result, geoengineering is more likely to be deployed. However, geoengineering has many drawbacks. It would deal with the effects of climate change rather than the causes. It would be ineffective in addressing the associated issue of ocean acidification. It would mean starting a new worldwide experiment to compensate for the failure of the previous one (rising atmospheric concentrations of greenhouse gases). As solar geoengineering is affordable, governments may opt to implement it unilaterally. On the other hand, it has the potential to reverse global warming. Like air capture, the challenge with geoengineering is governance: which countries should decide if and under what circumstances solar geoengineering should be attempted.

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REFERENCES

1. Arga, Adhityani. 2007. "Climate talks in Bali head for compromise." Reuters. https://www.reuters.com/article/us-bali-friday-idUSSP2677320071214.
2. Barrett, Christopher B. 2005. "Rural poverty dynamics: development policy implications - Barrett - 2005 - Agricultural Economics." Wiley Online Library. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.0169-5150.2004.00013.x
3. Barrett, Scott. 2005. *Environment and Statecraft: The Strategy of Environmental Treaty-making*. N.p.: Oxford University Press. 10.1093/0199286094.001.0001
4. Committee on Foreign Relations, United State Senate. 1998. "- Implications of the Kyoto Protocol On Climate Change." GovInfo. https://www.govinfo.gov/content/pkg/CHRG-105shrg46812/html/CHRG-105shrg46812.htm.
5. Greenwald, Bruce, and Joseph E. Stiglitz. 2006. "Helping Infant Economies Grow: Foundations of Trade Policies for Developing Countries." *American Economic Review* 96, no. 2 (May): 141-146. 10.1257/000282806777212206
6. Hoel, Michael. 1996. "Should a carbon tax be differentiated across sectors?" *Journal of Public Economics* 59, no. 1 (January): 17-32. 10.1016/0047-2727(94)01490-6
7. Hoffert, Martin I., Ken Calderia, Gregory Benford, and David R. Criswel. 2002. "Advanced technology paths to global climate stability: energy for a greenhouse planet." *Science Compass Review* 298 (5595): 981-987. 10.1126/science.1072357
8. Joseph, Aldy, and Robert N. Stavins. 2012. "Using the Market to Address Climate Change: Insights from Theory & Experience Share Your Story." Harvard DASH. https://dash.harvard.edu/bitstream/handle/1/10605425/Aldy-Stavins-UsingMarkets.pdf
9. Kellbakken, Steffen, and Jon Hovi. 2007. "The price of non-compliance with the Kyoto Protocol: The remarkable case of Norway." *EconPapers*. https://econpapers.repec.org/article/sprieaple/v_3a7_3ay_3a2007_3ai_3a1_3ap_3a1-15.htm
10. Khosroabadi, Faezeh, Alireza Aslani, Kaveh Bekhrad, and Zahra Zolfaghari. 2021. "Analysis of Carbon Dioxide Capturing Technologies and their technology developments." *Cleaner Engineering and Technology* 5, no. 1 (September): 1-17. https://doi.org/10.1016/j.clet.2021.100279
11. Nordhaus, William D. 2007. "Review: A Review of the 'Stern Review on the Economics of Climate Change'." *Journal of Economic Literature* 45 (3): 686-702. http://www.jstor.org/stable/27646843
12. Wara, Michael. 2007. "Is the global carbon market working?" *Nature*. https://www.nature.com/articles/445595a