Not Worth the Money

The Costs and Benefits of Global Climate Policies

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NOT WORTH THE MONEY - THE COSTS AND BENEFITS OF GLOBAL CLIMATE POLICIES

EXECUTIVE SUMMARY

Global warming has become a priority problem across much of the world, with many countries committing to the political target of limiting global temperature rises to no more than 1.5 degrees C. over those that prevailed in the pre-industrial era. This is partly because climate impacts have been presented repeatedly by the media and governments as catastrophic, leading many people to believe that unmitigated climate change is likely to lead to devastated lives, collapsing societies, and even human extinction.

In fact, these claims of devastation are almost entirely unwarranted and can lead to wasteful climate policies in which money is spent and decisions are made driven by fear and panic. Consequently, before one can have an intelligent discussion of climate policy, one must first address the misplaced concerns about devastating impacts from climate change.

Climate modelers attempt to predict the trends in global greenhouse gas emissions, the effects of these trends on the concentrations of carbon dioxide equivalents in the atmosphere, the consequent changes in average global temperatures and climate and then the effects of those changes on the world's economy and society, as measured by changes in gross domestic product (i.e. income).

The Intergovernmental Panel on Climate Change models use a range of scenarios for future emissions growth, based on different assumptions about future trends in population and economic growth, technological change, and emissions. This is a source of considerable controversy, as the worst-case scenario (RCP 8.5), now considered implausible, is treated as though it were the "business -as-usual" or most likely, case and it is given the most prominent coverage in UN public documents. It gives virtually no attention to the expected growth in global income to 2100. By then, global income is projected to increase by 4.5 times from today's level. With climate damages deducted, income levels would be only 4.3 times its 2020 level, but much improved.

The costs of climate mitigation under the Paris Agreement were calculated on the basis of the Nationally Determined Contributions (NDCs) submitted to the United Nations in 2015 and 2016, just before and after the

2015 Conference of the Parties in Paris. The global cost of these measures will be at least $945 billion in annual lost GDP, but probably twice that high (i.e. about $2 trillion per year.)

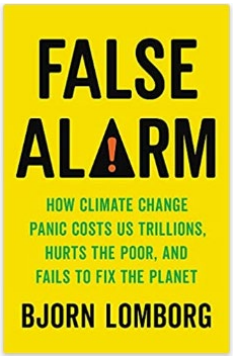
The UN Framework Convention on Climate Change organization (UNFCCC) estimates that the impact of all the measures promised would be to reduce emissions by about 32 billion tonnes of CO2e over the period. That is equal to about 0.45% of global business-as-usual emissions from 2015 to 2100. This could reduce global temperatures by about 0.029 degrees C. If one assumed that the countries of the world continued adhering to their high-end promises from 2030 to 2100, global temperatures would be reduced by somewhere between 0.17 degrees C. and 0.24 degrees C. Even if the emissions reductions were twice as high, this cut is under 1% of what is necessary to reach the IPCC aspirational goal of limiting average global temperature increases to 1.5 degrees C by 2100.

The annual cost of the initial Paris commitments lies between $750 billion and $2 trillion per year, and it will deliver carbon dioxide cuts of at most 7.5 billion tonnes per year. Each tonne reduced will cost on average $109-$252. Under a wide range of optimistic or realistic cost estimates and under all the main estimates for the benefits of cutting a tonne of CO2e, the measures committed under the first round of Paris Agreement NDCs are not worth the costs. They will likely deliver just 11 cents of climate benefits for each dollar spent.

NOT WORTH THE MONEY

THE COSTS AND BENEFITS OF GLOBAL CLIMATE POLICIES

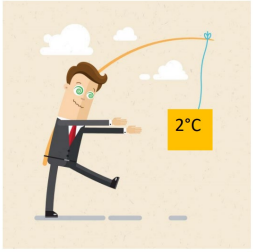
In April 2020, the Danish environmentalist Bjorn Lomborg published a brilliant article on the long-term costs of climate change and the costs and benefits of the climate policies that governments have implemented to address climate issues. Those who absolutely believe the thesis that human greenhouse gas emissions are causing catastrophic climate change are sometimes called "warmists". Those who believe that natural variability is the primary influence on relatively benign climate changes are sometimes called "skeptics". By comparison, Bjorn Lomborg is a "lukewarmer". In other words, he believes that humans are largely responsible for the climate changes that are occurring and that the consequences will be negative but that the costs of the measures now being taken to reduce emissions far outweigh any potential benefits.



Whatever one thinks of Lomborg's views of climate science, his assessment of the costs and benefits of climate action is appealing to those who seek a sophisticated and consensual approach to climate policy; that is, one that does not divide those with differing views into irreconcilable 'tribes". With that in mind, in this article I will synthesize what I view as the most important points made in Lomborg's article.

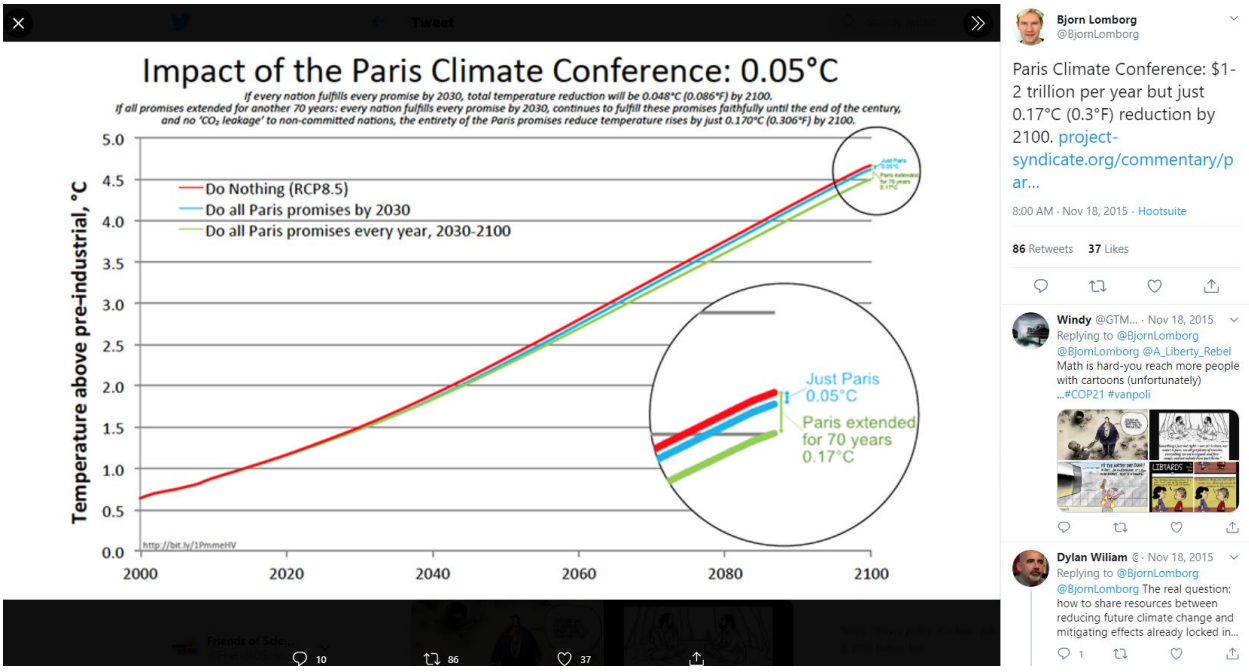
THE PROBLEM

Global warming has become a priority problem across much of the world with many countries committing to the political target of limiting global temperature rises to no more than 1.5 degrees C. over those that prevailed in the pre-industrial era. This is partly because climate impacts have been presented repeatedly by the media and governments as catastrophic, leading many people to believe that unmitigated climate change is likely to lead to devastated lives, collapsing societies, and even human extinction.



In fact, these claims of devastation are almost entirely unwarranted and can lead to wasteful climate policies in which money is spent and decisions are made driven by fear and panic. Consequently, before one can have an intelligent discussion of climate policy, one must first address the misplaced concerns about devastating impacts from climate change.

Global average temperatures have risen slightly over 1 degree C. since 1850, and the changes in climate, while often exaggerated, have been fairly modest over that period, So, the real issue concerns the future, which no one knows with certainty. Consequently, we are called upon to rely on the predictions of mathematical modelers. These modelers attempt to predict the trends in global greenhouse gas emissions, the effects of these trends on the concentrations of carbon dioxide equivalents in the atmosphere, the consequent changes in average global temperatures and climate and then the effects of those changes on the world's economy and society, as measured by changes in gross domestic product (i.e. income). This process is extraordinarily complicated and clouded by uncertainties. While sophisticated and data-driven, it ultimately amounts to an almost endless series of best guesses. But that is all we have got.



Lomborg uses the projections of the Intergovernmental Panel on Climate Change (IPCC), the United Nations body that, while politicized in its communications with policy makers, remains the closest thing that we have to a global scientific authority on climate.

IPCC PROJECTIONS OF CLIMATE CHANGES

The IPCC uses integrated assessment models (IAMs) to estimate the effects of increased carbon dioxide concentrations in the atmosphere on the global climate and on global well-being. There are actually two different parts to the modelling. The first part attempts to project the effects of the increased carbon dioxide concentrations on global temperatures, weather, and natural phenomena such as ocean levels. The second one attempts to monetize these impacts (i.e. interpret what they mean for future global income). While there are about 20 IAMs in use, most analysis is focused on three: DICE, FUND, and PAGE. The IAMs estimate the impact costs from unmitigated (i.e. without policy measures) climate and the policy costs from climate mitigation. While DICE and PAGE estimate similar levels of total damages, FUND projects lower impacts, and actually shows global net benefits from increased carbon dioxide concentrations at lower levels of warming (i.e. below 4 degrees C.). This is largely

because FUND models dynamic vulnerability, that is, the practice of wealthier societies to take more effective adaptation measures. In his article, Lomborg mostly used the cost estimates based on the DICE model.

The models also use a range of scenarios for future emissions growth, based on different assumptions about future trends in population and economic growth, technological change, and emissions. This is a source of considerable controversy, as the worst-case scenario (RCP 8.5), now considered implausible, is treated as though it were the "business -as-usual" or most likely, case and it is given the most prominent coverage in UN public documents. Lomborg discusses the effects of the current range of scenarios (now labelled Shared Socioeconomic Pathways, or SSPs 1 to 5). The projected temperature in 2100 for the SSPs ranges from 3.24 degrees C in SSP1 to 4.86 degrees C in SSP5. This means that the negative climate impact in 2100 for SSP 1 would be 2.5% of GDP, whereas SSP5 would see a negative 5.7% impact.

IPCC PROJECTIONS OF GLOBAL INCOME

Lomborg notes that a "survey of global experts" shows that the expected median annual per capital increase in income is 2.59% for the period 2010-2050 and 2.03 % for the full period 2010-2100.[1] This means that the GDP per capita in 2100 will be 610% (I.e. over six times) of the 2010 GDP per capita. Not only that, but the income growth in today's lower-income countries will be far faster than the income growth in today's most developed regions. In simple terms, on average the people in the wealthier countries will be three and a half times richer than today, but the people in the poorer countries will be nine and a half times richer than today. The UN's SSP 2 scenario, which is a "middle of the road" one in which social, economic, and technological trends do not shift markedly from historical patterns, still foresees major income increases, with global income increasing by 4.5 times from today's level. With climate damages deducted, income levels would be only 4.3 times its 2020 level, but much improved.

It is also worth noting that under the SSP5 scenario, in which fossil fuel uses increase significantly and help to drive economic activity, the IPCC projects a world almost twice as rich as SSP1 (the sustainable development scenario). Global GDP would be $1,034 trillion compared to $563 trillion in the SSP1 world.

[1] P. Christensen, K. Gillingham, W. Nordhaus. Uncertainty in forecasts of long-run economic growth Proc. Nat. Acad. Sci., 115 (21) (2018),

Lomborg was writing in 2020, so he did not have access to estimates of the costs and benefits of measures that are intended to pursue the objective of "net-zero emissions by 2050". Instead, he assessed the effects of the measures that countries had by then announced that they would take in the period to 2030. There were then no "official" estimates of the cost of the emissions reduction measures, so he used the best then documented in the peer-reviewed climate literature.

He includes a useful warning:

"Previous studies of economics of climate and energy have clearly shown two things. First and perhaps not surprisingly, in the rare cases where official cost estimates are made, these are often significantly underestimated. The EU estimated that the total cost of its 2020 policies could be as little as an annual 0.4% of GDP loss (64 billion euros per year).[2] *The peer-reviewed cost was 1.3% (209 billion euros annually), or more than three times larger…*[3]

Second, politicians rarely pick the most efficient policies that cut CO2 at the lowest cost. This typically doubles the cost. "

The costs of climate mitigation under the Paris Agreement were calculated on the basis of the Nationally Determined Contributions (NDCs) submitted to the United Nations in 2015 and 2016, just before and after the 2015 Conference of the Parties in Paris. The NDCs are the five-year plans setting out the targets set and proposed measures to reduce national GHG emissions reductions in the period to 2030. The United States plan indicated an intention to reduce overall GHG emissions by 26 to 28% below the 2005 level by 2025. The EU NDC committed to

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[2] Capros, P., L. Mantzos, V. Papandreou, and N. Tasios. 2008. *Model-based analysis of the 2008 EU policy package on climate change and renewables.* Available at: http://ec.europa.eu/clima/policies/strategies/2020/docs/analysis_en.pdf

[3] Richard S.J. Tol *A cost–benefit analysis of the EU 20/20/2020 package* *Energy Policy*, 49 (2012), pp. 288-295

cut its emissions by 40% below 1990 levels in 2030. China did not commit to reduce its GHG emissions, but it stated it would reduce its emissions intensity (i.e. emissions per unit of GDP) by an amount that would be the equivalent of at least 1.9 billion tonnes of carbon dioxide equivalent (CO2e) per year. Mexico conditionally committed to reduce its emissions by 40% below what it would otherwise have emitted by 2030. It is notable that each country used a different baseline against which to measure its emission reduction commitment. This adds to the complexity of calculating the emissions reductions actually intended.

The total cost of the US., EU, China, and Mexico measures, according to peer reviews, was $739 billion (or $757 billion if the US aimed for a 28% reduction) in annual lost GDP. As these represent about 80% of all reductions, Lomborg assumed that the global cost would be 20% higher, or about $945 billion in annual lost GDP.

Previous experience (i.e. the record of all the emissions reduction targets set since 1992) indicates that national effective climate policies are unlikely to be implemented as announced and advertised. This means the total cost is more likely to be at least double the estimates cited[4]. **Thus, Lomborg considers that the global cost of attaining the Paris goals would be at least $1 trillion by 2030 and the cost with realistically less-efficient policies likely will be close to $2 trillion annually.** For context, $2 trillion is about 100 times the $20 billion that the world annually spends on biodiversity or the $19 billion that the world spends annually on addressing and eliminating HIV. It is on a par with the entire expenditure for the world's military ($1.8 trillion per year) in 2018.

THE BENEFITS OF THE PARIS AGREEMENT

Lomborg looks at the benefits of the Paris Agreement both in terms of the impacts on CO2 emissions and the impact on global temperatures in 2100.

The UN Framework Convention on Climate Change organization (UNFCCC) estimates that the impact of all the measures included in the 2015-2016 NDCs would be a median reduction of 31.8 billion tonnes of CO2e over the period, equivalent to a reduction of 6 billion tonnes of CO2e in 2030. The Stanford Energy Modelling Forum global business-as-usual scenario estimates a cumulative emissions reduction from 2016 to 2100 of 6970 billion tonnes of CO2e[5], similar to the United Nations Environment Program estimate of 7142 billion tonnes CO2e over the period. **This means that the Paris Agreement median reduction is equal to about 0.45% of global business-as-usual emissions from 2015 to 2100.**

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[4] Christoph Bohringer, Thomas F. Rutherford, Richard S.J. Tol *The EU 20/20/2020 targets: an overview of the EMF22 assessment*. Energy Econ., 31 (Supplement 2) (2009), pp. S268-S273

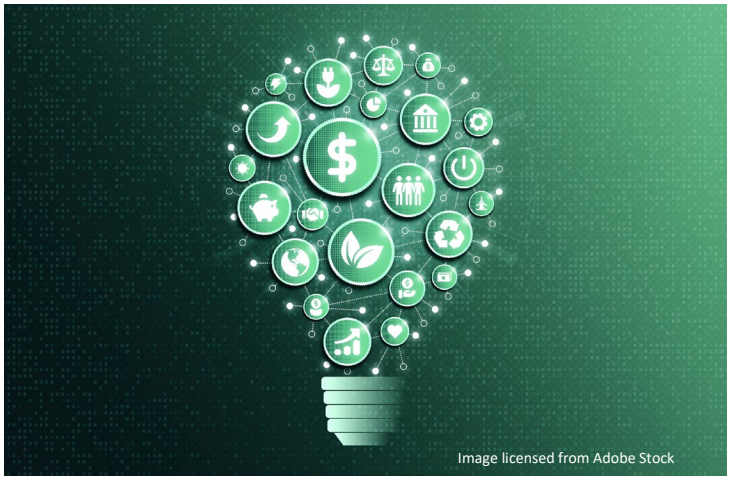
[5] Elmar Kriegler, G Luderer, N Bauer, L Baumstark, S Fujimori, A Popp, J Rogelj, J Strefler, D P van Vuuren. *The role of technology for achieving climate policy objectives: overview of the EMF 27 study on global technology and climate policy strategies*. Climate. Change, 123 (3–4) (2014), pp. 353-367

The relationship between cumulative CO2e emissions and global temperature response is subject to considerable controversy. Lomborg uses the estimate of a 4.5 degrees C response to a 1000 billion tonnes of CO2e increase. This means that the measures committed under the Paris Agreement first round of NDCs could reduce global temperatures by about 0.029 degrees C. If one assumed that the countries of the world would continue adhering to their high-end promises for 2030 for the next seven decades (i.e. to 2100), they would in total cut 540 billion tonnes of CO2e. This is equivalent to incurring an undiscounted $70 trillion in costs. **The reduction in temperature by 2100 is 0.17 degrees C. using Lomborg's estimates, or about 0.24 degrees C. using IPCC data. That is a reduction from the temperature that would prevail under a "business-as-usual" scenario, which may be far higher than 2 degrees C.**

There are many other sources and studies using different methodologies to calculate the reduction of emissions by 2030. After reviewing and critiquing them, **Lomborg concludes that even if one were to agree that the Paris agreement initial NDCs will cut emissions by 64 billion tonnes CO2e by 2030 (i.e. more than double his estimate), this cut is under 1% of what is necessary to reach the IPCC aspirational goal of limiting average global temperature increases to 1.5 degrees C by 2100.**

COST-BENEFIT OF THE PARIS INITIAL NDCS

As the annual cost of the initial Paris commitments lies between $750 billion and $2 trillion per year, and it will deliver carbon dioxide cuts of at most 7.5 billion tonnes per year, each tonne reduced will cost on average $109-$252.



This can be compared to the social cost of carbon (the benefit in dollar terms of an avoided tonne of carbon dioxide emissions). Lomborg compared the different estimates of the social cost of carbon using the DICE, FUND and PAGE models with their own discount rates and under the five Shared Socioeconomic Pathways. The average SCCs in 2030 are $31.40 per tonne, ranging from $15 per tonne under SSP1 to $65 per tonne under SSP3.

In no case of the analysis do the benefits exceed the costs. In short, under a wide range of optimistic or realistic cost estimates and under all the main estimates for benefits of cutting a tonne of CO2e, the measures committed under the first round of Paris Agreement NDCs are not worth the costs. They will likely deliver just 11 cents of climate benefits for each dollar spent.

If Lomborg were to perform his analysis today, using the measures to which countries have committed in the second round of NDCs submitted in 2020, the costs of "net zero" would be significantly higher, but there is no reason to believe that the benefits would be. However, Environment and Climate Change Canada (ECCC) now estimates the value of the social cost of carbon in 2030 to be $294 per tonne[6], which allows it to justify much more expensive measures.

Dr. Ross McKitrick critiqued the ECCC social cost of carbon estimate in a recent article.[7] The article is worth reading in its entirety as it points out that the ECCC used the implausible and generally discredited RCP8.5 scenario in its analysis, and his concluding summary is easy to understand.

"*Thus, I reiterate that SCC estimates are if-then statements. They are not intrinsically true or false: what matters is the credibility of the assumptions. If emissions follow the RCP8.5 scenario (which they won't), and if people don't adapt to climate change (which they will), and if CO2 and warm weather stop being good for plants (which is unlikely), then the SCC could be five times larger than previously thought. More likely it isn't, and very well could be much smaller.*"

In extreme contrast to the ECCC, Ken Gregory has used his critique of the FUND model to suggest that the social cost of capital in 2020 ranges from minus $10 to minus $14 per tonne.[8] In other words, carbon dioxide emissions offer a significant net benefit to society, and none of the current climate mitigation costs are justified. Further, as Gregory points out, economist Dr. Richard Tol calculates that the global average private benefit of the use of fossil fuel at the margin is about US$411/tCO2 in 2010 dollars. As soon as one restricts fossil fuel usage, the marginal benefits increase. The total benefits of fossil fuels in dollars per tonne is extremely high and is not acknowledged in calculations of the social cost of carbon.

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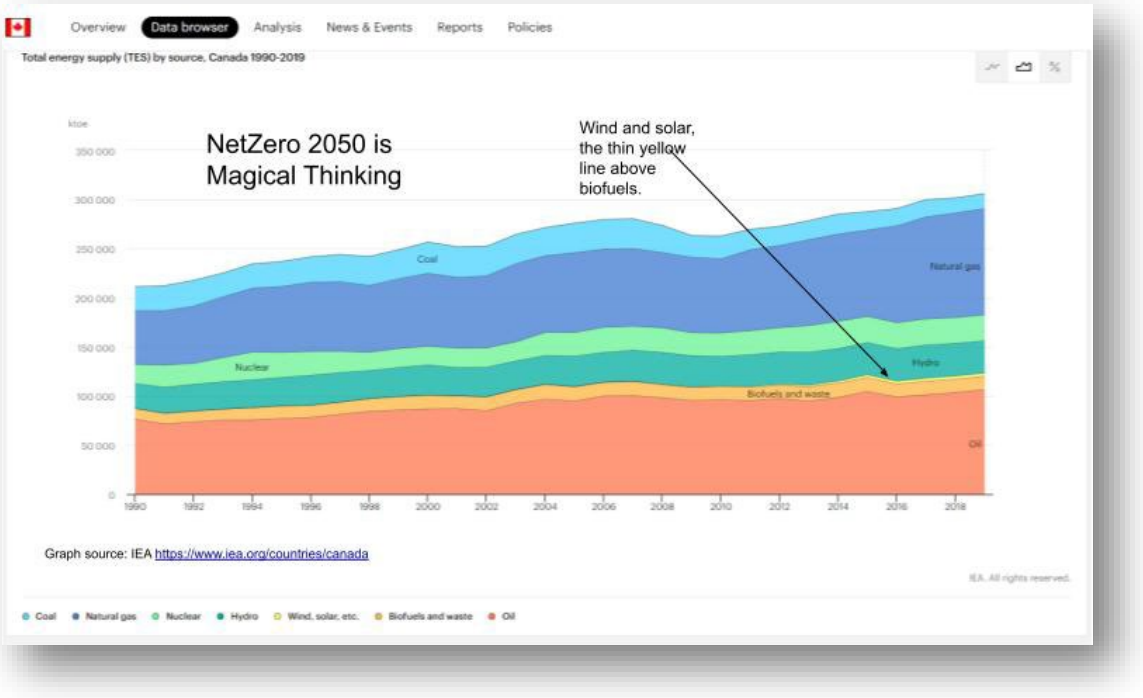
[6] https://www.sciencedirect.com/science/article/pii/S0040162520304157
[7] https://financialpost.com/opinion/junk-science-week-social-cost-of-carbon-game
[8] https://wattsupwiththat.com/2021/05/29/social-cost-benefit-of-carbon-dioxide-from-fund-with-corrected-temperatures-energy-and-co2-fertilization/

COST-BENEFIT ANALYSIS FOR CLIMATE POLICY

Climate change imposes real and increasing costs, according to Lomborg's analysis. However, the goal of a prudent policy is to find the point at which the point where the cost of climate change and the costs of climate police measures are the lowest.



Most economists believe that a policy based almost entirely on the use of carbon dioxide taxes, with the revenues from the taxes all recycled back into the economy through a reduction in the rate of generally-applied taxes, would be the most economically efficient way to reduce greenhouse gas emissions. Most of the modelling of emissions reduction costs assumes that this policy approach is used. There is one major problem with this. No country that has implemented carbon dioxide taxes has relied exclusively on revenue-neutral taxes; instead, governments cannot resist implementing a wide range of subsidies, regulations, and other "direct action" measures by which they favour certain industries and seek to centrally plan the changes in the energy economy. All the analyses of emission reduction programs consequently vastly under-estimate their costs.

CLIMATE POLICY IN A WORLD OF MANY CHALLENGES

Some of the most insightful and convincing comments made by Lomborg compare the climate issue to the others facing humanity. He points out that there are many deadlier environmental problems in the world: For example, indoor and outdoor air pollution annually kills almost 5 million people while global warming kills perhaps 150,000

(and cold temperatures kill far more). The world is beset with far more serious problems such as lack of education, poor health malnutrition, international military conflicts, trade barriers, and corruption.

The best climate policy is investment in energy research and development. Adaptation is also a good investment, often returning a couple of dollars for every dollar spent.

Lomborg's message is well worth heeding.

ABOUT THE AUTHOR

Robert Lyman is an economist with 27 years' experience as an analyst, policy advisor and manager in the Canadian federal government, primarily in the areas of energy, transportation, and environmental policy. He was also a diplomat for 10 years. Subsequently he has worked as a private consultant conducting policy research and analysis on energy and transportation issues as a principal for Entrans Policy Research Group. He is a frequent contributor of articles and reports for Friends of Science, a Calgary-based independent organization concerned about climate change-related issues. He resides in Ottawa, Canada. Full bio.

ABOUT FRIENDS OF SCIENCE SOCIETY

Friends of Science Society is an independent group of earth, atmospheric and solar scientists, engineers, and citizens that is celebrating its 21st year of offering climate science insights. After a thorough review of a broad spectrum of literature on climate change, Friends of Science Society has concluded that the sun is the main driver of climate change, not carbon dioxide (CO2).

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