Carbon Taxation for Climate Change Mitigation

Executive Summary
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I. Introduction

Greenhouse gas ("GHG") pollution has for too long been treated as an intractable "tragedy of the commons" problem. It is sometimes almost considered to be a right in the bundle of other property rights. There is no right to pollute the entire planet to the extent that it may be virtually or actually destroyed. Just as other rights in society come with a price, so should carbon production and usage. Time has come for implementing a carbon tax nationally and considering cooperation and possibly revenue transfers throughout the world. Doing so not only makes sense from technical and financial angles, it is also an ethical mandate. The climate belongs to *everyone* despite current or historical use patterns around the world. The current blame game between the Global North and South and resulting inertia must stop and yield to effective action before it is too late. This article promotes the imposition of carbon taxation. Existing cap-and-trade programs are not sufficient to solve climate change. A blended "cap and tax" model is likely to work better just as carbon taxation can in and of itself contribute significantly to the discontinuation of carbon usage while helping to alleviate poverty nationally and internationally.

II. Climate Trajectory and Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 nation state parties at COP 21 in Paris on December 12, 2015, and entered into force on November 4, 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. To do so, countries have agreed to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.

However, some worrying findings are also found. The commitments made by all 191 Parties taken together imply a sizable *increase* in global GHG emissions by 2030 compared to 2010 of about 16%. According to the latest IPCC findings, such an increase, unless actions are taken immediately, may lead to a temperature rise of about 2.7º C or more by the end of the century. In other words, there is a substantial "ambition gap" (corresponding to 19-23 GtCO2e) between what governments have promised to do and what should be done to meet the adopted increase in temperature rise. The world has now used 85% of the CO_2 budget that would give a 50% chance of limiting heating to 1.5C, the danger limit agreed in Paris in 2015."

III. Current and Historical Emitters

The top ten CO_2-emitting countries in the world are (total CO_2 in millions of metric tons (Mt) in 2020):

1. China — 11680.42
2. United States — 4535.30
3. India — 2411.73
4. Russia — 1674.23
5. Japan — 1061.77
6. Iran — 690.24
7. Germany — 636.88
8. South Korea — 621.47
9. Saudi Arabia — 588.81
10. Indonesia — 568.27

By comparison, the global food system is responsible for approximately 21–37% of total annual emissions. International transportation is responsible for 2.5%.

Per capita, the United States has the thirteenth-highest per capita emissions at 13.68 tons, while Russia is 20th (11.64), Japan is 26th (8.39), China is 28th (8.20), and India is 110th with 1.74 tons per capita.

Although the United States is currently "only" the second-greatest emitter, the United States has emitted more CO_2 than any other country to date: at around 400 billion tons since 1751, it is responsible for 25% of historical emissions; twice as much as than China, the world's second largest national contributor.

IV. What is a Carbon Tax and How Would it be Imposed?

Currently, the prices we pay for fossil fuels in various forms do not reflect the true costs of climate destabilization and air pollution. A carbon tax would help internalize what is now typically an unaccounted-for externality. With such misleading price signals, consumers, companies, and governments all use more fossil fuels than would be the case if prices signaled the full costs of using fossil fuels. A correct carbon price signal plays a crucial role in redirecting investment away from fossil fuels and into clean energy and energy efficiency.

A carbon tax is a fee imposed on the price of fossil fuels and of everything produced and distributed by using such fuels, all in proportion to the CO_2 released when the fuels are burned. Some consider it to be the core policy for reducing and eventually eliminating the use of fossil fuels whose combustion is destabilizing and destroying our climate. A carbon tax is a way to have users of carbon fuels pay for the climate damage caused by releasing carbon dioxide into the atmosphere. If set high enough, it becomes a powerful monetary disincentive that motivates switches to clean energy across the economy, simply by making it more economically rewarding to move to non-carbon fuels and energy efficiency. The carbon content of every fossil fuel, from anthracite or lignite coal to heating oil and natural gas, is precisely known. A carbon tax obeys

these proportions, taxing coal more heavily than petroleum products, and much more than natural gas. This makes a carbon tax simple to document and measure."

Importantly, a carbon tax is not the same as "cap-and-trade" although the latter also falls under the carbon pricing umbrella. A cap-and-trade or cap-and-permit system sets a cap on the quantity of carbon emissions to be allowed each year in a given nation and issues permits up to that limit. The quantity is fixed, but the permit *price* can vary. Economic booms may drive up carbon prices just as recessions may drive them down. In contrast, a carbon tax is added onto the price of carbon itself, but allows the *quantity* of emissions to vary. During economic booms, the tax will remain the same, but the quantity of emissions will be higher than during recessions. Since the goal is both to reduce overall consumption and increase the price for signaling and consumption use, a combination of *both* a carbon tax *and* a cap may very well be desirable to bend the carbon emission curve as steeply and rapidly as is needed.

The price for carbon would be levied "upstream" at the tanker ports, pipeline terminals, and coalmine heads where fossil fuels first enter the economy and/or the nation. For each ton of CO2 that will be emitted once the fossil fuel is burned, the company that brings the fuel into the economy would be required to pay the tax. A carbon charge would be a one-time charge. This is not nearly as difficult as it may sound at first blush. For example, electric generators would pay the mandated carbon tax to their coal or natural gas suppliers who would forward the payment to the government; the generators would pass along the tax to the retail electric utility which in turn would charge it to customers to the extent that market conditions allow. The same would go for petroleum products (e.g., gasoline, jet fuel, heating oil), with governments collecting the tax from refiners or importers of refined petroleum products, and the taxes passed on to oil wholesalers and eventually to retail customers. This approach will maximize accuracy and incentives and minimize paperwork and leakage. In the United States, about 1,200 to 1,500 fossil fuel energy producers would pay carbon taxes (150 petroleum refineries, 500 – 800 coal producers (depending on the point of compliance) and about 500 natural gas distributors will be taxed.) The United States Congressional Budget Office similarly estimates that an upstream system would require only about 2,000 collection points nationwide. Carbon that is chemically bound into manufactured products such as plastics, but is not burned, will not be taxed. Similarly, any CO2 from energy production that is permanently sequestered rather than released into the atmosphere will not be taxed or will receive an offsetting tax credit. Additionally, some carbon tax proposals include exemptions for export-dependent businesses to help them remain competitive in global markets.

Does a carbon tax work, though? As a threshold matter, it has been estimated that a $1.13 increase in the effective carbon rate (the sum of tradeable emission permit prices, carbon taxes, and fuel excise taxes) leads to a 0.73% reduction in emissions over time.

While carbon taxes will need to rise briskly to create the required price incentives, they will also, after all, need to be phased in to give individuals and businesses the opportunity to adjust. With not much time left, that is becoming a challenge that only will get yet worse over time. There is no magic formula or perfect number of a carbon tax, but one view is that a "starter tax" that "grows fast enough to reduce CO2 emissions by 1/3 within a decade probably offers a viable combination of meaningful incentive and opportunity for adaptation …. At least as important as

the tax *level* is the commitment to *keep raising the tax*, preferably annually, so that energy-critical decisions … are made with carbon-appropriate price signals.

Carbon prices are not yet high enough to result in effective carbon reduction, as is evident from the nature of the problem. In 2019, just one in 200 emission units were priced at or above $40 per ton, a rough cutoff between somewhat-effective and largely symbolic pricing of carbon dioxide and other greenhouse gases. *Other experts note that in 2021, the global average carbon price per ton was only approximately only $2* given the fact that only about 20% of global emissions were covered by actual carbon pricing schemes. Even worse, many countries go so far as to *subsidize* fossil fuels by means of policies that are tantamount to a negative carbon price. A recent IMF study reports that, as of 2015, direct fossil-fuel subsidies amounted to USD 333 billion a year worldwide. This is equivalent to about USD 10/mt CO2 – roughly five times higher than the world's average global carbon price … of USD 2/mt CO2. In other words, the average carbon price in the world today is *minus* USD 8.

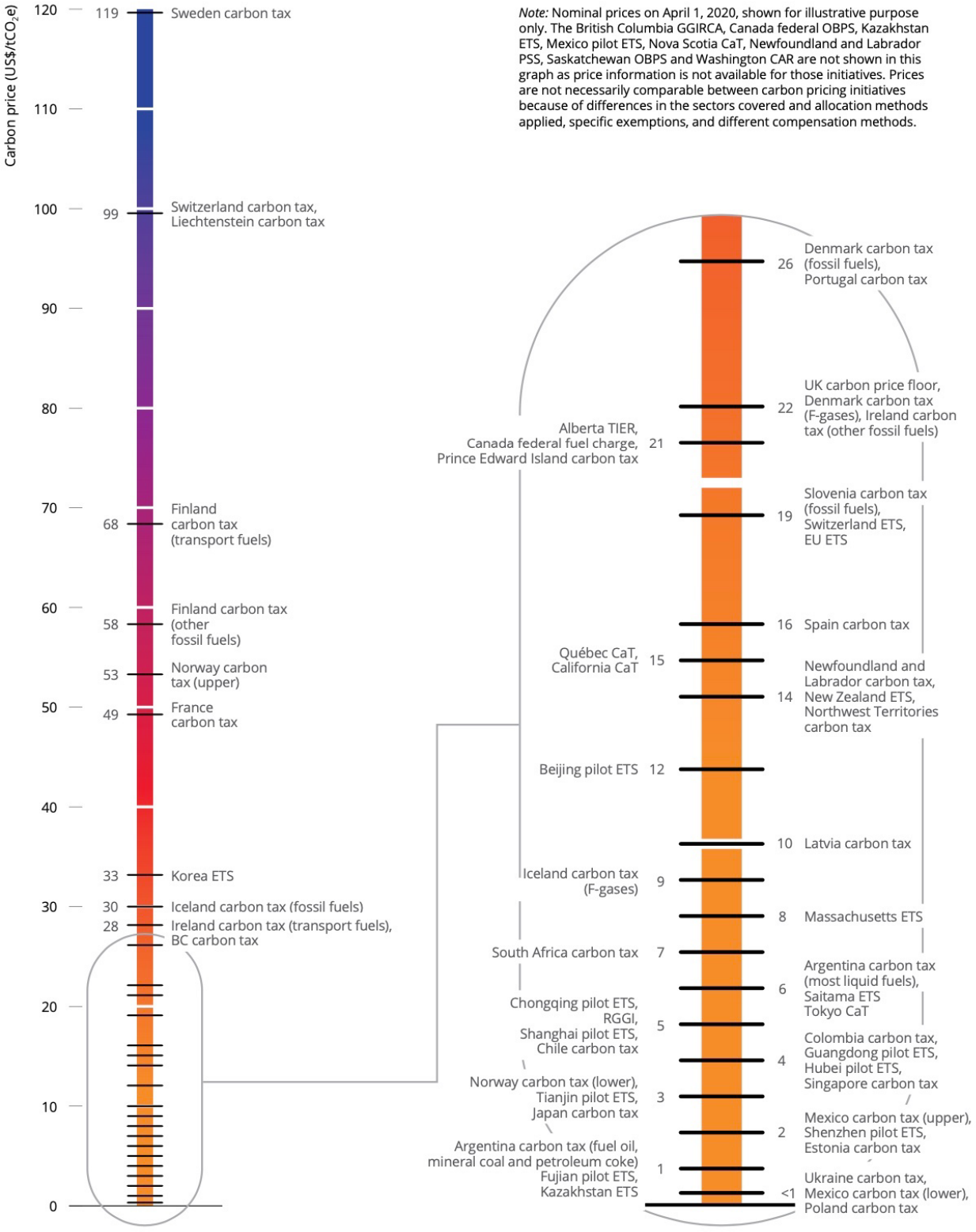
Calculations of what an appropriate tax should be vary, *but economists agree that the tax will have to be much higher than what is currently the case.* For example, setting the global average price of carbon per ton significantly higher *at $100 or more is necessary right away to incentivize net zero emissions by 2050, according to a poll of climate economists*. This higher-than-initially expected price for carbon is seen as essential to fund the transition to net zero emissions by 2050, which is estimated to cost $44 trillion or 2-3% of annual global GDP. This price is significantly higher than where most countries who set the price currently have it, including among high carbon emitters. *It is also higher than the $75 per ton by the end of this decade recommended by the International Monetary Fund.*

Of course, the taxation rate also depends on the speed of the decarbonization scheme desired. To reach the Paris Agreement goal of limiting global warming to 1.5º C, global net human-caused emissions of carbon dioxide (CO2) would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050. The OECD has calculated that $68 per is consistent with only a "slow" decarbonization scenario by 2060.[1] *$136 per ton is a central estimate of the carbon price needed in 2030 to be able to decarbonize by mid-century.*

The below chart shows both high *and* low carbon prices in select jurisdictions around the world in 2021.

[1] https://www.oecd.org/tax/tax-policy/effective-carbon-rates-2021-brochure.pdf

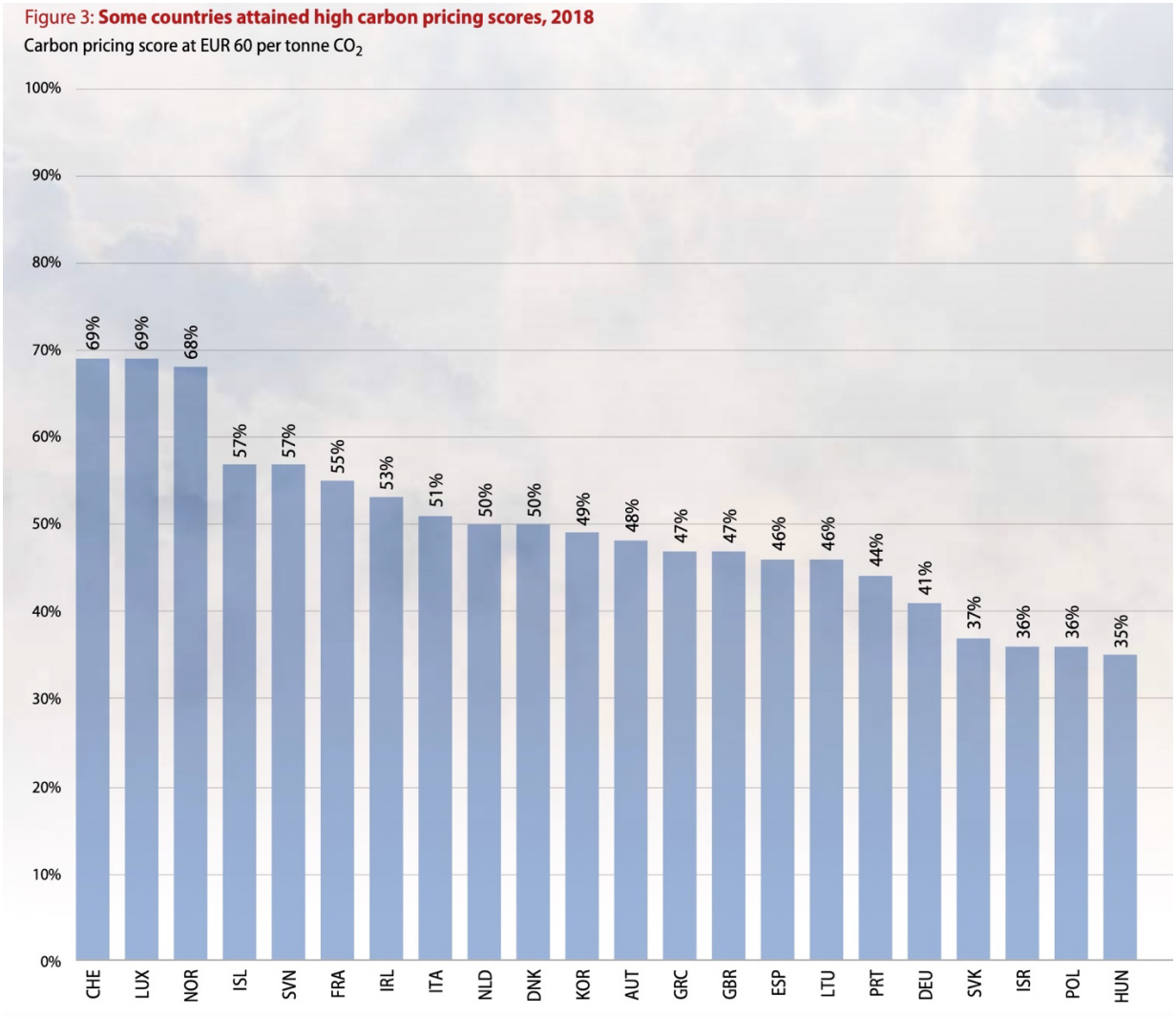
Prices in implemented carbon pricing initiatives



Note: Nominal prices on April 1, 2020, shown for illustrative purpose only. The British Columbia GGIRCA, Canada federal OBPS, Kazakhstan ETS, Mexico pilot ETS, Nova Scotia CaT, Newfoundland and Labrador PSS, Saskatchewan OBPS and Washington CAR are not shown in this graph as price information is not available for those initiatives. Prices are not necessarily comparable between carbon pricing initiatives because of differences in the sectors covered and allocation methods applied, specific exemptions, and different compensation methods.

V. Early High Carbon Pricing Success Stories

Some nations – and not just those in the EU – have become carbon pricing leaders with high carbon pricing scores (CPS) indicating early success towards the ultimate goal. For example, Switzerland, Luxembourg and Norway reached a CPS60 of close to 70%. The performance of these and other high carbon pricing scorers is shown below.



How did these high achievers get that far already? First, they typically price emissions from the road sector significantly, a step that is unlikely to garner much support throughout much of the United States. They also have moderate to high carbon prices for fossil fuel use in the residential and commercial sectors. In Europe, they are in or linked to the EU ETS. In South Korea's ETS contributes 30% to its overall carbon pricing efforts while the remaining 70% results from taxes on fuel use. Switzerland's performance was the result of fuel taxes in the road sector fully earmarked for road infrastructure purposes, a significant carbon incentive tax (EUR 83 per ton since 2018) for fossil fuel use in the residential and commercial sector, a highly decarbonized electricity supply, and few industrial emissions. Norway similarly uses significant taxes on fossil fuels used in the residential and commercial sector as well as a highly decarbonized

electricity supply and a large share of industrial sector emissions resulting from the offshore petroleum industry that is subject to both a carbon tax and the EU ETS. Luxembourg has a large share of daily commuters who do not live in the country, a high share of transit traffic, and considerable "fuel tourism" (motorists crossing borders to buy fuel that is cheaper in one nation than in a neighboring nation) which leads to its road sector dominating the overall energy use. In other words, in many jurisdictions, transportation is key to fossil fuel use reductions.

Of all examples, the Nordic countries, especially Sweden, deserve a special mention. These countries have implemented a "Pigouvian" taxation mechanism,[2] which can help in achieving carbon neutrality by internalizing the negative environmental externality exerted by fossil fuel production processes while boosting the energy innovation by means of the tax revenue.

First, Sweden levies the highest carbon tax in the world which was implemented in 1991. The current carbon tax rate is approximately 126 USD per metric ton of CO2 and is primarily directed towards fossil fuels used in heating devices and motor fuels for transport. Hence, it serves as a benchmark purpose to understand the impact of carbon tax on the economy. Second, it is interesting to note that Sweden's GDP *increased* by 78% from 1990 to 2017 while domestic greenhouse gases emissions *decreased* by 26% thus highlighting how Sweden managed to maintain economic growth despite the high environmental tax regime. Third, one third of the emissions are attributed to the transport sector in Sweden, which supports the argument for how such a Pigouvian tax scheme is targeted to few sectors, and therefore, the outcome of the same (such as energy innovation) could be restricted to certain sectors only. This means that as we move towards a situation where countries ultimately become greener, *the revenue streams generated from carbon pricing would go down* and may impact significantly important economic activities in a nation. Hence, by deriving important learnings for Sweden as the unit of analysis might act as a baseline policy-driven approach for the other countries, which have implemented the carbon tax mechanism.

VI. National and Global Attitudes towards Carbon Taxation

In September 2021, a record one-third of Americans – 33% - now say that they are "alarmed" about climate change, while another 26% call themselves "concerned." Only about 2 in 10 (19%) are "doubtful" or "dismissive." A December 2020 poll also showed that 66% registered voters support making fossil fuel companies pay a carbon tax. The respondents favor using the revenue to reduce other taxes (such as the federal income tax) by an equal amount (i.e., a revenue-neutral carbon tax).

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[2] A Pigouvian tax is a tax on a market transaction that creates a negative externality, or an additional cost, borne by individuals not directly involved in the transaction. For instance, smoking in a public restaurant creates a negative externality because second-hand smoke can affect nonsmokers and worsen their long-term health outcomes. Drivers of gas-powered vehicles pay the gas tax to account for the externalities of pollution and wear and tear to the roads. Levying an excise tax in these situations can serve to recoup some of the cost of these externalities and "internalize" the cost of the externality to the purchase of the product.

Other research also shows that so long as any carbon taxation revenues are used for renewable energy research and development or *revenue distribution to individuals,* a majority of the American population supports it. For example, if a carbon tax increased general costs by 10% without any specific use determined ahead of time, 68% of Americans oppose it while 29% support it. If the tax was used for national deficit reduction, 56% would oppose it and 38% would support it. But if the revenue was returned with an income tax rebate, the numbers would flip: 56% would support it and 28% would oppose it. Finally, if the revenue was used for renewable energy research and development, as many as 60% of Americans would support it while 37% would oppose it. It is clear that Americans are *not* in favor of paying higher taxes in general, *but* if they can visualize tangible effects, the story may well be different.

The belief in the dangers of anthropogenic climate change and the need to take urgent action is, in short, finally rising to a more realistic level in the United States. But it is still not among the issues about which Americans worry the most. A December 2021 poll shows that the five most significant concerns were, in order, the government/poor leadership (21%), the Coronavirus and other diseases (13%), immigration (7%), inflation and racism (tied at 6%), and unifying the country. The category "environment/pollution/climate change" was ranked as the most important issue by only 2% of respondents just as fewer than 0.5% of respondents ranked "natural disaster relief/response" as one of the most important problems facing the country today.

In general, Democrats favor carbon taxation while Republicans do not. This political issue has not shifted much at either the federal or state level among Republicans for some years. However, in 2021, Utah Republican Rep. John Curtis announced a new "Conservative Climate Caucus" which shows that conversations around climate change are finally shifting in the Republican Party. This shift is led by not just the recognition of necessary weather mitigation solutions, but also the economic opportunities that exist across the energy sector. Furthermore, it is not so much individual extreme weather events that are motivating the Republican party, it is the larger trendline that indicates this is a challenge that will have ramifications for business and beyond. It was always about the financials and still seems to be so. It is important to recall that in attempts to persuade conservative lawmakers to come around to the idea of a carbon tax.

Public support is currently the main obstacle to carbon taxation in almost any part of the world. It is extremely important to understand such opposition and how to overcome it. In an effort to do so, approximately 5,000 citizens in Australia, India, South Africa, the United Kingdom, and the United States were polled about the issue of carbon tax. The respondents were asked whether they would support such a carbon tax in their country if it were also implemented in all other countries. They were given background information on national and global greenhouse-gas emissions, fuel and electricity costs, income and employment, as well as on climate dividends, if any. Each person was assigned one potential policy solution, chosen at random.

Three designs received majority (>50%) support in all five countries, when averaged across tax rates. These were: lowering income taxes, redistributing revenues domestically to each citizen, and earmarking funds for mitigation projects in all countries. The first two could be achieved through harmonized carbon taxes; the third would require a global carbon tax.

A majority of people surveyed in all five countries favored the following three strategies for distributing revenues from a global carbon tax: sharing them among citizens, supporting mitigation across the world, and lowering personal income taxes.

Funding mitigation projects worldwide received the highest support (65%), on average. Sharing out funds per capita globally also appealed in Australia (59%), India (85%), South Africa (53%) and the United Kingdom (56%), but not in the United States (44%). Thus, an international climate fund could succeed outside the United States if its revenues were allocated to all countries. Transferring wealth from developed to only emerging countries might trigger opposition in the former. Thus, the most feasible option to begin with appears to be a global system of harmonized carbon taxes, in which countries retain control over the revenues and would thus not have to agree on the use of revenues with other countries or even share such revenues with other nations. But one global tax might be accepted if the funds are distributed across numerous countries rather than just a few. Overall, though, the political climate does not yet seem ripe for attempting global transfers of money despite the theoretical desirability of doing so.

At least in the United States, it is also important to, shallow as it may sound, avoid using the term "tax." It is notable that nearly twenty states have established some form of a price on commercial and residential electricity consumption, eschewing the term "tax" in favor of other correct, but more palatable, phrases such as "climate fees," "renewable energy surcharges," "public benefit funds," or "social benefit charges." Those states that have already started imposing additional fees on electricity do so on *all* electricity concerned, not just that drawn from fossil fuels. Thus, the terms are actually best framed as a "user fee" or "charge" on energy consumption rather than a pure "carbon tax," which in the United States is still too politically explosive of a term.

VII. Corporate Support for Carbon Pricing

Companies are beginning to adopt net zero targets, driving demand in the voluntary carbon market and hopefully leading to more political buy-in. A growing number of companies are using internal carbon pricing to reduce emissions across their value chains. In 2019, about 1,600 companies disclosed that they currently use internal carbon pricing or that they anticipate doing so within two years. With an increasing number of companies committing to net zero targets and growing investor pressure, the use of internal carbon pricing to reduce supply chain emissions is likely to grow in the future. And while internal carbon prices fall short of Paris Agreement-aligned prices, they often exceed regulatory prices.

For example, in 2019, however, oil giants BP and Shell each pledged $1 million to Americans for Carbon Dividends, a conservative-backed lobbying group that also supports revenue-neutral carbon pricing. ExxonMobil, ConocoPhillips, and other major corporations have backed the measure and pledged lobbying dollars to support it.

Why the corporate change in attitude by even fossil fuel producers towards climate action? There are a number of reasons why companies are jumping at the opportunity to support a market-based solution to climate change. Falling prices for renewable energy, new bounties of

cleaner-burning natural gas, and notably, growing public concern about a warming planet's impacts have also played a big role in global corporations' change of course on climate.

The shift in corporate opinion towards climate-forward federal policy, and carbon pricing in particular, can also be traced back to investor and legal pressure. An example came in 2019 when 58 BP investors holding the equivalent of around $12.7 billion of shares in the oil giant, co-filed a resolution urging the company to set out a business strategy consistent with the goals of the Paris Agreement. It was the first time globally that shareholders holding a 10 percent stake in a major listed company have filed a resolution on climate change.

In short, corporations may finally be realizing that whether or not they own "stranded assets" such as fossil fuels, a carbon tax and other action are inevitable. Their rhetoric may, however, also be seen as empty words as it still seems unlikely that a carbon tax would be accepted in the near future in the U.S. One way or another, companies do not decide what the law should be, although they spend much money on lobbying to try to do so. Lawmakers do. These should be influenced to adopt carbon taxation both in the U.S. and elsewhere.

VIII. Carbon Tax Implementation and Revenue Distribution

The actual roll-out and refinements of a carbon tax is, needless to say, going to be difficult. But difficulties can be overcome. In this case they must. A key challenge in identifying equitable climate policies is achieving aggressive mitigation without overburdening already disadvantaged populations, for example through increases in energy and food prices or job losses. Fortunately, studies find that placing a price on emissions would be more cost-effective than other policy options, such as tightening emissions standards, subsidizing renewable energy, or investing in research and development. Research also finds that pollution taxes are less regressive than emission standards. Importantly, research in behavioral economics and political science finds that using carbon tax revenues to fund equal carbon dividends is the most politically acceptable policy option. This is due to the progressivity, the visibility, and the transparency of a carbon dividend, which may be particularly important there are low levels of trust and high levels of economic inequality and polarization.

The first and crucial obstacle is how to win public support for a carbon tax. The key in that context is to understand the opposition. Public attitudes to carbon taxes follow patterns. Most people underestimate the benefits of lower emissions and overestimate drawbacks such as job losses. Acceptance increases once the policy is enacted, so implementing a tax gradually is more successful. Importantly, people tend to like progressive policies under which costs are borne mainly by those most able to pay.

One study considered three rates for a hypothetical global carbon tax to be introduced after 2020: US $40, $60 and $80 per ton of CO2, in line with recommendations by the World Bank-supported High-Level Commission on Carbon Prices. The study identified six options for spending the money raised: (1) supporting climate mitigation projects domestically, (2) doing so in developing countries or (3) in all countries, (4) paying out a per-capita dividend nationally or (5) globally and (6) using the money to lower domestic income taxes. (Many developing countries are, of course, lobbying for a pot of international funding, for example through the

Green Climate Fund, to help them transition to cleaner economies. A global carbon tax could provide such funds). This study found that

> [f]irst, higher tax rates would lead to larger reductions in greenhouse-gas emissions (by one-third at $80 per tonne or one-fifth at $40). Ploughing revenues into mitigation projects would accelerate emission reductions further.
> Second, the extra cost borne by energy users is modest in countries with relatively clean supplies, such as the United Kingdom, where electricity prices would increase by 12% on average with a tax rate of $60 per tonne of CO2. It is greater for countries that rely on fossil fuels, especially coal. For example, the electricity price for South Africans would double with the same $60 tax.
>
> Third, [even] a worldwide carbon tax would not disrupt the global economy. It would bring extra costs, which would slow economic growth. But GDP losses would be modest, especially if revenues were used to reduce labour taxes and stimulate the economy. Carbon-intensive economies, such as India and South Africa, would face the highest losses (of 2% and 5% of GDP, respectively, for a tax rate of $40 per tonne of CO2).
>
> The impacts of distributing revenues internally depend on the nature of the economy and size of population. Per-citizen dividends range from $89 in India to $838 in Australia, at $40 per tonne of CO2. If pooled globally, the average payout would be $189 per person. Populous countries such as India would be net beneficiaries of hundreds of billions of dollars per year. Many developed countries would lose out [unless corrective action was taken].

This and several other studies broadly recommend a "climate dividend" or "people's payout" for citizens. These are per-capita payouts from carbon taxing (the carbon "rent") and are thought of in increasingly favorable ways. Crucially, for political feasibility reasons, "[i]f all the money is given back to citizens, carbon taxes do not swell government coffers, which appeals to the political right. The left is also interested because the average tax burden is unchanged and low-income households are better off."

In short, the primary way a carbon tax could be used to generate equality is by taking the funds it raises and redistributing them to lower-income people. This can be an effective tool in reducing poverty. This also is the most popular option.

Devoting a carbon tax revenue to fund a carbon dividend makes the policy progressive, minimizes redistribution among households of similar means, mitigates group-based inequalities, and benefits 55 percent of people, including 84 percent in the bottom half of the distribution. (Incidentally, the 84% in the lower income classes in the United States have received little income increase since 1980.) Thus, what is initially a regressive tax can be designed to become progressive. It is, of course, also important to contemplate how carbon tax policies affect already existing inequalities on the basis of race and ethnicity, age, and urban-rural status.

IX. Global Carbon Justice

How would a global "green new deal" be financed? The Just Energy Transition model, which only analyzes for *current* CO2 flows, proposes that those nations with higher emissions and higher incomes, apart from funding their own energy transition, also partially fund the transition for the countries with fewer means as mentioned above. In similarity with other studies, it presumes that *all* nations will levy carbon taxes although the actual rate may vary across to whether they are high- or low-income nations. This model sets a benchmark at the current global average per capita level of emissions. Those countries which emit more than that pay for their own transition *plus* fund a part of the transition of those who are below this average. The global average carbon emissions is 4.97 metric ton per capita. All countries with emissions above this level (68 in all) would be "payers" to finance energy transition for the 135 "beneficiary" countries which are emitting below this level.

The total amount of "carbon compensation" made by the payer nations comes out to around USD 570 billion at a global carbon tax of USD 46.1 per metric ton. The distribution of this amount across the payer countries would be based on their distance from the global average controlled for their population size.

Other major studies also finds that if all countries adopt the necessary uniform global carbon tax and then return the revenues to their citizens on an equal per capita basis, it will even be possible to meet a 2° C target *while increasing* wellbeing, reducing inequality and alleviating poverty. Thus, it is possible for a society to implement strong climate action without compromising goals for equity and development.

A major problem with a global approach to emission reductions via a carbon tax is, however, that this may well not be aligned with local politicians who have to worry about being elected and reelected. In contrast, local offsets create tangible local benefits. Local offsets supports jobs, economic development, and local environmental benefits. These outcomes seed valuable political support. Thus, when push comes to shove, the market philosophy of "shop the world" seems to give way to "buy local." Carbon offsets have greater political support when they create local benefits, no matter the quality or price of those offsets. Restricting far-flung offsets faces fewer political barriers than would limits that restrain domestic offset benefits. In short, politicians prefer projects that deliver local economic, environmental, and political benefits at home.

Instead of focusing outward and promoting political efforts that engage other jurisdictions as the best possible sign of policy success, that framing might be better if it was reversed: The most important thing climate leaders can do is demonstrate what successful carbon pricing looks like at home. That success could then be emulated by others.

X. How the United States Can Benefit from a Carbon Price

Implementing carbon pricing as part of the United States' development of a 21st century climate change mitigation strategy could accomplish four key goals:

1. Mitigate climate change

First and foremost, carbon pricing is the most direct and most efficient way to achieve the emissions reductions that are necessary to mitigate climate change. The U.S. will have to take drastic action if it is to meet its climate goals. Under current policies, the U.S. will only reduce emissions by 20-22 percent from 2005 levels by 2025, and by 20-26 percent by 2030. This is only half of the goal set by President Biden. a $50 per ton carbon tax rising by five percent per year would reduce emissions by 26 to 47 percent relative to 2005 levels—up to 90 percent of the reductions needed to achieve President Biden's Paris Agreement goal.

In addition, any revenue earned from carbon pricing can be used to reduce the effects of climate change on the most vulnerable communities and to provide job retraining for fossil fuel workers.

2. Justify a carbon border tax

Broadly speaking, carbon border adjustments are meant to protect domestic firms from having to unfairly compete with firms producing in countries with weaker greenhouse gas regulations …. For a country with strong climate regulations (and a large domestic market), a carbon border tax can be an effective tool to maintain the competitiveness of domestic firms. However, it makes little sense to institute a border adjustment in the U.S. without first imposing a domestic carbon price …. Imposing a carbon border tax without a domestic carbon price would also make the U.S. vulnerable to challenges and retaliation in global trade.

3. Boost the global, long-term competitiveness of American companies

Instituting a federal carbon price would allow firms to plan their long-term investment decisions better. Imposing carbon pricing in the U.S. might also ensure continued access for American companies to markets abroad …. Finally, instituting a carbon price in the U.S. can prepare American firms for global technological transitions, strengthening their competitiveness in the future.

4. Restore the U.S.' global reputation as a leader on climate issues

Over the past few decades, the United States' global reputation on climate issues has steadily declined. While other countries and nations, such as the EU, have set ambitious climate goals, the U.S. continues to grapple with climate deniers blocking any substantive action on climate change. Rather than government leaders and policymakers committing to significant action on

climate change, the majority of reductions in emissions over the past decade have been achieved through shifts in fossil fuel usage and increased efficiency in industry.[3]

XI. Carbon Taxation Concerns

As a threshold matter, it should be noted that several studies – including some of the ones mentioned above – are based on the presumption that *all* nations around the world will implement some type of carbon tax. But such a presumption may not become reality; at least not in the short timeframe needed. On the other hand, it is must also be said to be true that any action – even if only experimentation to be refined into better solutions along the way – is better than no action at all or continued rhetoric without real application. Thus, even if not *all* countries adopted carbon taxation from the outset, *some* nations doing so would have an effect on GHG reduction in and of itself as well as important signaling effect to other nations.

It is important to make sure that no "perverse incentives" are created in this context. Such might arise if, for example, it would be beneficial for some jurisdictions to disregard their own carbon reduction obligations and potentially even encourage or expect others to continue using carbon as this would, everything else being equal, create a benefit for revenue-receiving nations. In other words, if a developing nation could earn "money for free" via carbon payouts from other nations without the particular developing nation taking sufficient effort itself, that would work against the overall scheme, which is to take action around the world, not only to establish a revenue stream for some. Carbon offsets in cap-and-trade schemes have, for example, been argued to create perverse incentives. Rather than offer an initial step on the road to new markets and deeper market links, offsets become an entrenched source of cheap but low-quality compliance. They water down ambitions and create strong incentives to avoid further regulation because any legal requirement to reduce emissions would cut off the flow of funds from offset credits. Negative secondary effects of any carbon market pricing system should be carefully considered.

Funds to flow from certain regions to others, whether this be at the sub- or supranational levels, should be earmarked for climate change mitigation and adaptation purposes seen broadly. This is so to speed up actual action and, once again, to avoid some regions taking action without others doing the same; the well-known "leakage" or "tragedy of the commons" problem where some jurisdictions may not take action as they either benefit from creating goods or services for others with stricter regulations (the leakage problem) or refrain from taking action because others who co-contribute to the problem also may not do so (the tragedy of the commons problem). Regions should thus only receive funds if they can demonstrate improved policy and regulations to avoid a funded status quo ante situation.

It is important to note that some theories have examined both carbon taxation and emissions trading under one. For the reasons set forth above, emissions trading programs may indeed not be fruitful alone. This is so because a worldwide *halt* to CO2 emissions is desired, not just shifting emissions permits around in "efficient-sounding-but-unjust market-based outcomes,

[3] https://www.brookings.edu/research/why-the-us-should-establish-a-carbon-price-either-through-reconciliation-or-other-legislation/

which is what the current market process entails. A combination of methodology must, in all likelihood, be used. This would be a "cap and taxation" scheme, not just a cap and trade one.

Of course, many political obstacles will arise and will have to be addressed along the way using appropriate rhetoric, facts, and examples. Some researchers argue that regulations are more effective and much easier for politicians to accept because the general public are not as critical towards somewhat untransparent costs arising through changes of the law as they are towards very visual taxes.

Many policy- and research-related complexities also have to be taken into account with the researchers, law- and policy-makers, and others who work in this area.

XII. Conclusion

Time is running out to avoid climate change at a point that could be catastrophic. The "future" discussed in this context is 2050 or sooner because of the established urgency of this problem.

Research demonstrates that carbon taxation could help solve the problem or even solve it outright. The revenues from a carbon tax capable of achieving a 2° C target may be large enough to fund substantial policies that can also promote equity and protect vulnerable populations nationally and, in time, around the world. It is, however, important to initially accept "experimentalist governance" in the carbon taxation context. This requires learning about the incentives for companies and governments to test new ideas, then learning quickly what works and what does not in order to adjust goals and directions accordingly. In turn, this process requires highly motivated and capable governments and industries such as those seen in many of the jurisdictions that currently lead on climate policy or are poised to do so. Implementing some type of progressive carbon taxes can initially be fairly straightforward — though some countries might currently lack the administrative capacity to do so, and others might simply not want to— *and* can help alleviate poverty by routing the funds to low-income people or regions, even if only nationally to begin with. An equal per capita redistribution of carbon tax revenues *within* countries — a relatively uncomplicated policy to implement — can increase wellbeing, reduce inequality and alleviate poverty. These benefits occur in countries at all levels of development, primarily accrue to individuals at the bottom of the income distribution and can be even greater with a *global* equal per capita redistribution.

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