The EU-27, U.S., U.K., and China Should Dump Cap-and-Trade as a Policy Option and Adopt a Carbon Tax with Reinvestment To Reduce Global Emissions

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ABSTRACT

Cap-and-trade is a failed policy. Under the Kyoto Protocol, global emissions have continued to increase and the European Union Emissions Trading System (EU ETS) price collapsed due to hot air and over allocation of emissions. The time has come to abandon cap-and-trade as a method or means of potentially reducing global greenhouse gas (GHG) emissions. As such, the European Union Twenty-Seven (EU-27) should abandon the EU ETS and adopt a carbon tax with reinvestment (CTR), leading the way for the United Kingdom, United States, and China to also adopt this strategy. Together, the EU-27, United Kingdom, United States, and China account for 57% of total carbon-dioxide emissions, not including land use and deforestation. If these countries, which account for approximately 65% of global gross domestic product (GDP) and over 60% of world trade, adopt this system, it would provide a significant incentive for the remainder of the world to adopt similar legislation.

The tax would apply to all goods and services based on emissions intensity plus shipping emissions, and once collected, countries can retain the revenue for the purposes of rebuilding the power grid and developing alternative energy sources for transportation. This formula will lead to significant reductions in GHG emissions. With a CTR in place, the EU, United States, United Kingdom, and China would reduce their economy-wide emissions by 48%, 49%, 51%, and 13%, respectively, within twenty years. This would amount to a combined 34.2% reduction of current global emissions, which is a significant down payment to avoiding the world warming by more than 2°C. With respect to China, the 13% reduction is contrasted with most current projections that it

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will double its GHG emissions. This would occur while automatically putting a border-trade adjustment in place. Finally, the EU is heavily dependent on energy imports. The majority of these imports come from Russia, which has flexed its energy muscle multiple times under President Putin. With a CTR structure, the EU would become energy independent in the power and heating sectors, thus providing added political, as well as economic power, for the EU on the world stage.

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I. INTRODUCTION

A. Global Climate Cause and Consequences

Failure to reduce global greenhouse gas (GHG) emissions is not an option. If we fail, then we risk the future of our environment and threaten catastrophic devastation to our coastlines, cities, farms, and the entire planet's resources.[1] The changing climate, due to man-made emissions, could very well significantly alter the landscape and characteristics of planet Earth.[2] With "very high" confidence, the bulk of the rise in temperatures over the past fifty years, according to climate scientists, can be attributed to human-caused GHG[3] emissions from burning fossil fuels combined with land-use changes.[4] Yet, inaction seems to be the word of the day. Emissions of global GHGs continue to grow. Hope continues to present itself at every Conference of the Parties (COP) meeting, yet disappointment soon follows, as the Kyoto, Copenhagen, Durban, and other COP meetings all have failed to produce a reduction in total emissions. The Intergovernmental Panel on Climate Change's (IPCC) fifth assessment report indicates significant legislative action is needed to control emissions.[5] Thus, there is growing demand for action on domestic and international climate change legislation leading to significant reductions in GHG emissions. The past fifteen years have seen the twelve warmest years in recorded history as oceanic temperatures reached record highs and Arctic ice

1. *Cf.* William Collins et al., *The Physical Science Behind Climate Change*, SCI. AM., Oct. 6, 2008, http://www.scientificamerican.com/article.cfm?id=science-behind-climate-change (briefing science of climate change).

2. *See* Stephen Sewalk, *Project Financing an Energy Revolution in the U.S.A.*, 3 ENGINEERING PROJECT ORG. J. 141, 141 (2012).

3. *See* United Nations Framework Convention on Climate Change art. 1(5), May 9, 1992, 1771 U.N.T.S. 165 [hereinafter U.N. Convention on Climate Change] (defining "greenhouse gases" as "those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation"); *see also* David G. Duff, *Tax Policy and Global Warming*, 51 CANADIAN TAX J. 2063, 2065 n.2 (2003) ("Although different gases have different effects on global warming, it is customary to standardize these emissions to CO_2 equivalents when measuring their effects on global warming.").

4. *See* Camille Parmesan et al., *Beyond Climate Change Attribution in Conservation and Ecological Research*, 16 ECOLOGY LETTERS 58, 58 (Supp. 2013).

5. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, at v (Thomas F. Stocker et al. eds., 2013), *available at* http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf.

melted faster than most models predicted.[6] A recently conducted study by the Proceedings of the National Academy of Sciences, covering a fifty-year period, discovered the higher temperatures caused by climate change are resulting in tropical forests being able to absorb less and less carbon dioxide (CO_2) every year.[7]

Based on models developed by scientists to avoid the globe warming by more than 2^oC compared to pre-industrial levels, it is necessary to stabilize the concentration of GHGs in the atmosphere at 450 parts per million (PPM)[8] in carbon-dioxide equivalents (CO_2e).[9] The challenge is that the level of atmospheric GHGs has increased 44% from pre-industrial levels of 280 to 400 PPM, as of 2013.[10] From 1970 to 2004, the amount of GHG emissions increased by 70%.[11] The concentration in the atmosphere continues to grow by approximately two PPM per year as shown in Figure 1 below,[12] briefly surpassing the symbolic 400-PPM level in May 2013.[13] Current world emissions of 30 billion tons of CO_2e per year are not sustainable. Presently the average emissions per capita globally are more than four tons of CO_2e per year.

> Australia, the USA, Canada, Germany, Sweden, China, India and Kenya are emitting 26.9, 23.5, 22.6, 11.9, 7.4, 5.5, 1.7 and 0.3 ton [sic] of CO_{2e} per person per year, respectively. To achieve 450 PPM by 2050, it is necessary to reduce average emissions to 18 billion tons of CO_{2e} per year between 2013 and 2050.[14]

6. *See* Tom Randall, *'We Need To Act': Transcript of Obama's Climate Change Speech*, BLOOMBERG (June 25, 2013, 5:40 PM), http://www.bloomberg.com/news/2013-06-25/-we-need-to-act-transcript-of-obama-s-climate-change-speech.html.

7. *See* Weile Wang et al., *Variations in Atmospheric CO_2 Growth Rates Coupled with Tropical Temperatures*, 110 PROC. NAT'L ACAD. SCI. 13061, 13061 (2013), *available at* http://sites.bu.edu/cliveg/files/2013/09/weile-wang-cgr-temp-pnas-2013.pdf.

8. *See* Robert Kunzig, *Climate Milestone: Earth's CO2 Level Passes 400 ppm*, NAT'L GEOGRAPHIC (May 9, 2013), http://news.nationalgeographic.com/news/energy/2013/05/130510-earth-co2-milestone-400-ppm.

9. *See* Mike Young, *Two Degrees Warmer May Be Past the Tipping Point*, UNIV. POST (Nov. 12, 2009, 7:07 AM), http://universitypost.dk/article/two-degrees-warmer-may-be-past-tipping-point (noting two-degree increase will cause irreparable harm).

10. Brian C. Murray & Heather Hosterman, *Climate Change, Cap-and-Trade and the Outlook for U.S. Policy*, 34 N.C. J. INT'L L. & COM. REG. 699, 699 (2009). PPM are measured in CO_2e measures. *See id*; *see also* Kunzig, *supra* note 8.

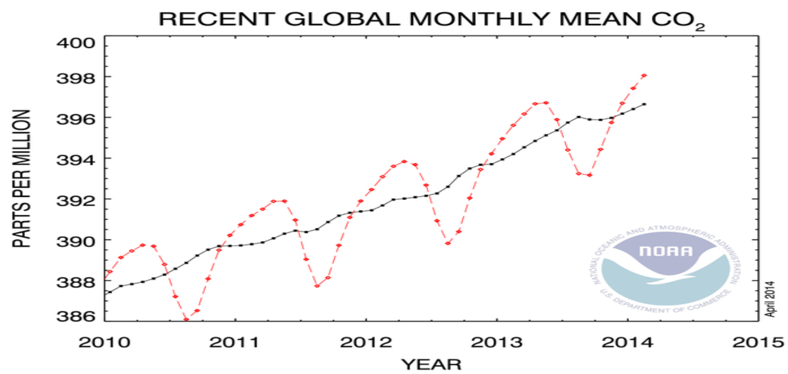
11. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS 3 (B. Metz et al. eds., 2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-spm.pdf.

12. *Trends in Atmospheric Carbon Dioxide*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. (last updated Apr. 8, 2014), http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html.

13. Jason Samenow, *Atmospheric Carbon Dioxide Reaches 400 Parts per Million Concentration Milestone*, WASH. POST, May 10, 2013, http://www.washingtonpost.com/blogs/capital-weather-gang/wp/2013/05/10/atmospheric-carbon-dioxide-concentration-400-parts-per-million.

14. Sewalk, *supra* note 2, at 142.

Figure 1: National Oceanic & Atmospheric Administration Reported CO_2 Levels[15]



Furthermore, there is concern 450 PPM may be too much. The Potsdam Institute calculated the environment may only be able to manage up to 350 PPM, a level that has already been exceeded.[16] According to other calculations, even if global emissions were reduced to year 2000 levels and kept constant, the Earth would still experience a warming trend of 0.1ºC every ten years due to the slow feedback of the oceans.[17] Over an average person's lifetime, this would be equivalent to an increase of 0.7 to 0.8ºC. There are climate scientists who believe the rapid rate of emissions growth may have already caused permanent damage to the Earth and its ecosystems, effectively changing the atmospheric composition of our planet.[18]

Therefore, our primary concern should be to develop the best response possible to the current level of emissions in order to prevent the forecasted increases in GHG emissions levels to avoid catastrophic climate change.[19] First, we need to ensure that we understand the causes in order to change what we are currently doing wrong. According to the IPCC, the main culprit is our fossil fuel consumption, which accounts for the majority of anthropogenic GHG emissions.[20] The very natural resources that allowed us to thrive and

15. *Trends in Atmospheric Carbon Dioxide*, *supra* note 12.

16. *See* Young, *supra* note 9.

17. Murray & Hosterman, *supra* note 10, at 702-03.

18. *See* Robin Kundis Craig, *"Stationary Is Dead"—Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENVTL. L. REV. 9, 24 (2010).

19. *See* UNITED NATIONS ENV'T PROGRAMME & WORLD TRADE ORG., TRADE AND CLIMATE CHANGE 2 (2009), *available at* http://www.wto.org/english/res_e/booksp_e/trade_climate_change_e.pdf.

20. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, RENEWABLE ENERGY SOURCES AND CLIMATE CHANGE MITIGATION 7 (Ottmar Edenhofer et al. eds., 2012), *available at* http://srren.ipcc-wg3.de/report/IPCC_SRREN_Full_Report.pdf (showing 56.6% of CO_2 from fossil fuels in 2004 as highest single emission comprising GHG composition).

prosper during the Industrial Revolution, resulted in the rapid expansion and growth of our species, and continue to represent a source of livelihood for entire industries and populations, have placed the current world ecosystem in peril.[21] We have seen the impacts of unparalleled growth in China, leading to heavily polluted air and waterways. This has led to efforts to inform the general populace of the dangers of unmitigated GHG emissions and the need for countries to urgently address their carbon emissions.[22] Without a plan and a strategy leading to the correct legislation to dramatically reduce GHG emissions, the Earth's habitable environments may be irrevocably altered in the near future, potentially jeopardizing the future of our own species.

These uncontrolled rapid increases in GHG emissions could result in global climate change leading to melting snowcaps and glaciers, rising sea levels, and changing weather patterns (including rising seawaters, floods, droughts, disappearing rivers, and altered landscapes).[23] Due to global warming, sea levels have risen approximately eight inches since 1880, and with an expanding global population, more people now live by the water.[24] Estimates by scientists predict that sea levels could rise an additional twenty to eighty inches during the twenty-first century.[25] Existing infrastructure along the shorelines could be significantly impacted, begging the question: what will we do with the infrastructure? Will we want it to simply be flooded over, polluting our oceans? In the United States and United Kingdom, there are over 3 million properties and homes that could be flooded, and most are less than four feet above high tide.[26] This will affect all countries with ocean shorelines and rivers that migrate to oceans.[27] The impact of climate change will be vast, affecting not only infrastructure (e.g., seaports, airports, highways, pipelines, etc.), but also agriculture (via droughts and floods) and lifestyles. The impact of climate change has the potential to lead to decreasing standards of living, especially in

21. *See* Ove Hoegh-Guldberg & John F. Bruno, *The Impact of Climate Change on the World's Marine Ecosystems*, SCI. MAG., June 18, 2010, at 1523 (overviewing how human activity changes world's oceans and negatively affecting marine ecosystems).

22. *See* Henry A. Ruhl et al., *Societal Need for Improved Understanding of Climate Change, Anthropogenic Impacts, and Geo-Hazard Warning Drive Development of Ocean Observatories in European Seas*, 91 PROGRESS IN OCEANOGRAPHY 1, 2 (2011) (detailing need for ocean observatories to monitor climate change).

23. *See* Murray & Hosterman, *supra* note 10, at 702 (outlining environmental impacts from GHG emissions).

24. *See* BEN STRAUSS ET AL., CLIMATE CENTRAL, SURGING SEAS: SEA LEVEL RISE, STORMS & GLOBAL WARMING'S THREAT TO THE U.S. COAST 2 (Mar. 14, 2012), *available at* http://slr.s3.amazonaws.com/SurgingSeas.pdf.

25. *See id.*

26. *See id.* at 5 ("Across the [United States], nearly 5 million people live in 2.6 million homes [on land] *less* than 4 feet above high tide."); *Climate Change Explained*, ENV'T AGENCY, http://test.environment-agency.gov.uk/homeandleisure/climatechange/31802.aspx (last visited Apr. 20, 2014) ("In the U.K., there are currently 490,000 properties at significant risk of flooding.").

27. *See Climate Change Explained*, *supra* note 26.

communities and countries with an economy heavily dependent on variations in climate.[28] This includes developing countries, as well as cities and states that have primarily agriculture-based economies.[29]

B. Responses to Global Warming

Due to the rapidly rising emissions levels, changing climate, and rising sea levels, among others reasons, many nations are searching for some form of climate change legislation to lower GHG emissions levels.[30] However, many of the proposals to date seem to have failed at regulating emissions, making governments hesitant to adopt a policy.[31] It is possible these legislatures and governments are waiting to find a well-developed, thought-out, and efficient policy, preferably adopted and operating successfully in another nation before adopting the legislation for their own country or region.[32] Despite lawmakers being cognizant of the benefits, this reluctance is due in great part to their desire to avoid certain factors including: fear of harming domestic businesses, lack of confidence in proposed climate change schemes, and the continued speculation by certain groups about the seriousness of carbon emissions in the atmosphere.

1. Rio, Kyoto, Foreign Direct Investment, and Carbon Leakage

Developed countries are quite concerned that if they impose heavy restrictions on carbon emissions, then these restrictions will apply only to domestic producers and not imports, leading to carbon leakage. Carbon leakage typically occurs when an industrialized country proposes legislation that will restrict emissions of carbon. This includes schemes such as the European Union Emissions Trading System (EU ETS) cap-and-trade system, the Waxman-Markey bill, the Lieberman-Warner bill, and many others. Consequently, emissions-dependent industries relocate to countries with no emissions restrictions.[33] They do so primarily to avoid restrictions on their

28. *See* THE WORLD BANK, WORLD DEVELOPMENT REPORT: DEVELOPMENT AND CLIMATE CHANGE 37 (2010), http://siteresources.worldbank.org/INTWDR2010/Resources/5287678-1226014527953/WDR10-Full-Text.pdf.

29. *See id.*

30. *See* Nathaniel Loewentheil, *Of Stasis and Movements: Climate Legislation in the 111th Congress* (Yale Univ. Inst. for Soc. & Policy Studies, Working Paper No. ISPS12-020, 2013), *available at* http://isps.yale.edu/research/publications/isps12-020-0#.U1PWuPldXTo (providing example of lack of public and legislative support in United States for climate change movement); *see also* Terry Townshend et al., *How National Legislation Can Help To Solve Climate Change*, 3 NATURE CLIMATE CHANGE 430, 430 (2013) (overviewing international efforts to pass climate change-related laws).

31. *See* Loewentheil, *supra* note 30, at 5 (discussing roadblocks to passing legislation in United States); Townshend et al., *supra* note 30, at 430.

32. *See* Townshend et al., *supra* note 30, at 431.

33. *See* Glen P. Peters & Edgar G. Hertwich, *Trading Kyoto*, 2 NATURE REPORTS CLIMATE CHANGE 40, 40 (2008).

emissions. However, in the process, greater emissions result, as will be explained below. Anecdotally, there is evidence that this occurred during the 1990s and 2000s (the era of globalization).

The United Nations Conference on Environment and Development (dubbed "the Earth Summit"), held in Rio de Janeiro, Brazil in 1992, called upon developed countries to reduce GHG emissions.[34] This Summit led to the Kyoto Protocol.[35] Following Rio and Kyoto, foreign direct investment (FDI) in developing countries—which were not held accountable for their levels of emissions—boomed, leading to rapidly rising emissions in these countries. After developed countries capped their emissions, the significant flow of FDI into developing countries allowed

> [developing] nations to benefit from their omission to internalize environmental negativities [, which] could be both environmentally and economically counter-productive. If mobile taxpaying industries relocate to pollution haven countries that offer little environmental regulation or taxation, then an environmentally conscious country could lose valuable industries and their receipts, while no overall environmental benefit would accrue, as the industry may continue, or even increase levels of pollution overseas.[36]

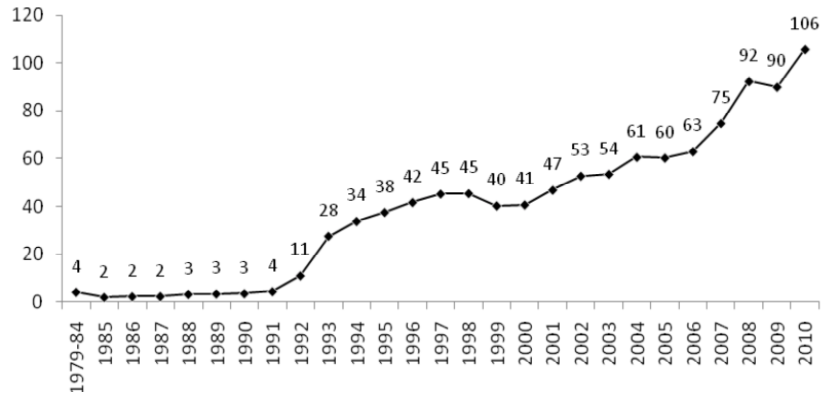
Figure 2 below depicts the flow of FDI into China around the time of the 1992 Earth Summit. From 1979 to 1991, FDI ranged from $2 to 4 billion. From 1992 forward, investment into China soared, reaching $106 billion by 2010.

34. *UN Conference on Environment and Development (1992): The Earth Summit*, UNITED NATIONS (May 23, 1997), http://www.un.org/geninfo/bp/enviro.html.

35. Kyoto Protocol to the United Nations Framework Convention on Climate Change, *adopted* Dec. 11, 1997, 2303 U.N.T.S. 148 (entered into force Feb. 16, 2005).

36. Jon M. Truby, *Towards Overcoming the Conflict Between Environmental Tax Leakage and Border Tax Adjustment Concessions for Developing Countries*, 12 VT. J. ENVTL. L. 149, 157-58 (2010).

Figure 2: China FDI 1979-2010 ($ billions)[37]



What is the result of this "failed" policy? It has led some countries to shift blame for their emissions. For example, China assigns blame to other countries for one-third of its emissions, which are attributed to the country's massive exports.[38] This is surely not a situation anticipated by Kyoto. Even though the EU and the United States have minimized increases (or actually decreased them in some cases) in their emissions levels since the year 2000, upon examining the data based on emissions intensities (GDP/total GHG emissions) of imports versus exports, total emissions, including imports, actually skyrocketed for both the EU and the United States.[39] Meanwhile, without regulations on land-use, Land Use, Land-Use Change, and Forestry (LULUCF) countries, such as Brazil and Malaysia, continue to contribute to global emissions by cutting down their forests.[40] These unintended side effects led some countries, such as the United States, to propose legislation (e.g., the Lieberman-Warner and Waxman-Markey bills) that would include a carbon tax on imports for those countries that failed to internalize their cost of emissions. Furthermore, this led the EU down a path to attempt to impose a carbon tax on airlines flying into the EU. Developed countries, among them the United States and those comprising the EU, are concerned that unless imports are included within emissions restrictions, many industries that are beneficial to their economies will simply

37. Shujie Yao & Jing Zhang, *Chinese Economy 2010: Post Crisis Development*, UNIV. OF NOTTINGHAM CHINA POL'Y INST. 11 (2011), http://www.nottingham.ac.uk/cpi/documents/briefings/briefing-67-china-economic-review-2010.pdf.

38. *See* Duncan Clark, *West Blamed for Rapid Increase in China's CO_2*, THE GUARDIAN, Feb. 22, 2009, http://www.theguardian.com/environment/2009/feb/23/china-co2-emissions-climate.

39. This is primarily due to carbon leakage of industry moving from the United States, EU, and Japan to China. It is possible Kyoto had the unintended result of increasing global emissions by moving production from low-emissions intensity countries to high-emissions intensity ones.

40. A carbon tax policy needs to take this into account, thereby discouraging Brazil and Malaysia from cutting down their forests.

relocate to remain competitive internationally, and therefore, avoid internalizing the cost of their emissions. The United States did not sign on to the Kyoto Protocol because of the differences in countries included in Annexes I and II.[41] Specifically, the United States noted that because developing countries, especially China, would not be subject to the emissions limits, U.S. industries would be unfairly punished as a result, and would likely relocate to those countries that do not impose emissions limits.[42]

2. The United States and the EU-27

In 2008, the second highest global emitter of CO_2 was the United States.[43] Similar to China's status under the Kyoto Protocol, the United States signed the agreement, but did not ratify it, and has therefore, been exempt from the emissions regulation benchmarks.[44] However, due in part to the economic recession, in 2011, the United States was on track to potentially reduce its CO_2 emissions levels close to the Kyoto Protocol's targets.[45] Despite this encouraging trend, the United States has never adopted any form of GHG emissions-reducing legislation.[46] As illustrated in Figure 3 below, in 2012 U.S. emissions were at their lowest levels since the mid-1990s, although they were not 7% below 1990 levels as promised by Al Gore at Kyoto's signing.[47]

41. *See* U.N. Convention on Climate Change, *supra* note 3, Annexes I-II.

42. *See* JANE A. LEGGET ET AL., CRS REPORT FOR CONGRESS: CHINA'S GREENHOUSE GAS EMISSIONS AND MITIGATION POLICIES 1 (Sept. 10, 2008), *available at* http://www.fas.org/sgp/crs/row/RL34659.pdf.

43. *An Atlas of Pollution: The World in Carbon Dioxide Emissions*, http://e360.yale.edu/images/digest/carbon_web.pdf (last visited Apr. 20, 2014) [hereinafter *An Atlas of Pollution*].

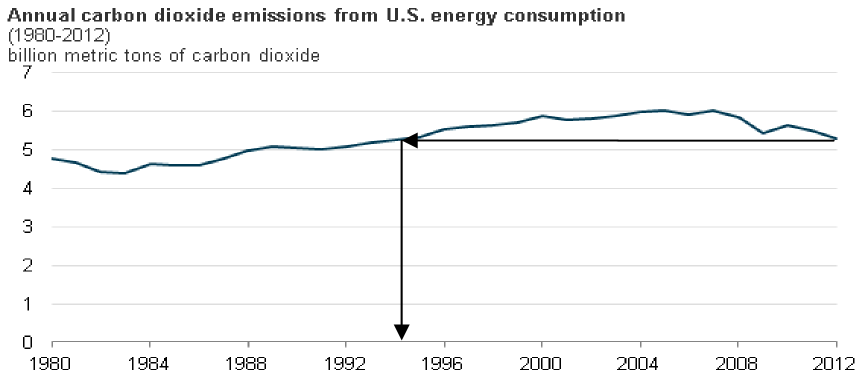
44. *See* Jon Hovi et al., *Why the United States Did Not Become a Party to the Kyoto Protocol: German, Norwegian and U.S. Perspectives*, 18 EURO. J. INT'L REL. 129, 130 (2012).

45. *See* Allan LeBlanc, *Is The U.S. About To Accidently Meet the Kyoto Protocol Targets?*, BERKELEY ENERGY & RESOURCES COLLABORATIVE (Sept. 4, 2012), http://berc.berkeley.edu/is-the-us-about-to-accidentally-meet-kyoto-protocol-targets.

46. *See* Terry Townshend et al., *supra* note 30, at 430 (noting United States failed to pass bespoke legislation, but using existing Clean Air Act to regulate emissions).

47. *See* Ryan Balis, *The Cost of Kyoto*, NAT'L CENTER FOR PUB. POL'Y RES. (Feb. 14, 2005), https://www.nationalcenter.org/TSR021405.html.

Figure 3: Energy-related CO_2 emissions 1980-2012[48]



Cap-and-trade programs are often the leading proposals when governments look to limit GHG emissions, and the United States has entertained the idea of a cap-and-trade system. The American Clean Energy and Security Act (also known as the Waxman-Markey bill) was the most recent cap-and-trade proposal.[49] The House of Representatives approved the bill, which was designed to lower carbon emissions and create clean energy jobs, but the Senate struck it down in 2009.[50] To date, Congress has yet to pass any legislation that would mitigate carbon emissions.[51]

President Obama outlined a series of initiatives during his June 2013 environmental-policy speech that would move the United States closer to implementing a holistic market-based climate change policy.[52] The President vowed his administration's continued support to lower GHG emissions by 17% from 2005 levels.[53] He also announced a series of new measures to reduce the nation's impact on global climate change.[54] These new initiatives include: allowing the U.S. Environmental Protection Agency (EPA) to complete pollution standards for new and existing power plants; directing the Interior Department to allow public lands to be reserved for new renewable energy facilities to be built; increasing the federal government's use of renewable

48. *Energy-Related Carbon Dioxide Emissions Declined in 2012*, U.S. ENERGY INFO. ADMIN. (Apr. 5, 2013), http://www.eia.gov/todayinenergy/detail.cfm?id=10691#.

49. The American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009), *available at* http://www.opencongress.org/bill/hr2454-111/text.

50. *Cf.* Robert Stavins, *The Wonderful Politics of Cap-and-Trade: A Closer Look at Waxman-Markey*, AN ECON. VIEW OF THE ENV'T (May 27, 2009), http://www.robertstavinsblog.org/2009/05/27/the-wonderful-politics-of-cap-and-trade-a-closer-look-at-waxman-markey (explaining cap-and-trade policy potentially beneficial in several aspects despite Waxman-Markey bill not passing).

51. *See* Townshend et al., *supra* note 30, at 430.

52. *See* Randall, *supra* note 6.

53. *Id.*

54. *See id*.

sources of energy; and encouraging negotiations with other nations to allow free trade of environmental goods and services, including clean energy technology.[55] President Obama also encouraged lawmakers to work together to create a market-based GHG emissions-reduction system that the United States could implement in the near future.[56]

Table 1 below shows the impact of imports on total U.S. emissions. The table highlights the imports from the largest U.S. trading partners. These imports have embedded emissions—emissions due to the emissions intensities of the respective countries. The emissions include LULUCF emissions. To simplify the table, if China exports 8% of its GDP to the United States, this implies 8% of their emissions are exported to the United States.

Table 1: Calculated and Estimated Net Imports of U.S. GHG emissions[57]

	US Imports (Largest Trading Partners)[58]	**Trading Partners GHG Emissions[59] ($MtCO_2$)**	**Exports as % GPD[60]**	**Emissions Imported ($MtCO_2$)**
Canada	$339,491,425	731.6	24.2%	177.0
China	$337,772,628	7,219.2	8.8%	635.3
Mexico	$215,941,619	629.9	19.8%	124.7
Japan	$139,262,197	1,342.7	2.8%	37.6
Germany	$97,496,574	977.4	3.8%	37.1
U.K.	$58,587,383	639.8	2.2%	14.1
Saudi Arabia	$54,747,449	374.3	11.5%	43.0
Venezuela	$51,423,628	266.3	16.2%	43.1
Sub-selection	$1,283,723,004	12,181.2	Calculated	1,079.6
Total Imports	$2,103,640,711		Estimated	1,769.0
Exports	$1,287,441,997	7,098.0	~9.06%	643.1
	Net Imports of GHGs		**1,125.9 ($MtCO_2$)**	

55. *See id.*
56. *See* Randall, *supra* note 6.
57. Based on the author's calculations.
58. *2008 Imports of HS Total All Merchandise*, TRADESTATS EXPRESS–NAT'L TRADE DATA, http://tse.export.gov/TSE/MapDisplay.aspx (last visited Apr. 20, 2014).
59. *CAIT 2.0: WRI's Climate Data Explorer*, WORLD RESOURCES INST., http://cait2.wri.org/wri (last visited Apr. 20, 2014) (providing yearly emissions data, including all gases for 2005).
60. *Gross domestic product 2010*, THE WORLD BANK (July 1, 2011), http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP.pdf. This calculation is a percentage of exports to the United States as a percentage of the nation's GDP. This is not ideal but serves as a good proxy for calculating exports as a percentage of GDP to then allocate emissions.

Alternatively, if the United States exports 9% of its GDP, then it exports 9% of its emissions. This allows for a fair analysis of emissions. By assigning an equal weight to all products and services by value one avoids the potential duplicity by those who might claim the energy for exports comes from clean power plants (solar, wind, nuclear, and hydroelectric), while domestic production comes from dirty power (coal, oil, and natural gas power plants).

Table 1 indicates the United States is running a deficit of approximately 1.13 billion tons of GHG emissions for two reasons: first, the United States imports significantly more than it exports, and second, many U.S. imports are from energy inefficient countries, such as China. For example, China produces two to three times as many GHG emissions per dollar of GDP than the United States does.[61] Even though total U.S. domestic emissions stabilized, due to imports, U.S. emissions, including imports, have continued to increase.

Alternatively, the EU chose to scrap carbon-tax proposals and adopt a cap-and-trade policy. The EU created the EU ETS in 2005 as a cap-and-trade program designed to restrict CO_2 emissions in certain industries throughout much of Europe.[62] The industries included were refineries, combustion-related facilities, iron and steel factories, cement plants, and electricity providers.[63] The cap-and-trade program's goal was to create and maintain a market for carbon that would encourage investment into new low-emissions technologies.[64] The initiative and resulting legislation was viewed as a huge victory for supporters of climate change mitigation when it was implemented in 2005. This also gave the world a chance to observe if the first large emissions trading scheme would prove successful. However, since the EU ETS began, it has become bogged down by poor economic efficiency and plagued by unrealized environmental goals.[65] This failure has been exacerbated recently by the news that the EU ETS is on the brink of failure and has not lived up to its potential, creating uncertainty among legislatures worldwide with regards to this type of climate initiative.[66] Only eight years into this scheme, many members of the European Parliament appear ready to abandon the EU ETS.[67]

61. This "emissions intensity" is calculated as follows: Because the United States, a $15 trillion economy, has 6 billion tons of GHG emissions, it would imply $2500 of GDP per ton of emissions. China on the other hand has an economy that is roughly $7 trillion and produces approximately 7 billion tons of emissions or roughly $1000 produced per ton of GHG emissions.

62. RICARDO COELHO, CARBON TRADE WATCH, GREEN IS THE COLOR OF MONEY: THE EU ETS FAILURE AS A MODEL FOR THE "GREEN ECONOMY" 3 (Joanna Cabello & Tamra Gilbertson eds., 2012), *available at* http://www.carbontradewatch.org/downloads/publications/EU-ETS_Report-web.pdf.

63. *See* Julien Chevallier, *Banking and Borrowing in the EU ETS: A Review of Economic Modelling, Current Provisions and Prospects for Future Design*, 26 J. ECON. SURVEYS 157, 158 (2012).

64. *See id.*

65. *See* Anna Petherick, *Holding out Hope*, 3 NATURE CLIMATE CHANGE 534, 534 (2013).

66. *See* COELHO, *supra* note 62, at 2.

67. *See Carbon Trading: ETS, RIP?*, THE ECONOMIST, Apr. 20, 2013, http://www.economist.com/news/finance-and-economics/21576388-failure-reform-europes-carbon-market-will-reverberate-round-world-ets.

On April 16, 2013, the European Parliament rejected a measure designed to save the EU ETS scheme that would have back loaded future carbon-emissions allowances and bolstered the faltering program.[68] Because of the vote, the program's carbon-market price for allowances collapsed to new lows.[69]

3. China and Other Developing Countries

Over the past thirty years, the world has witnessed the Chinese economy grow exponentially. This has greatly increased China's GDP and exports, due to significant FDI as shown in Figure 2 above; however, China now suffers from extreme environmental problems stemming from the rapid development.[70] It is estimated that China's economic losses due to environmental degradation and pollution account for roughly 10% of its gross national income.[71] With high FDI and rapid economic growth, China is now the world's second largest economy, and the largest national emitter of CO_2 in the world.[72] Going forward it is uncertain how China is proposing to reduce its very high levels of emissions.[73] These emissions levels increased by 170.6% from 2000 to 2008, and since then, have increased an additional 10%.[74]

China did sign on to the Kyoto Protocol; however, as mentioned previously, it is exempt from the emissions-lowering benchmarks proposed in the agreement.[75] Attempting to mollify its critics, China initiated a carbon-trading scheme in 2008 with the objective of reducing GHG emissions through a voluntary carbon market.[76] While private companies manage this carbon-trading scheme, the Chinese government appears to be supporting the carbon markets, as are local governmental entities throughout China.[77] Although it is taking a top-down approach, it seems the central government has no plans to establish a unified trading system for the country and will continue to allow domestic emitters to create their own carbon markets.[78]

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68. *See id.*

69. *See id.*

70. *See* Junjie Zhang, *Delivering Environmentally Sustainable Economic Growth: The Case of China*, ASIA SOCIETY 1, 4 (Sept. 2012), http://asiasociety.org/files/pdf/Delivering_Environmentally_Sustainable_Economic_Growth_Case_China.pdf.

71. *See id.* at 12.

72. *See id.* at 4; *An Atlas of Pollution*, *supra* note 43.

73. *See* Zhang, *supra* note 70, at 5 (noting Chinese policy makers facing obstacles on reducing environmental impact).

74. *An Atlas of Pollution*, *supra* note 43.

75. *See* Ying Ma, *China's View of Climate Change*, HOOVER INSTITUTION STANFORD U. (June 1, 2010), http://www.hoover.org/publications/policy-review/article/5302. The Kyoto Protocol set binding emissions targets for thirty-seven countries, but exempted developing countries like China. *See id.*

76. *See* Yitian Huang, *Policy Experimentation and Emergence of Domestic Voluntary Carbon Trading in China*, 30 E. ASIA 67, 68 (2013).

77. *See id.* at 80-81 (indicating national and local Chinese government support important to scheme's success).

78. *See id.* (outlining roles of government and industry).

In general, most developing countries, including Russia as a part of Annex I to the Kyoto Protocol, want the benefits of emissions trading (i.e., the potential income), but do not want to affect their development or their industries. They generally blame the developed countries for most of the emissions released to date, although Chinese emissions are rapidly catching up. Brazil has reduced its destruction of the Amazon forest, but Malaysia continues to burn down its forests to produce palm oil for Europe.[79] FDI continues to flow rapidly to developing countries as corporations diversify their industrial bases and potentially hedge their bets as to who will adopt emissions limits. A significant amount of the FDI is directed to the so-called "BRIC" nations (Brazil, Russia, India, and China).[80] As noted, an indirect consequence of Rio and Kyoto may have been to increase global emissions as a result of globalization and very long supply chains.

Part I of this Article examined the current state of climate change legislation, the importance of limiting GHG emissions, and how policies could have indirectly resulted in greater global emissions. Part II examines cap-and-trade by looking at the failure of the EU ETS system of carbon regulation. Part III reviews the carbon-tax approach. Part IV presents a modified carbon-taxation program incorporating reinvestment, details its benefits, and provides results for the EU, United States, United Kingdom, and China. Part V summarizes why the world should abandon cap-and-trade as a policy in favor of a carbon tax with reinvestment (CTR).

II. CAP-AND-TRADE

A. Cap-and-Trade Explained

In order for a legislature to develop a cap-and-trade program, it is necessary to appoint a governmental agency to establish a maximum level of emissions (a cap) on carbon; typically, at the start, this will only affect certain targeted industries.[81] The industries or firms targeted are then required to lower their GHG emissions below the cap.[82] To encourage participation and compliance with a goal of minimizing initial costs, it is common to provide these polluters allowances (for free) to pollute, and, if they do not need all of the allowances

79. *See* Press Release, Wetlands Int'l, New Figures: *Palm Oil Destroys Malaysia's Peatswamp Forests Faster Than Ever* (Feb. 1, 2011), http://www.wetlands.org/News/Pressreleases/tabid/60/ID/2583/New-figures-palm-oil-destroys-Malaysias-peatswamp-forests-faster-than-ever.aspx; *Amazon Deforestation Reduced by Nearly 84%, Brazil Says*, PHYS.ORG (Jun. 5, 2013), http://phys.org/news/2013-06-amazon-deforestation-brazil.html.

80. BRIC is a term coined by Goldman Sachs in the 1990s to represent the largest and quickest growing developing countries—Brazil, Russia, India, and China.

81. *See* Robert Hahn & Robert Stavins, *The Effect of Allowance Allocations on Cap-and-Trade System Performance*, 54 J.L. & ECON. S267, S269-71 (2011).

82. *See id.*

due to proactive efforts, they can trade or sell them to other polluters.[83] Polluters who are unable to reduce their GHG emissions below their allocation, can then purchase these traded allowances. Based on this structure, a cap-and-trade system appears to create a market between polluters in which the supply and demand of the allowances determines the price of emissions (dollars per ton of CO_2).[84] By factoring in price and allowing the price to fluctuate to achieve the cap, the cap-and-trade system is designed to reduce GHG emissions by allowing polluters to choose between investing to reduce emissions or purchasing allowances. The goal is to bring about the most efficient processes that use less energy and to create demand for cleaner forms of energy due to rising costs associated with emissions.[85]

1. Pros of Cap-and-Trade

A cap-and-trade program has some unique advantages with respect to reducing GHG emissions. It is favored politically because it avoids use of the word "tax," and allows governments to appear proactive by dictating the level of emissions allowances.[86] Environmentalists tend to favor it because they perceive the cap to be a fixed, clear quantity restriction, therefore incentivizing polluters to reduce emissions.[87] Industrial groups who are able to adjust their emissions like the program because of their inherent money-making potential.[88] The supporters of cap-and-trade schemes believe in two critical assumptions: carbon emissions below a designated cap level are acceptable and do not cause undue harm to the environment, and a market of trading pollution allowances is "the most cost effective means of reducing pollution to the predetermined level."[89]

2. Cons of Cap-and-Trade

The biggest challenges of cap-and-trade are determining the baseline amount of emissions and reduction targets, how to allocate allowances, and how to use offsets.[90] These issues combined with the rules surrounding them often slow

83. *See id.*

84. *See id.*

85. *See* Hahn & Stavins, *supra* note 81, at S288-89.

86. *See* Robert N. Stavins & Robert W. Hahn, *Why Cap-and-Trade Should (and Does) Have Appeal to Politicians*, VOX (Apr. 13, 2010), http://www.voxeu.org/article/why-cap-and-trade-should-and-does-have-appeal-politicians.

87. *See* Stephen Sewalk, *Carbon Tax with Reinvestment Trumps Cap-and-Trade*, 30 PACE ENVT'L L. REV. 580, 587 (2013).

88. *See id.*

89. *Id.* (quoting Roberta F. Mann, *The Case for the Carbon Tax: How To Overcome Politics and Find Our Green Destiny*, 39 ENVT'L L. REP. NEWS & ANALYSIS 10118, 10120 (2009)).

90. *See* Edward Nell et al., *Economic Growth and Climate Change: Cap-and-Trade or Emission Tax?* 10 (Schwartz Ctr. for Econ. Policy Analysis, Working Paper No. 2009-4, 2009), *available at* http://www.newschool.edu/scepa/publications/workingpapers/SCEPA%20Working%20Paper%202009-4.pdf.

down the development of a cap-and-trade scheme, leading to lengthy implementation periods.[91] While the level of emissions is viewed as certain, it is difficult to forecast a price to achieve the promised emissions-reduction levels defined by the cap.[92] Because of the need to balance many factors, carbon markets experience unforeseen volatile price shifts, raising the need to constantly monitor the cap-and-trade scheme and question actual emissions levels.[93] Should the price of carbon soar, there is pressure to relax or modify the cap to reduce the price.[94] However, if the cap is relaxed too much, the price drops and the market disintegrates.[95]

A cap-and-trade scheme does not actually guarantee a reduction in real GHG emissions, only in perceived or stated emissions, which contradicts the primary goal of enacting such a scheme. To determine caps, this type of scheme requires certainty about the demand for emissions, and therefore, requires precise regulation.[96] To make the program effective, all emissions allowances need to be auctioned off; otherwise, it is strife with subsidies to polluters.[97] If there is uncertainty in emissions demand, then a cap-and-trade program becomes unstable and unworkable.[98] Political interference can also threaten the viability of a cap-and-trade program.[99]

Moreover, implementing a cap-and-trade program is a complex undertaking. These programs depend on low-carbon-emission technologies being identified, developed, and adopted to make the costs manageable in emissions reductions.[100] Theoretically, the goal is for the markets to respond to the price, signaling that these technologies need to be developed in order to curb emissions. Therefore, the current and future prices provide an incentive for the development and use of these low-carbon technologies.[101] Importantly, costs must be kept low if cap reduction is to occur. But, what if the costs do not remain low or what if technologies take time to be developed? This uncertainty requires a sophisticated structure that assures additional government funding for research, as well as incentives for private research and development, including energy subsidization.[102] These concerns result in

91. *See id.* at 12-13.

92. *See id.*

93. *See* Julien Chevallier et al., *Options Introduction and Volatility in the EU ETS*, 33 RESOURCE & ENERGY ECON. 855, 857 (2011).

94. *See id.*

95. *See id.*

96. *See* Phil Levy, *The Carbon Tax/Cap-and-Trade Royal Rumble*, FOREIGN POL'Y (May 13, 2009, 11:51 AM), http://shadow.foreignpolicy.com/posts/2009/05/13/the_carbon_taxcap_and_trade_royal_rumble.

97. *See id.*

98. *See id.*

99. *See id.*

100. *See* Hann & Stavins, *supra* note 81, at S276 (noting reliance on technological solutions and conservation to meet emissions cap).

101. *See id.*

102. *See id.*

legislation allowing for multi-year compliance periods, banking and borrowing provisions, cost-containment mechanisms to avoid excessive pricing, and the availability of offsets for carbon capture and sequestration, which may or may not actually produce any benefits.[103]

Cap-and-trade can deliver an incorrect, unclear, or disconnected message regarding reducing emissions when the actual goal of the program should be primarily to reduce GHG emissions.[104] Cap-and-trade seemingly allows polluters to purchase the right to pollute or to be given free permits to pollute, which could be interpreted as the government encouraging polluters to continue emitting.[105] Is the concept of a "right to pollute" congruent with society's interests in reducing GHG emissions?[106] At least with a carbon tax—through its use of the word "tax"—it informs the public and polluters what happens to emitters (i.e., they pay).

B. Why Cap-and-Trade Has Proven Ineffective

1. U.S. Sulfur Market as an Example

The United States was the first country to adopt a cap-and-trade system. It created a sulfur market in the 1990s to reduce acid rain from stationary sources, not from a variety of sources.[107] Initially perceived as a great success because sulfur emissions fell and reduced acid rain, the cap-and-trade market for sulfur dioxide (SO_2) emissions collapsed in July 2010.[108] At one point, SO_2 emissions allowances traded for over $1600 per ton before dropping to less than $3 per ton.[109] The program caused unintended and misleading environmental effects.[110] Again, the goal was to reduce acid rain by reducing SO_2 emissions.[111] The unintended effect (and cheapest solution) was to replace high-sulfur coal from the East and Midwest with low-sulfur coal from the West.[112] While the desired reduction of SO_2 emissions was achieved, Western coal actually created more CO_2 pollution because of the need to transport it to the industrialized regions in the East and Midwest.[113] As Bitumen (Western

103. *See id.*

104. *See* David M. Driesen, *Capping Carbon*, 40 ENVTL. L. 1, 3-7 (2010).

105. *See* Reuven S. Avi-Yonah & David M. Uhlmann, *Combating Global Climate Change: Why a Carbon Tax Is a Better Response to Global Warming Than Cap and Trade*, 28 STAN. ENVTL. L.J. 3, 44-45 (2009).

106. *See id.*

107. *See id.* at 34.

108. *See* Joseph Bast, *Cap-and-Trade's Market Failure*, AM. THINKER (July 28, 2010), http://www.americanthinker.com/archived-articles/../2010/07/capandtrade_market_failure.html.

109. *Id.*

110. *See id.*

111. *See id.*

112. *See* Bast, *supra* note 108.

113. *See* Dallas Burtraw, *Cost Savings Sans Allowance Trades? Evaluating the SO2 Emission Trading Program to Date* 11 (Res. for the Future, Discussion Paper No. 95-30-REV, 1996), *available at*

coal) has less energy per ton than Anthracite (Eastern coal), it also meant more coal needed to be burned to achieve the same level of power production, combined with pollution from cross-country transportation, the result was increased overall carbon emissions.[114]

2. The EU ETS and Its Failure

Because of the perceived successful implementation of the U.S. sulfur market, at least as of the early 2000s, the EU adopted the EU ETS and modeled it after the U.S. sulfur market.[115] The EU ETS, comprising all of the countries of the EU, along with Iceland, Norway, and Liechtenstein, became the largest and most influential GHG emissions reduction program in the world.[116] However, it has failed to live up to expectations.[117] After the European Parliament voted to reject a back-loading attempt to strengthen the faltering cap-and-trade market for emissions allowances, the EU ETS's days may be limited.

The EU ETS is a combination of two other failed climate change initiatives.[118] It resembles the failed attempt by the European Commission's 1990's carbon tax and the Commission's failed attempt to reject flexible trading principles set forth in the Kyoto Protocol.[119] Implemented in 2005, the European Commission divided it into phases designed to allow changes to the program over time.[120] The first phase, "learning by doing," lasted from January 2005 to December 2007, whereby the EU ETS allocated allowances freely.[121] Initially adopted by fifteen member states, the EU ETS included 12,000 carbon polluters from many different industries.[122] In 2005, 260 million tons of CO_2

http://www.rff.org/documents/RFF-DP-95-30-REV.pdf?origin=publication_detail. Switching to low-sulfur fuel (coal) is the most popular compliance option to date. *See id.* Western coal is located further from Eastern power plants, requiring longer and therefore more polluting train transport. *See id.* Once the lower energy content coal is burned in Eastern power plants, more coal needs to be burned, thus producing more CO_2 emissions, although less SO_2 emissions.

114. *See id.*

115. LUCAS MERILL BROWN ET AL., THE EU EMISSIONS TRADING SYSTEM: RESULTS AND LESSONS LEARNED 5 (2012), *available at* https://www.edf.org/sites/default/files/EU_ETS_Lessons_Learned_Report_EDF.pdf.

116. *The EU Emissions Trading System (EU ETS)*, EUR. COMMISSION, http://ec.europa.eu/clima/policies/ets/index_en.htm (last updated Apr. 15, 2014).

117. *See generally* Petherick, *supra* note 65.

118. *See* Frank J. Convery, *Origins and Development of the EU ETS*, 43 ENVTL. RESOURCE ECON. 391, 392 (2009).

119. *See id.*

120. *See* C. Böhringer & A. Lange, *European Union's Emissions Trading System*, 3 ENCYCLOPEDIA OF ENERGY NAT. RESOURCE & ENVTL. ECON. 155, 156 (2013), *available at* ftp://poloeco.unica.it/brau/Economia%20Ambiente%20e%20Territorio/Dispense%20su%20CDM%20e%20EU-ETS/Boringher_Lange-EU-ETS.pdf.

121. *See* Marjan Peeters & Stefan Weishaar, *Exploring Uncertainties in the EU ETS: "Learning by Doing" Continues Beyond 2012*, 3 CARBON & CLIMATE L. REV. 88, 95 (2009).

122. *See* Yue-Jun Zhang & Yi-Ming Wei, *An Overview of Current Research on EU ETS: Evidence from Its Operating Mechanism and Economic Effect*, 87 APPLIED ENERGY 1804, 1805 (2010).

were traded on the EU ETS.[123]

In 2006, the price of the allowances rose to around €30 per ton of CO_2, which would later come to be the peak in carbon prices.[124] Prices then plunged 54% when several EU countries stated their actual emissions were less than the number of allowances.[125] With over-allocated allowances to emitters, there was no scarcity and therefore no support for prices.[126] By 2007, the price of an allowance was almost zero, which eliminated the need for targeted polluters to limit their GHG emissions.[127] Polluting was once again a free commodity. The first phase ultimately saw carbon emissions rise by 0.68%.[128]

3. Global Recession and Continued EU ETS Failure

This failure seemed to repeat itself in phase II in which over-allocations led to market fluctuations in price, contributing to the eventual collapse.[129] In 2008, the European nations were hit particularly hard by the global recession.[130] If everyone uses less energy (especially due to a recession), then there is less pollution; unless allowances are adjusted, there will be a problem with the price.[131] The EU's vote against withholding future allowances resulted in the price for allowances of one ton of carbon falling under €3.[132] As the EU expanded and new countries joined the EU ETS, the program sought to begin incorporating national emissions registries into one EU registry.[133]

Currently in phase III (2013 to 2020), the EU ETS is switching to auctioning allowances.[134] Australia's carbon trading system may be incorporated to make both systems compatible with each other.[135] Phase IV is slated for 2021 to

123. *See id*.

124. *See* Beat Hinterman, *Allowance Price Drivers in the First Phase of the EU ETS*, 59 J. ENVTL. ECON. & MGMT. 43, 43 (2010).

125. *See id*.

126. *See id.*

127. *See id.*

128. *See* Press Release, European Comm'n, *Emissions Trading: 2007 Verified Emissions From EU ETS Businesses* (May 23, 2008), http://europa.eu/rapid/press-release_IP-08-787_en.htm?locale=en.

129. *See* Hinterman *supra* note 124, at 44.

130. *See generally* COMM. ON CLIMATE CHANGE, MEETING CARBON BUDGETS—THE NEED FOR A STEP CHANGE: PROGRESS REPORT TO PARLIAMENT (2009), *available at* http://www.official-documents.gov.uk/document/other/9789999100076/9789999100076.pdf.

131. *See id*.

132. *See Carbon Trading: ETS, RIP?*, *supra* note 67.

133. *See* Prajakt Samant & Simone Goligorsky, *EU Emissions Trading System Single Registry: Timetable Announced*, NAT'L L. REV. (May 15, 2012), http://www.natlawreview.com/article/eu-emissions-trading-system-single-registry-timetable-announced.

134. *See* Tim Laing et al., *Assessing the Effectiveness of the EU Emissions Trading System* 23 (Ctr. for Climate Change Econ. & Policy, Working Paper No. 126 and Grantham Research Inst. on Climate Change & the Env't, Working Paper No. 106, 2013), *available at* http://www.lse.ac.uk/GranthamInstitute/publications/WorkingPapers/Papers/100-109/WP106-effectiveness-eu-emissions-trading-system.pdf.

135. *See International Carbon Markets*, EUR. COMM'N, http://ec.europa.eu/clima/policies/ets/linking/index_en.htm#australia (last updated Apr. 15, 2014).

2028 and could potentially increase the rate at which the cap is decreased each year.[136]

Ultimately, the EU ETS cost Europeans €210 billion through 2011, according to UBS Investment Research, and resulted in zero changes to overall emissions of the EU.[137] If those funds had been used in a targeted manner, they could have potentially lowered emissions in the EU by 43%.[138]

4. Windfalls, Burdens, and Failures

While ineffective at climate change mitigation, the EU ETS enriched power producers and a significant portion of the "costs" of carbon emissions allowances (freely allocated and auctioned) were passed on to consumers.[139] The EU ETS unintentionally energized the power industry's profits throughout Europe.[140] This is not an effective message for polluters—rather than penalize the power industry for high emissions and encourage them to reduce emissions across the board, the EU ETS allowed the emitters to see record profits while ignoring its underlying goal.[141] As a result, consumer's suffered due to high energy prices.[142] Over eight years, the EU ETS created the opposite of stability and certainty. Above all, the EU ETS market is volatile, inefficient, and has resulted in high costs for consumers while failing to reduce emissions.

5. Border Tax Adjustments: Carbon Leakage, EU ETS, and Aviation

Phase II of the EU ETS was also designed to expand the scope of the program and incorporate aviation emissions into the scheme in 2012.[143] All flights within the EU needed to acquire allowances to cover CO_2 emissions.[144] The goal for Europe was to create a Border Tax Adjustment (BTA) by selecting the aviation industry as the guinea pig. This created significant trade frictions with countries arguing that the BTA would be harmful to airlines and nullify previous treaties.[145] The United States and China were greatly opposed to the

136. *See Allowances and Caps*, EUR. COMMISSION, http://ec.europa.eu/clima/policies/ets/cap/index_en.htm (last updated Apr. 15, 2014).

137. *See* Sid Maher, *Europe's $287bn Carbon 'Waste': UBS Report*, THE AUSTRALIAN, Nov. 23, 2011, http://www.theaustralian.com.au/national-affairs/europes-287bn-carbon-waste-ubs-report/story-fn59niix-1226203068972#.

138. *See id.*

139. *See* Wietze Lise et al., *The Impact of the EU ETS on Prices, Profits and Emissions in the Power Sector: Simulation Results with the COMPETES EU20 Model*, 47 ENVTL. RESOURCE ECON. 23, 24 (2010).

140. *See id.*

141. *See id.*

142. *See id.*

143. *See* Robert Malina et al., *The Impact of the European Union Trading Scheme on U.S. Aviation*, 19 J. AIR TRANSPORT MGMT. 36, 36 (2012); *see also* Annela Anger & Jonathan Köhler, *Including Aviation Emissions in the EU ETS: Much Ado About Nothing? A Review*, 17 TRANSPORT POL'Y 38, 39-40 (2010).

144. *See* Anger & Köhler, *supra* note 143, at 40.

145. Malina et al., *supra* note 143, at 36.

expansion of the EU ETS into aviation emissions because the EU's largest trading partners had a large stake in the matter.[146] In response, the United States passed an anti-ETS act called the European Union Emissions Trading Scheme Prohibition Act of 2011.[147] When China also threatened to take action, the EU backed down by incorporating an exemption clause.[148]

Without an effective BTA, the EU's competitiveness with other global economies has been impacted by carbon leakage, a by-product of the EU ETS.[149] Economic competitors from other countries gain a competitive advantage because they do not need to internalize the cost of their emissions by adhering to such a restriction.[150] This leakage leads to an economic disadvantage for industries in regulated areas, while also undercutting the efforts of the reduction program by increasing emissions in nonregulated areas.[151] As can be inferred from Figure 2 above, developed countries that propose or pass emissions-capping legislation, as was done with Kyoto, experience a significant in-bound flow of FDI.

Economists and environmentalists have noted that climate change cannot be solved if carbon leakage is allowed to thrive, and they have suggested the adoption of BTAs.[152] The purpose is to level the playing field and minimize emissions by taxing imports from countries without climate change policies, thereby discouraging FDI to "dirty" countries.[153] In adopting a BTA, emitters operating in countries with no emissions controls do not gain a significant competitive economic advantage.

Because the EU ETS has not incorporated a BTA strategy, companies within the EU are left at a disadvantage in the global marketplace.[154] However, implementing a BTA is very challenging and, more likely than not, why the European Commission has yet to do so.[155] The EU would need to comply with rules of the World Trade Organization (WTO) when determining the BTA's application to certain products and services.[156] Given the precarious nature of

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146. *See id.*

147. *See generally* European Union Emission Trading Scheme Prohibition Act of 2011, Pub. L. No. 112-200, 126 Stat. 1477 (2012) (stating civil aircrafts from United States would not participate in EU ETS)

148. *See* Malina et al., *supra* note 143, at 36.

149. *See* Peters & Hertwich, *supra* note 33, at 40; *see also* Stéphanie Monjon, *A Border Adjustment for the EU ETS: Reconciling WTO Rules and Capacity To Tackle Carbon Leakage*, CENTRE FOR RES. ON ENERGY & ENVTL. ECON. & POL'Y 2 (2012), http://www.iefe.unibocconi.it/wps/wcm/connect/2868172a-c6fd-47b9-b8d9-9984bc140f47/Monjon.pdf?MOD=AJPERES.

150. *See* Kathy Baylis et al., *Leakage, Welfare, and Cost-Effectiveness of Carbon Policy*, 103 AM. ECON. REV. PAPERS & PROCEEDINGS 332, 333 (2013).

151. *See id.* at 332.

152. *See* Truby, *supra* note 36, at 156-57.

153. *See* Monjon, *supra* note 149, at 2.

154. *See* Frank Venmans, *A Literature-Based Multi-Criteria Evaluation of the EU ETS*, 16 RENEWABLE & SUSTAINABLE ENERGY REVIEWS, 5493, 5497 (2012).

155. *See id* at 5508-09.

156. *See* Monjon, *supra* note 149, at 4-5.

the EU's economy over the past few years, it is possible the EU is hesitant to adopt a BTA, lest it upset the fragile trading balance in the region.[157] But key questions remain: is cap-and-trade the best system, and would another system, such as a carbon tax, produce more efficient results (i.e., reduce EU emissions)?[158]

III. CARBON TAX

A. Carbon Tax as an Alternative

Does a more effective climate change legislative policy exist? The most popular alternative to the cap-and-trade program is a simple carbon tax; specifically, a tax levied on each ton of CO_2 emitted.[159] Most literature recognizes the carbon tax as the most basic form of climate change regulation that aims to lower carbon emissions.[160] Carbon emitters create negative externalities in the form of pollution that affects every aspect of society.[161] A carbon tax adds a cost to internalize those negative externalities.[162] A carbon tax implements the "polluter pays principle," outlined in Principle 16 of the Rio Declaration.[163] Economically, this internalization through carbon taxation creates a justifiable reason to impose the tax.[164] Overall, a carbon tax mandates that the polluter absorb the costs associated with the harm the pollution creates, as well as the cost of minimizing any future harm.[165]

Surprisingly, politicians are generally not supporters of a carbon tax.[166] This aversion likely stems from the unpopularity of policies that have a "tax" label.[167] Still, the carbon-tax structure has many distinct benefits making it appealing to both politicians and citizens alike. Carbon taxes result in prices

157. Venmans, *supra* note 154, at 5506-07.

158. *See generally* Gilbert E. Metcalf & David Weisbach, *The Design of a Carbon Tax*, 33 HARV. ENVTL. L. REV. 499 (2009); Michael J. Waggoner, *The House Erred: A Carbon Tax Is Better Than Cap-and-Trade* (Univ. of Colo. Law Sch., Legal Studies Research Paper Series, Working Paper No. 09-18, 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1489592.

159. *See* Levy, *supra* note 96. *See generally* Miles Young, Comment, *Beautifying the Ugly Step-Sister: Designing an Effective Cap-and-Trade Program To Reduce Greenhouse Gas Emissions*, 2009 B.Y.U. L. REV. 1379 (2009).

160. *See generally* Waggoner, *supra* note 158.

161. *See* Sewalk, *supra* note 2, at 143.

162. *See* Duff, *supra* note 3, at 2069.

163. *See* United Nations Conference on Environment and Development, Rio de Janiero, Braz., June 3-14, 1992, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/26/Rev.1 (Vol. I) Annex I, Principle 16 (Aug. 12, 1992). The Rio Declaration is a decree of twenty-seven principles adopted by the U.N. Conference on Environment and Development and endorsed by the U.N. General Assembly. *See id.* The principles of the Rio Declaration are the result of compromise between developed and developing nations. *See id.*

164. *See* Duff, *supra* note 3, at 2069.

165. *See* Sewalk, *supra* note 2, at 143.

166. *See generally* Hahn & Stavins, *supra* note 81.

167. *See id.*

that more easily reflect a product's environmental impacts, as such they encourage energy efficiency and new environmental technologies, generate revenue, and are easily implemented.[168] Carbon-tax advocates rally around its simplicity in regulatory systems, the clear message the tax delivers, and most of all, that it yields price stability.[169]

Carbon taxation proposals typically suggest two directions, both of which are revenue-neutral.[170] The first, referred to as an equal-dividends approach, allows for the revenues to be rebated in equal portions directly to all residents of a particular country or region.[171] The second, known as a taxation-shift approach, takes each dollar of revenue and reduces the existing taxes by that amount, thereby offsetting federal or state income taxes, payroll taxes, or sales taxes (e.g., value added tax (VAT)).[172] Both approaches return the revenue collected to the consumers, making the public more amenable and supportive of a carbon tax.[173] These designs mean the tax is not likely to become regressive.[174] The drawback is, like cap-and-trade proposals, it is not possible to assure carbon emissions will actually decline. The focus remains on consumers reducing their carbon consumption through new and improved technologies, energy efficiencies, and hopefully, cleaner power plants.[175]

Prior to the adoption of the EU ETS, there were proposals for the EU to simply adopt a broad carbon tax across Europe, but EU member states viewed the taxation across borders as a potential threat to national autonomy because taxing authority is traditionally a sovereign right of an individual country.[176] Also, a centralized tax structure is a step towards a federal government and political union. The North American Free Trade Agreement (NAFTA) would more than likely encounter similar objections, particularly given the United States' involvement in NAFTA.[177] Given the resistance to an EU-wide tax, it is interesting to note that every country in the EU already has a form of energy tax.[178] The European Commission has issued directives recommending energy

168. *See* Avi-Yonah & Uhlmann, *supra* note 105, at 7-8.

169. *See* Roberta Mann, *To Tax or Not To Tax Carbon—Is That the Question?*, 24 NAT. RESOURCES & ENV'T 44, 45 (2009).

170. *See Introduction: What's a Carbon Tax*, CARBON TAX CENTER, http://www.carbontax.org/introduction (last updated Sept. 17, 2013).

171. *See id.*

172. *See id.*

173. *See id.*

174. *See* Gilbert E. Metcalf, *Paying for Greenhouse Gas Reductions: What Role for Fairness?*, 15 LEWIS & CLARK L. REV. 393, 400 (2011).

175. *See* Avi-Yonah & Uhlmann, *supra* note 105, at 45.

176. *See* Convery, *supra* note 118, at 392-93.

177. NAFTA was implemented on January 1, 1994 to encourage economic activity and cooperation on trade and economics between the United States, Canada, and Mexico. *See generally* North American Free Trade Agreement, U.S.-Can.-Mex., Dec. 17, 1992, 32 I.L.M. 289 (entered into force Jan. 1, 1994).

178. *See* MARCO FANTINI ET AL., TAXATION TRENDS IN THE EUROPEAN UNION: DATA FOR THE EU MEMBER STATES AND NORWAY 68 (Marco Fantini ed., 2009), *available at* http://epp.eurostat.ec.europa.eu/cach

taxes that address global climate change.[179]

Carbon taxation has the potential to be more effective than the EU ETS cap-and-trade program currently in place; however, a carbon tax has many of the same drawbacks.[180] The largest potential pitfall of a carbon tax is that while it provides price certainty, it does not offer emissions certainty, and therefore, declining emissions.[181] Just like cap-and-trade systems, there is an incentive for polluters to lower their carbon emissions, but that does not ensure the reductions will occur or that they will be sufficient to avoid the disastrous impacts of global warming.[182] There is nothing in the carbon tax system that creates the implementation of new cleaner forms of energy.[183] A carbon tax has the same limitations that cap-and-trade programs have in that it may not address underlying environmental and public health issues facing the GHG-emissions legislation.[184]

B. Why Carbon Tax Beats Cap-and-Trade

Carbon taxation has some clear-cut advantages over the current EU ETS system as well as other cap-and-trade emissions reduction strategies. These advantages all take shape in the implementation of the program, the certainty of the program's effectiveness, the ability to enforce the carbon tax, and the environmental impact of the program.[185]

1. Certainty of Cost Compared with Certainty of Benefit

It is clear that both carbon taxation and cap-and-trade systems are market-oriented schemes constructed to reduce carbon emissions. However, there is a heated debate concerning the superiority of the two approaches, and perhaps the largest area of discrepancy between the two is the "benefit certainty" versus "cost certainty" standard.[186] In a cap-and-trade system, the cap—i.e., the maximum amount of allowable emissions—provides the environmental benefit from the emissions reduction and is referred to as the "benefit certainty."[187] However, just because it is labeled "benefit certainty" does not mean any benefit will actually occur, as illustrated by the case of the EU, and this is the

e/ITY_OFFPUB/KS-DU-09-001/EN/KS-DU-09-001-EN.PDF.

179. *See id.*; *see also* Leonardo Massai, *European Climate and Energy Policy Dossier*, ASSER INST. (last updated Sept. 10, 2007), http://www.asser.nl/default.aspx?site_id=7&level1=12219&level2=12236.

180. *See generally* Avi-Yonah & Uhlmann, *supra*, note 105.

181. *See* Naomi Oreskes, *Metaphors of Warfare and the Lessons of History: Time To Revisit a Carbon Tax?*, 104 CLIMACTIC CHANGE 223, 227-28 (2011) (setting forth uncertainty surrounding "proven instrument" of taxation).

182. *See id.* at 228.

183. *See id.*

184. *See id.* at 227.

185. *See* Avi-Yonah & Uhlmann, *supra* note 105, at 37-44 (highlighting advantages of carbon tax).

186. *See id.* at 35-37.

187. *See id.* at 36.

biggest flaw of cap-and-trade.[188] Additionally, all cap-and-trade programs have reversion mechanisms to a carbon tax if the price of carbon gets out of hand. For example, a country would never shut down its power sector simply because emissions permits for the year were all used by November.

The carbon-tax system, on the other hand, relies on a predetermined carbon-emissions price, set in advance, allowing emitters to plan future power plant upgrades to reduce emissions and improve efficiencies. It also allows consumers to plan their purchases. With this set pricing strategy, a carbon tax establishes cost certainty.[189] Cap-and-trade programs cannot match this cost certainty because there will be fluctuations in the market over time and the cost will be adjusted accordingly.[190] In practice, this stability in price that coincides with a carbon tax could prove to be as much as five times more cost effective than a cap-and-trade program.[191] It is also important to note the benefit certainty of the cap-and-trade scheme can be nullified if the cap is set at an inappropriate level and if there is no incentive for emitters to comply with the regulations.[192] This is precisely what occurred in the initial phases of the EU ETS.[193] Over allocation of allowances undermined the benefit certainty and negated the incentive for emitters to comply with the regulation, leading to a disappointing emissions reduction.[194] Thus, the certainty of the benefit is somewhat of a misnomer because the benefit is not concrete. Although carbon taxation does not have benefit certainty, an issue addressed by the CTR, it does have a very clear cost certainty.[195] The debate between which certainty is better becomes tilted heavily in favor of cost certainty when political intervention and unsustainable caps are added to the equation. In this regard, carbon taxation is favored over cap-and-trade.

2. Policy Enactment

Cap-and-trade is a strategy wrought with complexity.[196] This complexity is somewhat limited due to the upstream nature of the program.[197] In a cap-and-trade system, energy producers and citizens only see the higher prices passed along to them without the need or incentive to purchase their own permits. This minimizes the incentive to reduce consumption. That is, citizens will see

188. *See id.* at 36-37.
189. *See* Avi-Yonah & Uhlmann, *supra* note 105, at 36.
190. *See id.*
191. *See* Kenneth C. Johnson, Beware of the Dogmatist: A Consensus Perspective on the Tax-Versus-Cap Debate 1 (2008) (unpublished manuscript), *available at* http://ssrn.com/abstract=1154638.
192. *See id.*
193. *See* Hinterman, *supra* note 124, at 43.
194. *See id.*
195. *See* Avi-Yonah & Uhlmann, *supra* note 105, at 36; Sewalk, *supra* note 87, at 603.
196. *See* Sewalk, *supra* note 87, at 604.
197. *See id.* at 604-05.

the added cost but do not need to purchase permits to pollute. While this appears to imply a simpler approach, due to fewer emitters being involved, the system creates complexity in its implementation and oversight. First, the cap-and-trade program calls for extensive data to be collected in order to establish the cap amount. Then a decision to allocate, evenly distribute, or auction allowances needs to be made.

While this is may appear simple in theory, the EU ETS has shown it is one that can be complex in its application and can create serious deficiencies in the program if not adjusted appropriately.[198] When the legislation calls for free allowance allocation, the regulators in the scheme must decide who will receive the allowances and how many. Again, this is a simple sounding task that proved to be difficult during phases I and II of the EU ETS. In an auction of allowances, the regulating body must monitor the auctioning process to prevent fraud.[199] This necessary fraud-management strategy would also surely increase the cost of the cap-and-trade program. Next, another system of monitoring, such as a system either allocated freely or auctioned off, needs to be enacted to ensure fair trading of the outstanding allowances. This would be an endeavor to ensure allowances are utilized only once.[200] In addition, the cap-and-trade legislation must create an international enforcement policy for rule breakers if allowances are traded across international borders. Lastly, there must be provisions put in place that regulate the banking and borrowing of allowances.[201]

These types of provisions would likely create a safety measure in the case of extreme cost uncertainty.[202] If the cap-and-trade program calls for offsets for carbon sequestration and storage, then there must also be a provision to regulate these activities. Additionally, cap-and-trade programs, if they are to be effective, necessitate intense monitoring and reporting initiatives.[203] It cannot be denied that all of the requirements inherent in a cap-and-trade program impose complexities on to the implementation of the program. Further, the more complex the program the longer it takes to create and adjust each aspect of the scheme. In all, the EU should cut its losses with the EU ETS altogether, and adopt a new program—one based on a carbon tax—rather than attempt to adjust the failing cap-and-trade program, which is too difficult and slow to implement.

198. *See* Petherick, *supra* note 65, at 534.

199. *See* Metcalf & Weisbach, *supra* note 158, at 527-28 (pointing out regulators unlikely to allow utilities to charge customers for permits received for free).

200. *See id.* at 518.

201. *See* Joseph E. Aldy & Robert N. Stavins, *Economic Incentives in a New Climate Agreement*, BELFER CENTER FOR SCI. & INT'L AFFAIRS 2-3 (May 2008), http://belfercenter.ksg.harvard.edu/files/RS-JA%20Paper%20Economic%20Incentives%20080430.pdf.

202. *See id.* at 2 ("Recent attention has turned to incorporating 'cost containment' measures in cap-and-trade systems, including offsets, allowance banking and borrowing, and a safety valve.").

203. *See* Metcalf & Weisbach, *supra* note 158, at 532.

Carbon taxation is built around a simpler approach that can be implemented into the existing framework of the European Commission. There is no need to create and regulate a market, which is a continuing struggle for the EU ETS. A carbon tax could be imposed on all goods and services in Europe, as well as all imported goods and services.[204] For example, the tax could be set at $10 for every ton of carbon emitted to create the commodity. The tax could then increase over time as emitters become more accustomed to the tax.[205] In short, it is much simpler to adopt and manage than similar cap-and-trade approaches.[206]

3. Revenue Neutrality

Another clear advantage of a carbon tax based program for reducing carbon emissions over cap-and-trade based programs is that a carbon tax, no matter the form, will create revenue.[207] For example, a very low tax of only $10 per ton of carbon will generate approximately $50 billion for the EU per year.[208] Of course, the higher the tax levied on the carbon emitted, the greater the revenue amount for the regulator.[209] The use of this revenue would be very determinative of how the regulated population felt toward the legislation. One of the biggest criticisms against the carbon tax approach is that it has the potential to be jeopardized by becoming regressive.[210] The cap-and-trade approach has the same drawback.

Low-income households spend a greater percentage of their income on energy needs than higher income earning households.[211] Accordingly, the brunt of any rise in the energy price will be felt more severely by low-income earning households. Also, certain nations are more dependent on coal and will participate more in the carbon emissions reductions set forth in the program.[212] The best policy for the EU, or any regulating entity around the world, is to accommodate these political and economic issues while not compromising the principles that make the program cost-effective.[213] If enacted correctly, with

204. *See* Avi-Yonah & Uhlmann, *supra* note 105, at 32 (asserting ability of carbon tax to apply to all production and imports in United States).

205. *See id.* at 46-47 (noting if need to reduce emissions persists, history suggests tax rate could be increased).

206. *See id.* at 48.

207. *See id.* at 40.

208. Avi-Yonah & Uhlmann, *supra* note 105, at 40.

209. *See id.*

210. *See id.*

211. *See* Dallas Burtraw et al., *The Incidence of U.S. Climate Policy: Where You Stand Depends on Where You Sit* 14 (Res. for the Future, Discussion Paper No. RFF DP 08-28, 2008), *available at* http://www.rff.org/RFF/Documents/RFF-DP-08-28.pdf.

212. *See generally* Kenneth R. Richards & Stephanie Hayes Richards, *The Evolution and Anatomy of Recent Climate Change Bills in the U.S. Senate: Critique and Recommendations* (2009) (unpublished manuscript), *available at* http://www.indiana.edu/~cree/documents/SSRN_Richards_and_Richards.pdf.

213. *See id*. at v.

price stability, carbon taxes will generate revenues that may be utilized to provide compensation to those most affected by the tax.

4. The Impact on the Environment

While we may become lost in the focus on economics and politics, remembering the underlying cause concerning this legislation is important. The goal is to protect the environment and the public's health. In terms of climate change, everyone is a polluter, though not everyone pollutes to the same extent.[214] Perhaps the biggest downfall for the proposals to date in the cap-and-trade approach and carbon tax is that neither has provided proof that there will be a real reduction of carbon emissions if either is adopted. Both merely propose a reduction of carbon emissions will likely follow the adoption of the program. Cap-and-trade assumes market-based implementations will provide enough incentive for emitters to invest in and utilize new "greener" technologies.[215] Proponents of cap-and-trade believe this incentive will lead to an overall reduction in carbon emissions.[216] On the other hand, carbon taxation is based on the theory that by increasing the cost of carbon production throughout the chain of distribution, the use of carbon-intensive products will be less desirable and the public will be prompted to purchase items with a lower carbon intensity or usage.[217] Estimations and educated guesses as to the effect of any particular program's efficiency in lowering GHG emissions jeopardize the credibility of the approach as a whole, and may jeopardize the environment as well.

IV. A CARBON TAX WITH REINVESTMENT STRUCTURE (CTR)

A. Everyone Emits, Everyone Pays Under a CTR

Both cap-and-trade and carbon taxation are not capable of reducing GHG emissions with any certainty. If the EU and other nations and unions are to have a resonant impact on carbon emissions in the future, it is imperative that the system approaches lowering GHG emissions aggressively. The EU ETS has shown that a program without a certain approach may struggle to achieve its emissions-reduction goals. To ensure emissions are indeed lowered, new legislation must look to regulate all emitters and not just a certain subset of them.[218] A better alternative to both the cap-and-trade and carbon tax approaches is the CTR.[219]

214. *See id.* at 4 (explaining everyone pollutes in terms of CO_2).
215. *See* Hahn & Stavins, *supra* note 81, at S274.
216. *See id.*
217. *See* Waggoner, *supra* note 158, at 1259.
218. *See* Sewalk, *supra* note 87, at 609-10.
219. *See id.* at 610

A CTR is unique because it directly targets all carbon consumers and taxes them through a downstream strategy.[220] A CTR looks to incorporate the societal costs of GHG emissions, and promote emissions reduction.[221] The most obvious difference with this program is the reinvestment piece, which will work to nullify any doubt that the proposal will achieve the goals of benefitting society through environmental and health implications.[222] The monetary payment acts as a payoff of the environmental costs imposed by destructive emissions of carbon, and it serves to send an undeniable message about how seriously curbing GHG emissions will be taken.[223] The construction of environmentally friendly energy production facilities only furthers the message the tax itself sends.

B. Cost and Benefit Certainty

One of the most striking aspects of the CTR is its simplicity. For example, the tax could start at $5 per ton of carbon contained within the product based on emissions intensity.[224] The tax can be assessed either at the source or at the border on the good or service based on the emissions intensity (GDP/ton of CO_2), with the tax eventually paid by the consumer, as is always the case for a carbon tax or cap-and-trade.[225] Because everyone is an emitter based on carbon intensity, no one is exempt from the tax.[226] Following the implementation period, the tax rate increases systematically and is known to provide certainty to industries and consumers for their investments and planning purposes. "Despite an analysis remarking on the ability of increasing taxes to reduce future- and short-term emissions, the carbon tax with reinvestment does not rely on public option to reduce GHG emissions."[227] Unlike with the cap-and-trade system or the carbon tax, the CTR is not linked to the mere possible acquiescence of the power sector to adopt greener means of production.[228] The revenue from the taxation will be funneled into building new infrastructure for energy production.[229] Wind, geothermal, nuclear, solar facilities, and other renewable and clean sources of power will be built, taking the place of power plants that rely on carbon-emitting processes.[230] This alleviates the need to provide tax credits or incentives to develop and build these industries, rather

220. *See id*.
221. *See id.*
222. *See* Sewalk, *supra* note 87, at 610.
223. *See id.*
224. *See id.*
225. *See id.* at 610, 620.
226. *See* Sewalk, *supra* note 87, at 610.
227. *Id.*
228. *See id.*
229. *See id* at 610.
230. *See* Sewalk, *supra* note 87, at 610-11.

real orders are placed for their products to be manufactured and installed.[231]

Further, because the revenue for the construction of these facilities will come from the tax implemented by the program, there will be no disadvantage for utility providers, as they will not bear the burden of paying for building new plants.[232] Perhaps even more significantly, there will be no loss of jobs or production.[233] The construction of new infrastructure will actually create new jobs, estimated at over 1.3 million for construction and over 5 million direct, indirect, and induced jobs for the United States, EU, and United Kingdom.[234] By transforming old power installations into new low-to-no emissions facilities, the CTR program will quickly force emissions down without having to rely on market forces.[235] Strategically, this tax is designed to phase out over time. Although the tax rate rises from $5 to $50 per ton over a 10-year period, the tenth year marks a peak in total tax followed by a rapidly declining period of tax collection as a percentage of the economy.[236] This occurs, as shown in Figure 4 below, because as new power plants replace older power plants, the level of emissions declines significantly. Figure 4 is a flow chart that explains how the funds are collected and used. The model is based on all taxed GHG emissions. The taxes raised are used to order and construct new power plants. These power plants replace existing power plant infrastructure, which reduces emissions, resulting in lower future tax revenues.[237]

231. *See id.* at 611.

232. *See id.*

233. *See id.*

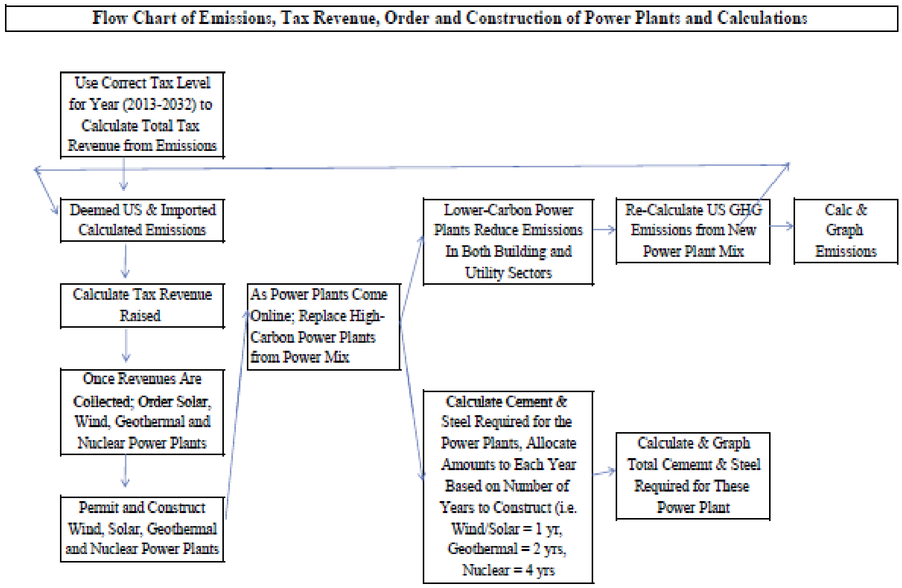
234. *See* Sewalk, *supra* note 87, at 611. During times of poor economic performance, the tax stream can be securitized, resulting in issuing project finance bonds allowing the construction of new facilities, while postponing payment until the future with a guaranteed revenue stream based on a carbon tax to pay the construction bonds.

235. *See infra* Figure 5. Figure 5 shows how an implemented CTR plan would lower emissions substantially over time.

236. Sewalk, *supra* note 87, at 610.

237. *See id.* at 613.

Figure 4: Model Flow Chart



C. *Economics of a CTR*

The economics of mitigating emissions vary significantly. We know from the EU ETS that due to misallocations of emissions the EU cap-and-trade system failed to reduce emissions, yet cost the public (i.e., the EU taxpayers) $287 billion.[238] At the peak, a ton of carbon traded on the EU ETS for €30, which was equivalent to approximately $38 per ton.

America's Climate Security Act of 2007 (also known as the Lieberman-Warner bill) proposed a cap-and-trade program to reduce U.S. emissions approximately 30% within twenty years.[239] Simulation models estimated the carbon tax would rise quickly, starting from $20 per ton in 2012, rising to $50 by 2020, and $70 by 2030.[240] The estimates showed millions of jobs lost and estimated added costs of $467 per year per household to purchase energy for the first eight years.[241] Other estimates showed carbon costs would have to rise significantly to curb demand and force utilities to produce cleaner power.[242]

238. *See* Maher, *supra* note 137.

239. *See generally* America's Climate Security Act of 2007, S. 2191, 110th Cong. (2007).

240. William W. Beach et al., *The Economic Costs of the Lieberman-Warner Climate Change Legislation*, THE HERITAGE FOUND. (May 12, 2008), http://www.heritage.org/research/reports/2008/05/the-economic-costs-of-the-lieberman-warner-climate-change-legislation.

241. *See id.*

242. *See* Tom Wilson, *Understanding Model Estimates of the Economic Costs of Climate Policy*, ELECTRIC POWER RESEARCH INST. 4 (May 22, 2008), http://eea.epri.com/pdf/epri-energy-and-climate-change-

The multiple models showed price ranges from $25 to over $150 per ton by 2030 to reduce emissions under the cap.[243]

The next U.S. cap-and-trade proposal was the American Clean Energy and Security Act (commonly referred to as the Waxman-Markey bill).[244] Models estimating the impact of Waxman-Markey on the U.S. economy included an aggregate reduction in GDP over twenty years of $7.4 trillion, a loss of 844,000 jobs, an increase in electricity prices by 90%, increased gasoline prices of 74%, and raising an overall average family's annual energy bill by $1500.[245] The American Enterprise Institute noted that to reduce emissions at the rate Waxman-Markey required would result in the United States turning the clock back more than a century in terms of emissions per capita, as provided below in Table 2.

TABLE 2
2005 PER-CAPITA EMISSIONS

	Per-capita CO_2 emissions (tons)	Per-capita income (2005 $)	CO_2 emissions intensity
Argentina	3.84	8,840	0.49
Belize	3.44	4,320	0.90
Botswana	2.45	5,540	0.50
Brazil	1.99	4,260	0.53
France	6.58	25,840	0.29
Grenada	2.77	5,990	0.52
Jordan	3.35	2,240	1.69
Mauritius	3.21	4,900	0.74
Syria	2.71	1,660	1.84
United States, 1875	2.40	3,180	n/a
United States, 2005	20.27	42,000	0.55

SOURCE: Energy Information Administration.

Under the typical proposals of cap-and-trade, the costs to society are very expensive and the benefits are doubtful. Additionally, carbon-tax legislation generally seeks immediate revenue neutrality, meaning taxes are collected and then returned equally to all of the payers, thereby technically incentivizing individuals to minimize their use of fuels and goods that result in high emissions.

Figure 5 illustrates how the economics of the CTR work in detail. Under the

research-seminar/2008/403934__E229020_T_Wilson_Understanding_Model_Estimates_Economic_Costs_of_Climate_Policy.pdf.

243. *See id.*

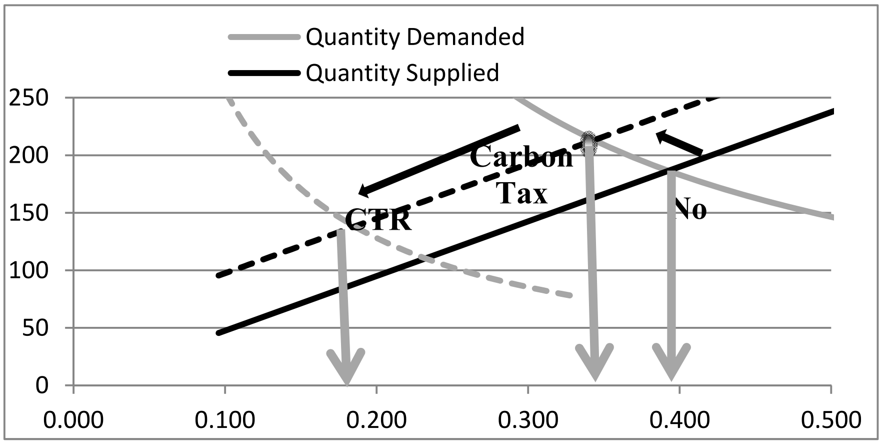
244. *See generally* American Clean Energy and Security Act, H.R. 2454, 111th Cong. (2009). Waxman-Markey was an energy bill that would have established a scheme similar to the EU ETS. *See id.* The House of Representatives approved the bill in 2009, but the Senate failed to pass it.

245. *See* William W. Beach et al., *The Economic Impact of Waxman-Markey*, THE HERITAGE FOUND. (May 13, 2009), http://www.heritage.org/research/reports/2009/05/the-economic-impact-of-waxman-markey.

current scenario (i.e., no tax) the United States emits approximately 0.4 tons of carbon per $1000 of GDP. In other words, the United States creates $2500 of GDP per ton of carbon emissions. The total cost of energy in the United States is equivalent to approximately $183 per ton of carbon. The intersection between the Quantity-Demanded curve and the Quantity-Supplied curve is $183 of energy to create a ton of carbon emissions and 0.4 tons of carbon emissions per $1000 of U.S. GDP. If a carbon tax of $50 per ton was imposed, this would result in a shift of the supply curve. The total cost of energy would now be equivalent to: $183 + $50 = $213. As a result, emissions decline due to reduced demand, as all goods (and services) become more expensive. This results in the intersection between Quantity-Demanded and Qs* (with a carbon tax of $50).

The economy becomes more energy efficient as energy use declines, but this comes at a high cost to households, as noted by the previously mentioned studies. Enter the CTR. The funds collected are used to build new power plants, creating significant levels of new jobs and economic output. The result is a new power infrastructure that is clean in comparison to the existing structure. As households pay for the power plants, the cost of future power (electricity) declines because utilities companies did not pay for the infrastructure. As a result, the public utility commissions no longer need to reward utilities companies with returns on assets paid for by the populace. The shift in quantity is tremendous and clearly outpaces the impact of purely rising costs from the carbon tax. As seen in Figure 5, Qs* ($50 carbon tax) now intersects with Qd* (CTR). The results are impressive. Although household costs increased due to the tax, the rebate in the form of cheaper, cleaner energy results in net savings to households and industry. Refunding the tax collected through cheaper, cleaner power in the relatively near future preserves the neutrality of the CTR. As the CTR also structures a BTA, this means a country's international competitiveness increases as energy costs drop due to clean energy. The new equilibrium shows energy efficiency improved by more than 34% (reduction in emissions) as well as reduced energy costs.

Figure 5: Cost of Carbon Energy vs. GDP per Ton of Emissions



D. Jobs and Economic Growth

The reinvestment of an implemented carbon tax would have a significant impact on job creation. First, the revenue from the tax is used to update old power facilities and establish new low-to-no emissions facilities that will require a number of new construction jobs.[246] The EU, United States, United Kingdom, and China could anticipate creating a minimum of 11,000 new direct construction jobs for each billion dollars of tax-created revenue.[247] These jobs would create an instant boost to any economy and functionally uplift the entire construction industry.[248] Also, after the initial construction of the facilities is finished, additional jobs will be created for maintenance and operation of these greener facilities.[249] This ensures that there will not be a drop in long-term employment numbers when the older facilities are retrofitted.[250] Studies have shown the number of jobs actually increases when low-to-no carbon facilities are operated instead of their higher-polluting counterparts.[251] This two-pronged employment benefit allows the CTR to have an immediate and lasting effect on economies that implement the approach.[252]

246. *See* Sewalk, *supra* note 87, at 611, 611 n.192.

247. *See* Rania Antonopoulos et al., *Investing in Care: A Strategy for Effective and Equitable Job Creation* 15-17 (Levy Econ. Inst. of Bard Coll., Working Paper No. 610, 2011) (discussing projected increase of construction jobs).

248. *See id.*

249. *See* Ulrike Lehr et al., *Green Jobs? Economic Impacts of Renewable Energy in Germany*, 47 ENERGY POL'Y 358, 359 (2012).

250. *See id.*

251. *See* Sewalk, *supra* note 87, at 611.

252. *See id.*

V. THE EU-27, U.S., U.K., AND CHINA SHOULD ADOPT THE CTR TO REDUCE GLOBAL EMISSIONS BY 34% IN TWENTY YEARS

A. Economic and Emissions Impact

While these countries emissions are outsized, so are their economies. In 2013 (measured in 2005 dollars), the United States was the largest economy in the world at $14,445 billion, followed by the EU-27 at $12,140 billion, China at $4,832 billion, and the United Kingdom at $2,360 billion.[253] Combined, these countries account for 61.1% of the world's projected GDP for 2013.[254] In 2010, these countries accounted for over 44% of the world's trade.[255] Although this number appears low, in actuality, the real trade numbers are much higher. This is so because the majority of trade occurs between developed countries. However, as the EU is counted as one country, trade between the European countries is not counted in Table 3. Rather, if counting EU countries separately with respect to trade and combining this with the United States, United Kingdom, and China, then the share of total of world trade would exceed 70%.

Table 3: Trade in goods and services 2010 ($ billions)[256]

Country or Region of Origin	Imports	Exports	Share of World's Imports and Exports
EU (incl. U.K.)	2542.8	2446.6	19%
U.S.	2290.6	1765.4	15%
China	1556.1	1714.7	10%

This economic heft is important, because, should these countries adopt the CTR, it would imply that they are adopting the CTR's BTA and would therefore significantly encourage other countries to enact similar CTR legislation or run the risk of being unable to compete in international markets. Formally, there are twenty-eight EU countries as well as three European Economic Area–European Free Trade Association states (Iceland, Liechtenstein, and Norway) within the EU ETS, which includes the United

253. *See International Macroeconomic Data Set*, U.S. DEP'T OF AGRICULTURE ECON. RES. SERVICE, http://www.ers.usda.gov/data-products/international-macroeconomic-data-set.aspx#.UoFNPzzn-Uk (last updated Dec. 19, 2013) (providing GDP statistics).

254. *See id.*

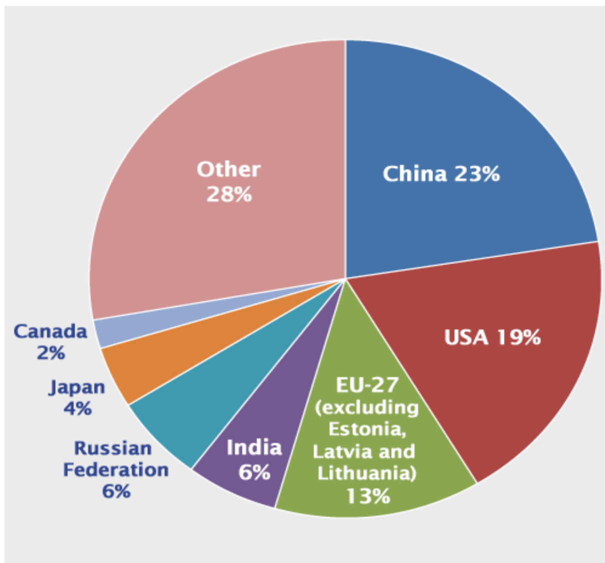
255. *See EU Position in World Trade*, EUR. COMM'N, http://ec.europa.eu/trade/policy/eu-position-in-world-trade (last updated July 1, 2013); *infra* Table 3 (providing 44% combined total share of world's imports and exports in 2010).

256. *See id.*

Kingdom.[257] For discussion and illustration purposes, the data is presented as an EU-27 data set with the U.K. data set shown separately to highlight that the CTR works effectively for smaller countries, larger countries, and regions.

In terms of global CO_2 emissions from fossil-fuel combustion, China represents 23% of total emissions, followed by the United States at 19%, the EU-27 at 13%, and the United Kingdom at 2%, representing 57% of global emissions for 2008, as shown in Figure 6.[258]

Figure 6: Allocations of Global CO_2 Emissions from Fossil Fuels[259]



The primary sources of GHG emissions come from fossil fuels, followed by land use and agricultural practices. The main fossil fuels burned are coal, natural gas, and oil. The power industry uses these fuels to generate most of its electricity. In this section, the energy sources used to produce electricity are presented as well as the impact the CTR would have on emissions.

Figure 7 illustrates which energy sources the EU uses to produce electricity. The EU obtains 54% of its power generation from fossil fuels. The 54% is comprised of coal (27%), oil (3%), and natural gas (24%). A significant portion of this natural gas is imported from Russia and Algeria. Surprisingly,

257. *The EU Emissions Trading System (EU ETS)*, *supra* note 116.

258. *Global Greenhouse Gas Emissions Data*, U.S. ENVTL. PROTECTION AGENCY, www.epa.gov/climatechange/ghgemissions/global.html#four (last visited Apr. 20, 2014).

259. *Id.*

the EU is burning more coal, due to low carbon prices on the EU ETS.[260]

Figure 7: EU Electricity Production by Source[261]

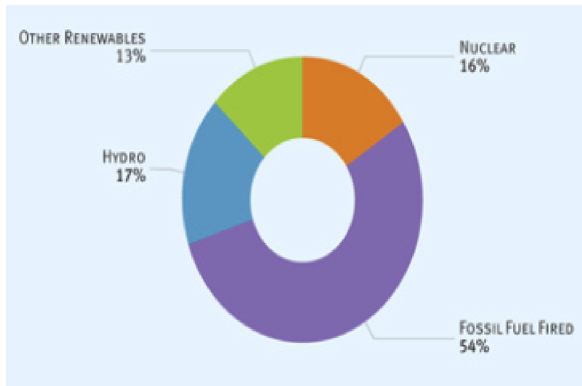
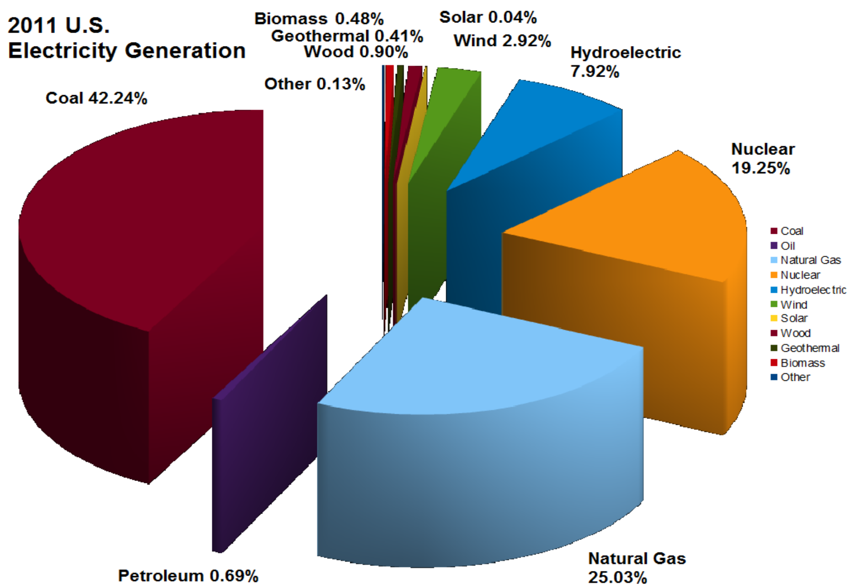


Figure 8 below presents U.S. data. The United States has shifted from coal to natural gas due to the fracking boom and production of shale gas. This has reduced coal's share of electricity production from over 50% to below 50%, although coal is still king. Electricity production comes from coal (42.2%), and natural gas (25.03%), while oil (0.69%) is rarely used for the production of electricity.

260. *See* Michael Kopalek and Tejasvi Raghuveer, *Multiple Factors Push Western Europe To Use Less Natural Gas and More Coal*, U.S. ENERGY INFO. ADMIN. (Sept. 27, 2013), http://www.eia.gov/todayinenergy/detail.cfm?id=13151.

261. *Back-up Needed: New Conventional Capacity Is Required*, EURELECTRIC, http://www.eurelectric.org/powerstats2011 (last visited Apr. 20, 2014).

Figure 8: U.S. Electricity Production by Source[262]



China is the biggest consumer of energy in the world due to its significant use of coal. Unfortunately, coal is a not an efficient energy resource when solely burned for power, resulting in lost energy and significant levels of emissions. China produces 79% of its electricity from coal with 2% coming from both natural gas and oil as shown below in Figure 9.

262. *See generally* U.S. ENERGY INFO. ADMIN., ELECTRIC POWER MONTHLY: FEBRUARY 2012 (2012), *available at* http://www.eia.gov/electricity/monthly/current_year/february2012.pdf (collecting data).

Figure 9: China's Electricity Production by Source[263]

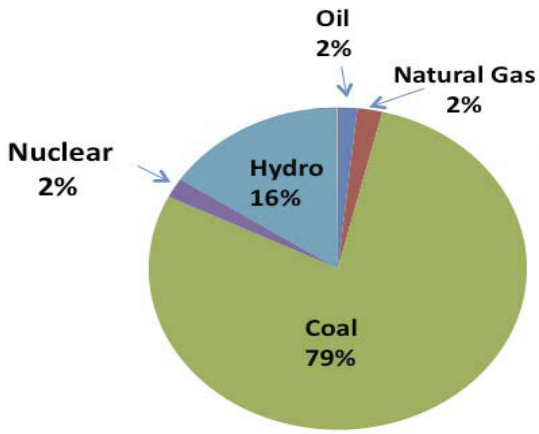
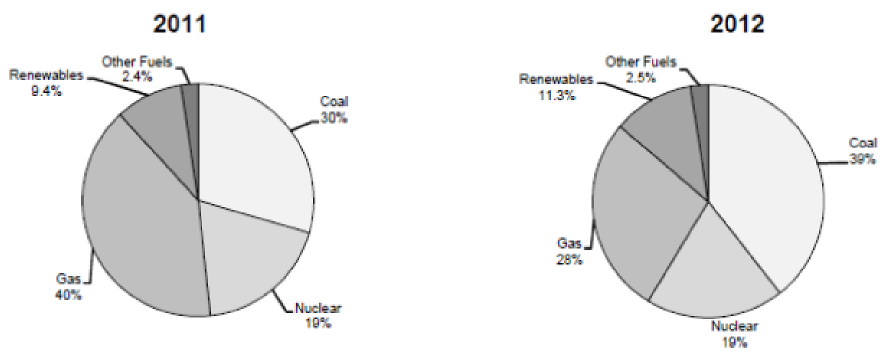


Figure 10 illustrates U.K. electricity production. The United Kingdom produces most of its electricity from natural gas (45%), followed by coal (32%), and a de minimis contribution from oil (1%).

Figure 10: U.K. Electricity Production by Source[264]



Beginning with the EU, it would be advisable to drop the EU ETS because it is clearly failing. Adopting a CTR approach would allow Europe to comply with the spirit of Kyoto and its policy goals, while introducing legislation with

263. *What Can the U.S. Learn from China's Energy Policy?*, INST. FOR ENERGY RES. 2, http://www.instituteforenergyresearch.org/pdf/What%20Can%20the%20U.S.%20Learn%20from%20China%27s%20Energy%20Policy-FINAL.pdf (last visited Apr. 20, 2014).

264. DEP'T OF ENERGY & CLIMATE CHANGE, DIGEST OF UNITED KINGDOM ENERGY STATISTICS, CHAPTER 5: ELECTRICITY 117, *available at* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/279546/DUKES_2013_Chapter_5.pdf.

real results.[265] Due to Europe's current economic malaise, the carbon tax portion of a CTR could be postponed, financed instead with a structured financial product, securitizing the carbon-tax-future revenue stream. This could finance current construction and stimulate the EU economy while postponing the tax until the economy recovers. A major critique of the EU ETS is that for all the money spent, the EU would have had a greater impact on emissions if it had redirected the funds to building new "green" infrastructure.[266] The CTR solves that problem by benefitting from the lower cost of implementation inherent with carbon taxes and by directing funds to building clean power sources.[267] A CTR would result in immediate rapid reductions in emissions.[268] Europe also would benefit from future cleaner and lower energy prices making its economy more competitive.

The objective of a CTR is to streamline implementation, and ensure feasibility and effectiveness. The proposed starting tax level for the CTR is $5 per ton of CO_2, and then increasing the level each year until it reaches a peak of $50 per ton.[269] This creates market certainty, while allowing the construction and materials sectors to build capacity to avoid demand-induced inflation. The revenues from the tax would peak and then decline rapidly as the emissions decline due to the adoption of cleaner energy sources.[270] The tax could be administered under the European Commission because it will utilize the same tax monitoring techniques that the EU has had in place for years.

In the United States, Congress could give up on proposals, such as the Waxman-Markey and Lieberman-Warner bills, because by adopting the CTR the United States could also stimulate its economy while significantly reducing emissions. This follows logically for the United Kingdom as well. More importantly, should the United States, EU, and United Kingdom adopt the CTR, it would be reasonable to believe that Japan and Australia would soon follow suit. This would pose a conundrum for China, as its major export markets would now impose a BTA on their goods. Therefore, it would make sense for China to adopt a similar plan.

In twenty years, the EU, United States, United Kingdom, and China could achieve significant reductions of GHG emissions in the building and utility sectors.[271] The benefits afforded to all nations or unions that adopt the CTR are substantial as dirty and expensive energy is quickly replaced with clean and inexpensive energy. During the process, due to the adoption of the carbon tax,

265. *See* Sewalk, *supra* note 2, at 151.
266. *See* Maher, *supra* note 137.
267. *See supra* Figure 5 (showing amount of revenue EU would collect as percentage of GDP if it switched to CTR approach).
268. *See supra* Figure 5.
269. *See* Sewalk, *supra* note 2, at 144.
270. *See id.*
271. *See id.*

consumers and industries are encouraged to adopt highly energy efficient devices.

Figures 11 through 14 show how a CTR would significantly reduce emissions in the EU, United States, United Kingdom, and China as the revenue stream from the CTR is used to order and build clean power plants to phase out existing ones, particularly by replacing the dirtiest power plants first. Replacing these facilities would produce immediate and significant emissions benefits. While multiple scenarios have been modeled, the following are presented as intermediate, conservative results.

Emissions for the EU-27 under a CTR would decline by 48% in a twenty-year period. The results for buildings are higher at 63%. This is illustrated in Figure 11 below. Revenues collected pay for new power plants, employ thousands of people, and generate tax revenues and economic growth while also reducing harmful emissions. The resulting reduction in emissions is higher for building and utility emissions because the CTR first focuses on replacing power plants, making it much easier to create a transportation system based off of clean electricity as well as fuel cell technology, thereby reducing emissions much further in the second phase of the CTR.

Figure 11: EU-27 Declining Emissions Levels as Power Plants Are Completed[272]

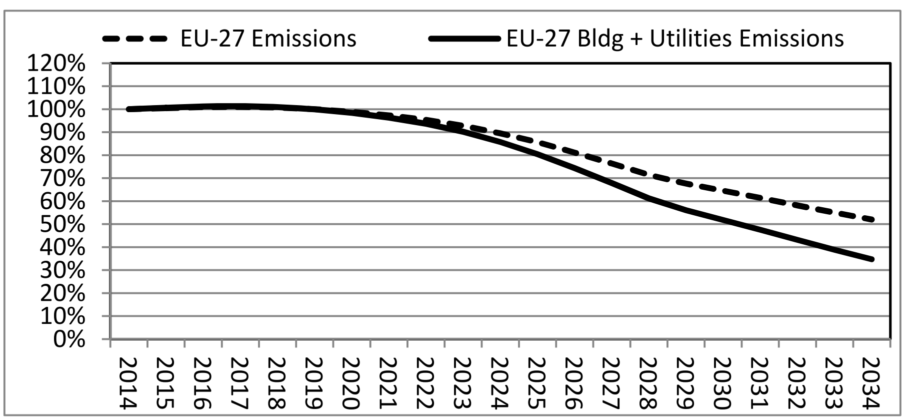
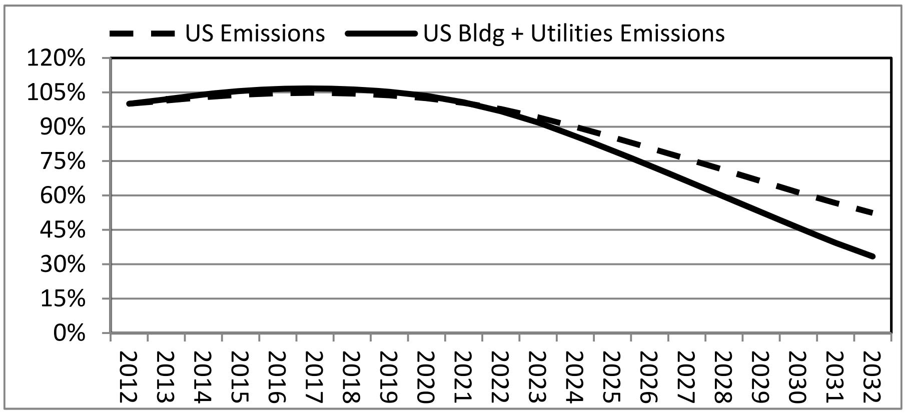


Figure 12 below shows that adopting a CTR in the United States results in a 47% reduction in total emissions within twenty years and a drop in emissions in

272. Figures 11 through 14 are the product of the author's own engineering and economic models. Figure 11 shows the impact of replacing high-emission power plants with low-emission power plants. For the EU-27, total emissions decline by 48% and by 63% for buildings and utilities. This case, using an 8-2-3 scenario, implies that it will take eight, two, and three years to order, construct, permit, and bring online nuclear, solar/wind, and geothermal power plant, among others. In general, results can be much better for quicker permitting periods and lower for longer permitting periods.

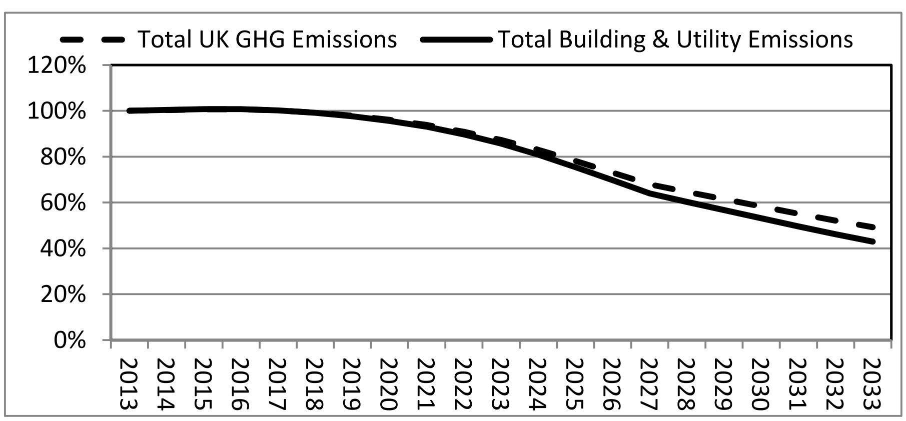
buildings and utilities of 67%. The results are improved for buildings and utilities because the United States relies more heavily on coal, however, total results are less because the country relies more heavily on oil for transportation.

Figure 12: U.S. Declining Emissions Levels as Power Plants Are Completed[273]



The United Kingdom registered similar results. Figure 13 shows that adopting a CTR in the United Kingdom results in a 48% reduction in total emissions within twenty years and a drop in emissions in buildings and utilities of 64%.

Figure 13: U.K. Declining Emissions Levels as Power Plants Are Completed[274]

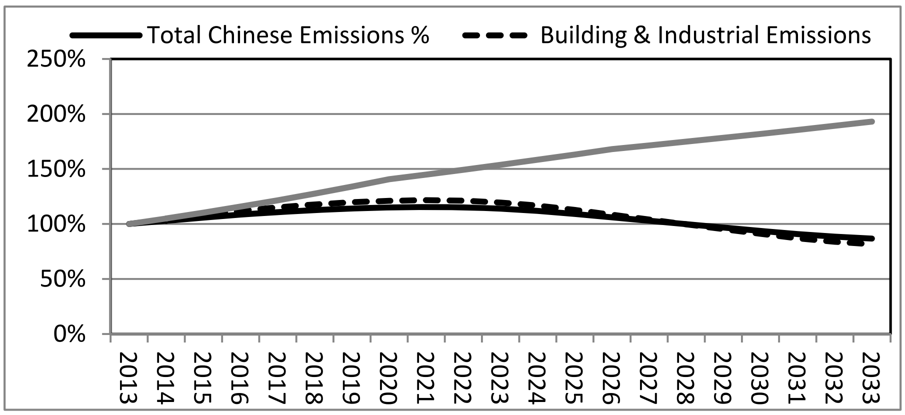


273. For the United States, the results are 47% for total emissions and 67% for buildings and utilities. The results are improved for buildings and utilities because the United States relies more heavily on coal. However, total results are less because the United States relies more heavily on oil for transportation.

274. For the United Kingdom, results are 48% for total emissions and 64% for buildings and utilities.

Figure 14 presents the results for China. Rather than emissions continuing to rise to over 190% of today's levels, China would need to adopt the CTR to remain competitive. The world would additionally benefit from reductions in total Chinese emissions. Under a CTR, economy-wide Chinese emissions decline by 13%, while emissions from buildings and utilities decline by 19%. The results are much lower because the Chinese economy is still expanding rapidly, and therefore, it is more difficult to convert all of its utilities as quickly.

Figure 14: China Declining Emissions Levels as Power Plants Are Completed[275]



The combined impact of a CTR on these countries is impressive. While accounting for 57% of global emissions, the CTR would produce a reduction in their portion by 34.2%. From approximately 30 billion tons of global emissions, emissions would be reduced to 24.2 billion tons, or approximately 20% in twenty years. More importantly, with a BTA in place, every other country would be strategically inclined to also adopt the CTR to remain economically competitive in these key global markets that account for more than almost two-thirds of the world's economy.

B. Equity, Autonomy, and Fairness

A CTR is environmentally proactive and due to the ability to flexibly structure the tax or project finance, depending on the current economic activity, a CTR would allow each adopting country to serve its economic interests. On the other hand, a cap-and-trade system sets a ridged cap (in theory) while the

275. Total Chinese emissions would decline by 13% from today's levels, while emissions from industry and buildings would decline by 19%. This is in sharp contrast to projections showing that Chinese emissions could double in the next twenty years.

price of allowances fluctuates according to demand from emitters.[276] This style of carbon-emissions legislation is difficult to apply, regardless of uniformity or diversity, as seen in Europe.[277] Every country in the EU and the world has its own energy needs from a climate change initiative according to its current energy infrastructure and economy. Germany relies more heavily on coal and Russian gas, while France uses more nuclear power, and Denmark has invested heavily in significant wind power capacity. Each country has its own challenges and the CTR would allow each one to set up its reinvestment priority to rid itself of the highest carbon-emission power plants. The CTR is flexible enough to allow each country in the program to maintain autonomy and receive equal benefit according to its needs. Each country that participates in the CTR approach would have its own tax rates and would collect its own share of taxes to rebuild power facilities. In essence, there would be thirty-one carbon tax rates operating in the EU under this approach.

BTAs are another important measure that can be implemented within the framework of a CTR.[278] These adjustments are designed to create a more even playing field between domestic producers who are faced with constraints on their GHG emissions and foreign competitors who have no such restrictions.[279] This strategy has been proposed under the EU ETS to help European nations compete with other countries like the United States and China.[280] Countries operating without the climate change mitigation implements have an economic advantage because they are typically able to offer lower prices as they are not being taxed or punished for their carbon output.[281] If BTAs were implemented along with a CTR, then the scheme would serve to strengthen each country's ability to enjoy autonomy while cooperating fairly in the program.[282]

C. Mitigation That Works—Stopping Climate Change

GHG emissions are unlike many other regulated articles in the fact that they are not stationary and their damaging effects are not limited to any particular region.[283] Carbon emissions travel around the Earth's atmosphere and create the global climate change issue known today.[284] This implies that tackling the issue of global climate change must be a unified endeavor among nations and

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276. *See* Nell et al., *supra* note 90.
277. *See* COELHO, *supra* note 62, at 3-4.
278. *See* Monjon, *supra* note 149, at 4.
279. *See id*. at 2.
280. *See id.* at 2-3.
281. *See id.*
282. *See* Monjon, *supra* note 149, at 2-4.
283. *See* Hans Gersbach & Noemi Hummel, *Climate Policy and Development* 1 (Ctr. for Econ. Res., CESifo Working Paper No. 2807, 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1484564.
284. *See id.*

unions of nations.[285] If nations around the world are unwilling to adopt climate change regulation and take serious steps to mitigate their carbon emissions, then the concentration of these harmful gases in the atmosphere could rise to twice the pre-industrialized levels before the end of the century.[286] This only further strengthens the argument that the world is in desperate need of a new plan and direction—one that actually works to unify the world in the joint effort of lowering GHG emissions.

If the EU were to abandon the EU ETS system that has done so little to lower carbon emissions to the level required to limit global climate change and adopt a CTR, it could likely produce a chain reaction of other countries following suit. One country that has been keeping a very close eye on the EU policies regarding climate change is the United States. The carbon-tax system would also be the best approach for the United States. However, many legislators are still leaning toward cap-and-trade type programs to address climate change.[287] It would likely prove foolish to follow the EU down the path of market-based carbon emissions regulation given the EU ETS's checkered record.[288] Importantly, the United States has had extensive experience working within the framework of an economy-wide excise tax. Setting up a new cap-and-trade based program would not only be very difficult to draft, but would also probably take years to implement, which is more time wasted battling against global climate change. In contrast, a CTR fits so well with already existing tax laws in the United States that climate change legislation could be implemented in a day, rather than over the course of years. Many climate change scientists believe that governments have already waited too long to initiate climate change measures.[289] More time equates to greater harm to the environment due to GHG emissions.[290] As Figure 11 showed above, significant emissions reductions are possible in the United States.

The very same benefits that would be realized by countries in the EU would also be realized by the United States if it were to adopt a CTR program. The United States, like Europe, would see an immediate influx of revenue from the approach that would be utilized to change the highest carbon emitting facilities into low-to-no carbon emitting ones. The benefits in terms of economic stimulus and clean energy self-sufficiency would be significant, benefiting the

285. *See* Jonathon H. Adler, *Eyes on a Climate Prize: Rewarding Energy Innovation To Achieve Climate Stabilization*, 35 HARV. ENVTL. L. REV. 1, 2 (2011).

286. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT 36 (Abdelkader Allali et al. eds., 2007), *available at* www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

287. *See* Bruce W. McClain & Heidi Hylton Meier, *The U.S. Cap and Trade Initiative: Current Status and Potential Impact on Business*, 28 AM. J. BUS. 7, 7-8 (2013).

288. *See* George Daskalakis & Raphael N. Markellos, *Are the European Carbon Markets Efficient?*, 17 REV. FUTURES MARKETS 103, 103-04 (2008).

289. *See* Craig, *supra* note 18, at 9 (explaining need to start enacting climate change measures now).

290. *See id.*

whole world. Next, the United States would also reap the benefits of new energy facilities that cost states nothing to build. This means an influx of jobs for the construction of the new low-carbon emitting facilities and for the operation and maintenance of them. Also, just as European citizens would soon be paying much less for energy under a CTR approach, so too would U.S. citizens. Not only would the United States be embarking on a new era of providing clean and renewable energy options to its citizens at a lower price, it would be creating jobs throughout the country and simultaneously slashing the high levels of carbon emissions that it has produced for generations.

An implemented CTR strategy in the EU, United States, United Kingdom, and China would put pressure on other nations to adopt stricter GHG-emissions measures. The carbon leakage that has proven to be an issue under the current EU ETS strategy would be nullified by the CTR's ability to tax all products at a rate according to carbon intensity.[291] This amount is determined by the total emissions in an economy or region divided by the GDP of that economy or region. This strategy creates an equitable trading system between nations, and curbs the threat of carbon leakage to other markets undermining the EU. Taken a step further, taxing imports by their carbon intensity creates a powerful incentive for EU trading partners to adopt emissions strategies as well. Table 4 below compares emissions intensity for several U.S. states and different EU and world countries.

291. *See generally* Sewalk, *supra* note 2.

Table 4: Emissions Intensities, Comparing U.S. States with Select Countries[292]

($ of GDP per Ton of CO_2 Emissions)			
Alabama	$892.86	India	$448.43
California	$3,703.70	Japan	$3,448.28
		France	$4,000.00
Washington	$2,941.18	U.K.	$3,571.43
Colorado	$1,886.79	Euro Area	$2,500.00
		U.S.	$2,040.82
Texas	$1,250.00	Australia	$1,298.70
Wyoming	$305.81	China	$312.50

D. CTR Complies with International Law

In *Socially Responsible Investment Law: Regulating the Unseen Polluters*, Benjamin Richardson states, "[t]he investment community continues to downplay inclusion of environmental and social criteria for consideration in corporate financing decisions."[293] Consistent with his thought is the argument that international-investment law poses potential barriers to climate change regulation.[294] Richardson identifies several cases where investment laws have

292. *See* Greg Fuhs, *A New, One-Stop Shop for Greenhouse Gas Emissions Data*, WORLD RESOURCES INST. (July 10, 2013), http://www.wri.org/blog/new-one-stop-shop-greenhouse-gas-emissions-data; *GDP (current US$)*, THE WORLD BANK, http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries (providing GDP data in U.S. dollars for listed countries) (last visited Apr. 20, 2014); *U.S. Economic Accounts*, U.S. DEP'T OF COMMERCE BUREAU OF ECON. ANALYSIS, http://www.bea.gov (last modified Apr. 17, 2014) (providing current dollar GDP and emissions data for U.S. states); *see also* Stephen Sewalk & Vincent Buscarello, *A New Lens for a New Perspective: The Emerging Post-Kyoto Climate Policy Framework as Explained Through New Enviro-Economic Metrics*, 6 J. OF EUEC 1, 1 (2013), *available at* http://www.euec.com/getattachment/euecjournal/A-New-Lens---Sewalk-and-Buscarello.pdf.aspx. The emissions intensities were calculated by taking GPD divided by tons of GHG emissions. This results in dollars of GDP per ton of GHG emissions, which were compared between countries or states. Structuring a program in this manner avoids the WTO challenge of method of production as global methods occur in different states and countries.

293. BENJAMIN J. RICHARDSON, SOCIALLY RESPONSIBLE INVESTMENT LAW: REGULATING THE UNSEEN POLLUTERS 6 (2008).

294. *See* Kate Miles, *International Investment Law and Climate Change: Issues in the Transition to a Low Carbon World* 3 (Soc'y of Int'l Econ. L., Working Paper No. 27/08, 2008), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1154588.

trumped environmental protection efforts, noting that in any conflict between the interests of investors and climate change regulation measures, very little weight is given to international environmental issues.[295] The potential for claims of indirect expropriation, discriminatory treatment, and breaches of fair and equitable treatment threaten climate change mitigation methods that include the allocation of permits or "rights to pollute."[296] Under the General Agreement on Tariffs and Trade/World Trade Organization regime, world trade must follow three fundamental obligations. The first is the most-favored-nation principle, which requires any advantage that is provided to a product be provided to all like products. The second principle, the national treatment principle, requires that foreign products be treated no less favorably than domestic products. The third principle is most relevant for cap-and-trade: "The prohibition on quantitative restrictions prevents member countries from using quotas, embargoes, or licensing schemes on imported or exported products."[297] With a cap-and-trade system, these international investment and

295. *See id.* at 11-19 (discussing examples of environmental regulation as indirect expropriation). In *Metalclad Corp. v. United Mexican States*, "[an] American investor brought a claim against Mexico, alleging expropriation of its investment and a breach of fair and equitable treatment standards" regarding the declaration of an ecological preserve surrounding the hazardous waste treatment site. *Id.* at 12 (citing Metalclad Corp. v. United Mexican States, ICSID Case No. ARB(AF)/97/1, Award (Aug. 30, 2000), 5 ICSID Rep. 212 (2002)). "The tribunal held that Mexico had not acted with the required levels of transparency" consistent with NAFTA and was, therefore, in breach of fair and equitable treatment standards. *Id.* In *Azurix Corp. v. Argentine Republic*, Azurix contaminated the local water supply causing the water to be undrinkable. *Id.* at 13 (citing Azurix Corp. v. Argentine Republic, ICSID Case No. ARB/01/12, Award (July 14, 2006), 14 ICSID Rep. 374 (2009)). Local authorities imposed a fine on Azurix for noncompliance with its obligations of water quality and Azurix filed a request for arbitration with the International Centre for Settlement of Investment Disputes (ICSID) alleging the action taken by the local authorities resulted in expropriation and breach of fair and equitable treatment standards. *See* Miles, *supra* note 294, at 13-14. Azurix also claimed that the water problems were the result of poor infrastructure due to the failures of the local authorities. *See id.* at 14. The tribunal, in short, held that the actions of the local authorities breached fair and equitable treatment. *See id.* In *Methanex v. United States*, a Canadian investor challenged a U.S. health and environmental regulation after the Governor of California issued an order declaring the Canadian ethanol manufacturer's fuel additive would be phased out by 2002 because of fears of contamination. *See id.* at 15 (citing Methanex v. United States, Final Award of the Tribunal on Jurisdiction and Merits, 44 I.L.M. 1345, 1370 (NAFTA Ch. 11 Arb. Trib. 2005)). Methanex filed a complaint under NAFTA. *See* Miles, *supra* note 294, at 15. However, the tribunal rejected Methanex's arguments. *See id.* at 16. Although the ultimate decision found in favor of California's position, Miles points to the flaw of the system, seeing as the claim proceeded to a hearing at all. *See id.* at 16-17. In *Compañía del Desarrollo de Santa Elena, S.A. v. Republic of Costa Rica*, a Costa Rican company that had been formed by American stockholders was expropriated by Costa Rica. *See id.* at 18 (citing Compañía del Desarrollo de Santa Elena, S.A. v. Republic of Costa Rica, ICSID Case No. ARB/96/1, Final Award (Feb. 17, 2000), 5 ICSID Rep. 157 (2002)). The issue was not the expropriation, but rather the amount of compensation due to the company. *See* Miles, *supra* note 294, at 18. Costa Rica claimed the right to expropriate due the ecological diversity of the surrounding land. *See id.* The tribunal held that the environmental objectives made no difference to the application of international investment rules. *See id.* at 18-19.

296. *See id.* at 27. *See generally* Jacob Werksman et al., *Will International Investment Rules Obstruct Climate Protection Policies?*, WORLD RESOURCES INST. (Apr. 2001), http://www.wri.org/sites/default/files/pdf/investrules.pdf.

297. Erik P. Bartenhagen, Note, *The Intersection of Trade and the Environment: An Examination of the Impact of the TBT Agreement on Ecolabeling Programs*, 17 VA. ENVTL. L.J. 51, 60 (1997); *see* General

trade laws are a true threat. If imports were to be included, and thereby limited, under a cap-and-trade system, an import quota would be implied. Setting quotas, however, violates WTO law.[298] This will not be the case with a CTR. With an across-the-board tax on set quantities of carbon, there are neither issues of discrimination or equity nor an issue of violating WTO laws forbidding taxes on imports "in excess of those applied, directly or indirectly, to like domestic products."[299] As long as the taxes are paid, companies are under no obligation to change or experience indirect expropriation. A key challenge is to ensure the objectives of these areas of law are able to align, rather than cross, in order to move forward to reduce the effects of climate change.[300] The simplicity of the system will allow the CTR to avoid clashing with ever-favored international-investment laws.

The effectiveness of a CTR on the international level could benefit the EU in several ways: first, effective emissions reductions would mitigate the negative environmental and social health impacts of climate change; second, the tax will encourage economic advancements through infrastructure development and new job creation; and finally, the international effects resulting from the CTR will assist the EU in maintaining its standing as a world leader.[301]

Agreement on Tariffs and Trade art. XI, Oct. 30, 1947, 61 Stat. A-11, 55 U.N.T.S. 194 [hereinafter GATT].

298. *See* GATT, *supra* note 297, art. XI(2)(b).

299. *Id.* art. III(2).

300. *See generally* Miles, *supra* note 294.

301. *See* Young, *supra* note 9.

Table 5: Comparison of Carbon Tax with Cap-and-Trade Legislation for WTO

Domestic Market →		Domestic Measure is a CHARGE (Tax)		Domestic Measure is a REGULATION (Cap)	
Imports ↓		Product Charge (VAT)	Producer Charge	Product Regulation	Producer Regulation
Measure on imports is a CHARGE	Border charge	"Equivalent" BTA is permissible Art. II(2)(a)	No BTA is Permissible Border charge is subject to "tariff ceiling" Art. II(1)		
	Internal charge	Nondiscrimination Art. III(2)	No BTA permissible Art III(2)	Non-discrimination Art. III(2)	No BTA permissible Art III(2)
Measure on imports is a REGULATION	Border regulation	N/A		Prohibited Quantitative Import Restriction Art. XI	No Border Adjustment Permissible
	Internal regulation			Nondiscrimination Art. III(2)	Prohibited Quantitative Import Restriction Art. XI

The European economy is increasingly becoming dependent on energy and infrastructure.[302] A reinvestment of the carbon-tax revenues would allow EU countries to stimulate their economies, leading to job creation for their citizens and lower GHG emissions.[303] Most carbon-tax schemes do not have the ability to be benefit certain because there can be no sound guarantee that the tax will encourage emitters to invest in cleaner technologies.[304] However, a CTR does not stake its effectiveness on the ability or will of the utilities, industry, and public to adopt new technologies to reduce carbon emissions. Rather, a CTR adopts the latest technologies in true-and-tried fields, relying on investment

302. *See* David G. Victor & Linda Yueh, *The New Energy Order: Managing Insecurities in the Twenty-First Century*, FOREIGN AFFAIRS (2010), http://www.foreignaffairs.com/articles/65897/david-g-victor-and-linda-yueh/the-new-energy-order.

303. *See* Sewalk, *supra* note 2, at 144.

304. *See* Mann, *supra* note 169, at 45.

from the tax revenue to develop and construct cleaner alternative energy power plants to lower GHG emissions.[305] Previous debates between cap-and-trade proponents and carbon taxation proponents have always boiled down to deciding whether cost certainty or benefit certainty was the more desirable attribute of a program to reduce carbon emissions.[306] The CTR is able to provide both types of certainties and is therefore, the approach that will prove most effective if adopted.[307] The EU should not continue losing money while having little impact on lowering carbon emissions utilizing the EU ETS cap-and-trade program and should switch to a CTR approach to ensure a cost-effective and efficient reduction in carbon emissions.

E. An Important Step Toward European Energy Independence

There is great concern within the EU regarding its rising energy dependence on other nations, particularly Russia and the Organization of the Petroleum Exporting Countries (OPEC).[308] From 2005 to 2012, European industries paid 37% more for their energy than U.S. industries and 20% more than Japanese industries.[309] The President of the European Council, Herman Van Rompuy, noted that by 2035 Europe could end up importing more than 80% of its oil and gas.[310] Energy is a very important component of economic growth and economic competitiveness in international trade. If the EU does not develop a climate change policy that builds alternative and nuclear power sources, like the CTR, then they could find themselves increasingly dependent on Russia and OPEC for natural gas.[311] In addition, strategically, this would be a bad policy not only politically, but also practically because Russia's gas production is flat to falling while domestic demand is rising.[312] Therefore, prices are likely to remain very high, with the potential for pipeline closures due to political issues as Russia is potentially on the verge of shutting the pipeline to Ukraine (and the EU) over past-due payments and price disagreements.[313]

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305. *See* Sewalk, *supra* note 2, at 144.

306. *See* Sewalk, *supra* note 87, at 603.

307. *See id.* at 603-04.

308. *See* Zoë Casey, *Rising Energy Dependency Endangers Europe's Economy*, EUR. WIND ENERGY ASS'N (May 23, 2013), http://www.ewea.org/blog/2013/05/rising-energy-dependency-endangers-europes-economy (noting Europe's growing foreign-energy dependence).

309. *See id.*

310. *See EU Plans To Reduce Russian Energy Dependence*, EURACTIV (Mar. 21, 2014, 4:52 PM), http://www.euractiv.com/energy/eu-leaders-discuss-reducing-ener-news-534344.

311. *See* Jack D. Sharples, *Russian Approaches to Energy Security and Climate Change: Russian Gas Exports to the EU*, 22 ENVTL. POL. 683, 691 (2013) (noting EU gas production decline will mean increased dependence on Russian gas imports); *see also* Petr Kratochvil & Lukáš Tichý, *EU and Russian Discourse on Energy Relations*, 56 ENERGY POL'Y 391, 391-392 (2013).

312. *See* Mikhail Krutikhin, *Anxiety in Moscow as the U.S. May Soon Overtake Russian Oil and Gas Production*, NAT. GAS EUR. (Oct. 10, 2013, 9:00 AM), http://www.naturalgaseurope.com/us-overtake-russia-oil-and-gas-production.

313. *See* Lindsay Wright, *Pipeline Politics: Russia's Natural Gas Diplomacy*, PIPELINE & GAS J., Aug.

VI. CONCLUSION

The world needs a climate policy that is proactive, does not wait for other countries to adopt it, and can have an immediate impact and benefit while protecting local industries. Global ecosystems are suffering irreparable harm due to the inability of nations and unions of nations to enact legislation limiting carbon emissions currently wreaking havoc on our global climate. A CTR could reduce EU, U.S., U.K., and Chinese emissions by 34% within twenty years, and even more by 2050. Legislation, treaties, and discussions, such as the Kyoto protocol, the EU ETS, Waxman-Markey bill, and Copenhagen summit have simply not worked and have actually resulted in growing global emissions.

A CTR seems to be the best way forward not only for the EU, but also for the United States, United Kingdom, China, and all other countries. Carbon taxation is uncomplicated in both its implementation and design as it offers the cost-certainty element missing in cap-and-trade programs. It promises price stability to avoid the issues that have plagued the EU ETS, and it also represents a unique ability to raise revenue for the use by nations that implement the carbon-tax approach. A CTR is even more effective than either a carbon tax or cap-and-trade approach because it ensures that revenue created by the taxation implements is used to combat carbon emissions and create new low-to-no carbon facilities. Also, a CTR works in a unique way to target all polluters, and not just selected emitters who fall in the targeted cap area or selected taxation pool. To date, there has never been a climate change policy with the CTR's advantages and effectiveness.

Some policymakers argue that cap-and-trade is the best approach for climate change legislation. Much of the affinity toward cap-and-trade programs was initiated because of successful programs in the past. One of the more prolific examples is the U.S. acid rain reducing measures implemented in 1995. Many proponents of the cap-and-trade approach to carbon-emissions regulation cite the acid rain program as an example of how well cap-and-trade works. However, the acid rain program is different than most cap-and-trade programs in many ways, most notably that it was not economy-wide. Furthermore, arguably the sulfur market could have been more effective under a CTR-style program, perhaps eliminating all sulfur emissions by now.

The EU ETS is the biggest and best example of a large-scale, trading-based program designed to produce environmental impacts, which has actually failed

2009, http://www.pipelineandgasjournal.com/pipeline-politics-russia%E2%80%99s-natural-gas-diplomacy; Shaun Walker, *Russia and Ukraine Edge Closer to 'Gas War'*, THE GUARDIAN, Oct. 29, 2013, http://www.theguardian.com/world/2013/oct/29/russia-ukraine-gazprom-gas-war ; Frank Umbach, *Tensions Threaten Long Standing Natural Gas Partnership Between EU and Russia*, OILPRICE.COM (Oct. 7, 2013, 10:07 PM), http://oilprice.com/Energy/Natural-Gas/Tensions-Threaten-Long-Standing-Natural-Gas-Partnership-between-EU-and-Russia.html.

to produce them. A CTR will create a downstream tax effect, which ensures that no one is exempt from enforcement of the legislation. By constructing low- or no-carbon emitting power facilities that use clean energy sources like wind, geothermal, nuclear, and solar, the CTR revenue will be put to use in a very effective way. The environment will benefit from the new clean energy options that will have taken the place of high carbon emitting plants. In addition, the citizens of all of the countries will experience economic benefits because they will be utilizing cheaper energy that runs from the new, more efficient infrastructure. Countries in the program will see new jobs spring up alongside the new power facilities and these countries will become examples for the rest of the world to follow. For these reasons, the successful implementation of a CTR program has the potential to influence the world and usher in a new age of environmentally responsible business practices that could prove fruitful for generations to come. For Europe, it is a chance to also gain energy independence from Russia and OPEC, and to steer its own political future without worrying about energy.