# PRAGMATISM NOT DOGMATISM: THE INCONVENIENT NEED FOR BORDER ADJUSTMENT TARIFFS BASED ON WHAT IS KNOWN ABOUT CLIMATE CHANGE, TRADE, AND CHINA

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TABLE OF CONTENTS



## INTRODUCTION

From 2009 to 2010, China installed more wind turbines than any other country, making it the world leader in installed wind capacity[1] and produced

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1. Rachel Morison & Paul Whitehead, *Global Wind Installations Up 22% in 2010*, *China Leads Growth*, PLATTS, Feb. 2, 2011, http://www.platts.com/RSSFeedDetailedNews/RSSFeed/ElectricPower/6798993. *But see* Keith Bradsher, *China Leading Global Race to Make Clean Energy*, N.Y. TIMES, Jan. 30, 2010, http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html?scp=1&sq=china%20leading%20global%20race&st=cse (noting that nearly

at least forty percent of the world's solar photovoltaic panels,[2] of which nearly ninety percent were exported;[3] the price of solar panels fell by a fifth globally and the United States placed an import tariff on solar panels[4] and filed a complaint with the World Trade Organization alleging that China illegally subsidized its wind turbine industry.[5] Also, in 2010, the United States completed 6.6 gigawatts (GW) of new coal-fired power generation;[6] China added nearly 60 GW of coal-fired power generation[7] and financed and/or sold at least $55 billion worth of coal-fired generation equipment to India;[8] and coal companies began searching for locations to build a port in Washington State that will facilitate greater coal exports to Asia.[9] Are any of these trends and developments inherently antagonistic to the others?

If climate change is a concern and if there is a goal to limit the amount of carbon dioxide entering the atmosphere, then yes, certain energy trends are antagonistic to others.[10] This is especially the case when considered from an investment capital point of view.[11] Investment capital for energy infrastructure projects is limited, which means that one project happens at

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a third of China's wind capacity is not yet connected to the national power grid); Lester Brown, *Wind Power Surges Forward Around the Globe*, GRIST MAGAZINE, Mar. 15, 2011, http://www.grist.org/wind-power/2011-03-15-wind (indicating that the United States currently leads in electricity generation from wind).

2. *China's Solar Photovoltaic Output 40% of World Total*, PEOPLE'S DAILY ONLINE, Sept. 29, 2010, http://english.peopledaily.com.cn/90001/90778/90860/7154496.html.

3. Tony Daltorio, *A Partly Sunny Outlook for the Solar Industry*, INVESTMENT U, http://www.investmentu.com/2009/August/sunny-solar-industry.html (last visited Apr. 29, 2011).

4. Keith Bradsher, *Solar Panel Tariff May Further Strain U.S.-China Trade*, N.Y. TIMES, Sept. 30, 2009, www.nytimes.com/2009/10/01/business/global/01tariff.html.

5. Doug Palmer, *U.S. Challenges China Wind Power Aid at WTO*, REUTERS, Dec. 22, 2010, http://www.reuters.com/article/2010/12/22/us-usa-china-windpower-idUSTRE6BL3EU20101222.

6. ERIK SHUSTER, NAT'L ENERGY TECH. LAB, TRACKING NEW COAL FIRED-POWER PLANTS 16, 24 (2011), *available at* http://www.netl.doe.gov/coal/refshelf/ncp.pdf.

7. *Id.* at 16.

8. *Id.*; *Shanghai Electric $10 Billion Order from India Signals China Export Surge*, BLOOMBERG, Oct. 29, 2010, http://www.bloomberg.com/news/2010-10-29/shanghai-electric-10-billion-order-from-india-signals-china-export-surge.html; Kartikay Mehrota, *Utilities Needing $45 Billion Turn to China Loans: India Credit*, BLOOMBERG BUSINESSWEEK, Jan. 20, 2011, http://www.businessweek.com/news/2011-01-20/utilities-needing-45-billion-turn-to-china-loans-india-credit.html.

9. Elisabeth Rosenthal, *Nations that Debate Coal Use Export It to Feed China's Need*, N.Y. TIMES, Nov. 21, 2010, http://www.nytimes.com/2010/11/22/science/earth/22fossil.html?_r=1&partner=rss&emc=rs.

10. In rapidly developing nations like China and India, domestic sources of energy, i.e., coal, will continue to be developed for both economic and national security reasons. But the critical questions are for how long, in what way, and at the expense of what other forms of energy?

11. In this article, "energy infrastructure projects" refer to both large investments which, either individually or cumulatively, produce energy or electricity and/or consume energy or electricity, and impliedly the fuels used to power them. This would include transportation infrastructure, residential and commercial buildings, and electricity generation facilities and equipment.

the expense of others.[12] Over the coming two decades, China is expected to spend trillions of dollars on energy-related infrastructure projects.[13] Managing global trade in a manner that can sufficiently encourage the development of low-carbon infrastructure, which will promote low-carbon economies in China and globally, is essential to limiting future greenhouse gas (GHG) emissions. Yet at present, the market's failure to price carbon means that there is little economic incentive to invest in more expensive low-carbon infrastructure.

Even though the United States added 6.6 GW of coal in 2010, more than at any other time in the last twenty-five years, the future prospects for coal in the United States are not good.[14] This is not because of aggressive action to address climate change, but rather because of the increased estimates of conventional and unconventional domestic natural gas reserves.[15] The price of gas in the United States is expected to stay low long enough, potentially, for gas to monopolize future additions to the United States electricity-generating sector for the foreseeable future.[16] So what do United States coal companies that built their businesses on the backs of the then largest energy and electricity consumer do? Naturally, they look for new markets. Luckily for them, there is fast-growing demand for coal in China and India—coal company executives are well aware of this.[17]

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12. Richard Dobbs et al., *How the Growth of Emerging Markets Will Strain Global Finance*, MCKINSEY QUARTERLY, Dec. 2010, www.mckinseyquarterly.com/Corporate_Finance/Capital_Management/How_the_growth_of_emerging_markets_will_strain_global_finance_2715; SIMON WHITEHOUSE ET AL., CARBON CAPITAL: FINANCING THE LOW CARBON ECONOMY 4 (2011), *available at* http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture_Barclays_Carbon_Capital.pdf ("We need clear and consistent policy frameworks to help unlock the required flow of private capital.").

13. McKinsey & Company estimates that over eight trillion dollars will be spent on energy infrastructure in Asia over the next decade, much of that in China. Naveen Tahilyani et al., *Asia's $1 Trillion Infrastructure Opportunity*, MCKINSEY QUARTERLY, Mar. 2011, www.mckinseyquarterly.com/Financial_Services/Banking/Asias_1_trillion_infrastructure_opportunity_2765.

14. SHUSTER, *supra* note 6, at 7, 10, 24.

15. Colo. Sch. of Mines, *Potential Gas Committee Reports Unprecedented Increase in Magnitude of U.S. Natural Gas Resource Base*, MINES.EDU (Jun. 18, 2009), http://www.mines.edu/Potential-Gas-Committee-reports-unprecedented-increase-in-magnitude-of-U.S.-natural-gas-resource-base; *see also* John Rowe, Chairman & Chief Exec. Officer, Exelon Corp., Address to the American Enterprise Institute (Mar. 9, 2011) (transcript available at http://www.eenews.net/tv/transcript/1293) (explaining that anticipated new regulations on $SO_2$, $NO_2$, and mercury emissions under the Clean Air Act are likely to influence the closure of some of the oldest and dirtiest coal plants in the United States as well).

16. Rowe, *supra* note 15.

17. "The long-term supercycle for coal is strengthening with each passing day," Peabody CEO Gregory H. Boyce said referring to markets in China and India. Joe Napsha, *Demand for Coal Fuels U.S. Exports*, PITTSBURGH TRIBUNE-REVIEW, Feb. 13, 2011,

Peabody Energy, the United States' largest coal producer, in conjunction with other companies, plans to build a port facility in Washington State to facilitate greater exports of thermal coal to Asia.[18]

Although the retreat of coal from North America was not caused by the imposition of a carbon price, it significantly illustrates the underappreciated risks inherent in leakage.[19] Leakage causes negative impacts not only by allowing emissions to shift from one country to another, but, more importantly, by inhibiting the advancement of clean energy technologies. This is especially true for countries like China, that are developing and are favored targets for foreign direct investment. For example, the low cost of gas in the United States means that, in general, coal is no longer economically competitive with gas.[20] The United States market is sending a signal that encourages investment in gas over coal. But internationally, and, more importantly, in the world's largest energy market—China—gas does not have a cost-competitive advantage over coal. Thus, the market signal that is effective in the United States is not effective in Asia. Therefore, only those capital investments that are specifically tied to the United States, such as a new generation facility, will shift away from coal. But those capital investments that are primarily tied to coal rather than a geographical location will continue to flow to coal, even if that means targeting new markets.

Paradoxically, the decline of coal-fired generation in North America—combined with the global market failure to price GHG emissions—works to provide additional perverse economic incentives that further encourage

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http://www.pittsburghlive.com/x/pittsburghtrib/news/s_722635.html#ixzz1Dy0R9rN4. (quoting Boyce). U.S. Energy Information Agency predicts continued growth in demand for coal and coal imports in China and India at least through 2035—China could add an additional 736 GW of coal-fired generation, an annual increase in coal consumption of over 2.5%. U.S. ENERGY INFO. AGENCY, DEP'T OF ENERGY, INTERNATIONAL ENERGY OUTLOOK 2010, at 63–68, 66 tbl.8 (2010), *available at* http://www.eia.doe.gov/oiaf/ieo/pdf/0484%282010%29.pdf.

18. Rosenthal, *supra* note 9. The primary port developers are Millennium Bulk Terminals Inc. and SSA Marine. Kim Murphy, *Fight Continues over West Coast Coal Exports to Asia*, L.A. TIMES, Mar. 15, 2011, http://latimesblogs.latimes.com/greenspace/2011/03/coal-export-longview-washington-millenium.html. Peabody has contracted to supply twenty-four million metric tons of coal for export through the terminal. *Id.* Peabody currently operates a coal trading hub in Singapore, primarily supplied by coal from Indonesia.

19. Some states are more aggressive than others at cutting $CO_2$ emissions, which has resulted in coal plants shutting down. Dean Kuipers, *Last Coal Plant in the Pacific Northwest to Shut Down Starting in 2020*, L.A. TIMES, Mar. 6, 2011, http://latimesblogs.latimes.com/greenspace/2011/03/last-coal-plant-in-pacific-northwest-to-shut-beginning-2020.html.

20. This is for several reasons. In the United States, coal plants cost substantially more to build than combined cycle gas plants, and emissions control for traditional pollutants from coal plants is much more costly.

China to continue its reliance on coal.[21] Current international trade and finance regimes, along with advances in modern logistics, facilitate market access for sellers and cheap access to internationally traded coal for buyers. Despite these perverse market incentives to rely solely on coal, China established dirigiste policies to promote the development of renewable energy industries. Through subsidies and protective measures that limited foreign imports, China developed infant industries in the wind and solar power sectors. In response to China's aggressive promotion of its wind power sector, the United States Trade Representative Office issued a formal complaint to the World Trade Organization (WTO) in December 2010, which claimed that Chinese subsidies violated WTO rules.[22]

Considered together, these two recent developments support the notion that international trade policies promote the continued use of fossil fuels and can be used to discourage the aggressive promotion of domestic clean energy industries. It appears the United States is more comfortable exporting fossil fuels to Asia than competing in the development of renewable energy technologies. Of course, there are nuances to each of these conclusions. For example, United States coal may burn cleaner than alternative supplies in Asia and China's installed wind turbines would likely be of higher quality if China used a less protective trade policy. But even after considering the potential benefits to each of these developments there still remains the evinced potential for existing international trade policy to undermine efforts to mitigate climate change.

The majority of existing legal literature on trade and climate change focuses appropriately on the legal ramifications of border adjustment tariffs, WTO appellate body decisions, and/or the language of the General Agreement on Tariffs and Trade (GATT).[23] This article differs from the existing literature in that it starts with the international governance

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21. Gary Clyde Hufbauer & Jisun Kim, *The World Trade Organization and Climate Change: Challenges and Options* 5 (Peterson Inst. for Int'l Econ., Working Paper No. 09-9, 2009), *available at* http://www.iie.com/publications/wp/wp09-9.pdf. It is generally accepted that climate change in relation to the continued use of fossil fuels represents a market failure because the real cost associated with GHG emissions is not internalized in the price of fossil fuels. The paradox described briefly here is elaborated on further in part III of this article.

22. Mark Drajem, *U.S. to File WTO Complaint Against China over Aid to Wind-Energy Producers*, BLOOMBERG, Dec. 22, 2010, http://www.bloomberg.com/news/2010-12-22/u-s-to-file-wto-complaint-against-china-over-aid-to-wind-energy-producers.html.

23. Joost Pauwelyn, *U.S. Federal Climate Policy and Competitiveness Concerns: The Limits and Options of International Trade Law* (Nicholas Inst. for Policy Studies, Duke Univ., Working Paper No. 07-02, 2007), *available at* http://129.194.160.51/webdav/site/ctei/shared/CTEI/Pauwelyn/internationaltradelaw.pdf; Zhongxiang Zhang, *The U.S. Proposed Carbon Tariffs, WTO Scrutiny and China's Response* (Int'l Econ. & Econ. Policy, Working Paper, 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1517488&download=yes.

challenges that climate change presents and then asks how international institutions and/or countries can use the reliance of the global economy on international trade as a tool to mitigate climate change.[24] Central to this approach is defining the challenges that climate change presents in respect to the global economy and international trade. In this respect, the most urgent climate change challenge is not environmental, it is economic. It is the global market's failure to internalize the environmental and human costs and risks associated with GHG emissions.[25] The scale of this global market failure is unprecedented and effectively addressing it will not be easy.[26]

Luckily, addressing climate change as a market failure rather than an environmental problem has potential benefits. First, the missions and expertise of the most prominent international institutions (e.g., the WTO, the World Bank, and the International Monetary Fund) are focused on dealing with economic development issues, not environmental issues. These institutions justify their existence based on their promotion of economic and human development as a public good. Clearly, climate change is an economic and human development issue as much as it is an environmental issue.[27] China's economic success counterbalanced against its environmental consequences illustrates that climate change is inherently interconnected with human and economic development.

Additionally, China's domestic approach to dealing with climate change also recognizes that climate change is an economic and social development issue. China's primary means of addressing climate change is through its five-year plan. China's five-year plan establishes the economic and social development goals for the nation.[28] By incorporating climate change considerations into the five-year plan, China essentially imbues its economic and social development goals with low-carbon characteristics. The ambitious goals contained in China's twelfth five-year plan, which aim to slow economic growth and restructure the economy to be less energy and

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24. This approach is in contrast to asking how efforts to mitigate climate change are or are not compatible with the existing international trade regime.

25. Because this article concentrates its analysis on energy infrastructure, it is more focused on carbon dioxide ($CO_2$) emissions from fossil fuels than the bundle of GHGs.

26. *See* NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW 27, 218 (2006) (discussing the magnitude of the market failure and the actions necessary to address the issue).

27. *See* SMITA NAKHOODA, WRI ISSUE BRIEF: CORRECTING THE WORLD'S GREATEST MARKET FAILURE: CLIMATE CHANGE AND THE MULTILATERAL DEVELOPMENT BANKS 1, 13 (World Res. Inst. eds., 2008), *available at* http://pdf.wri.org/correcting_the_worlds_greatest_market_failure.pdf ("Climate change policies cannot be the frosting on the cake of development; they must be baked into the recipe of growth and social development." (quoting Robert Zoellick, President, World Bank, Address at the 13th Conference of the Parties to the UNFCCC (2007))).

28. *What is the Five-Year Plan*, CHINA.ORG.CN, http://www.china.org.cn/english/MATERIAL/157595.htm (last visited Apr. 29, 2011).

carbon intensive, exemplify this integrated approach to dealing with climate change.[29] The question is whether China can achieve these ambitious goals and whether the international community and the international trade regime can effectively assist China.

Experts recognize the fact that climate change is both a market failure and a human and economic development issue.[30] However, at the international institutional level and at the level of action, these defining elements of climate change are insufficiently emphasized. Despite occasional rhetoric, the continued compartmentalization of trade and climate change policy evinces the broader failure of international institutions to internalize climate change as a market failure and as a human and economic development issue.

This article supports the body of literature that argues for a reconsideration of the current compartmentalization of trade and climate change.[31] At its simplest, this article promotes the idea that governments should immediately address climate change as a global market failure, and is thus an argument for a globally effective price on GHG emissions. At its most ambitious, this article posits that one of the largest barriers to addressing climate change is a commonly-held dogmatic belief in the universal applicability of free trade and free markets as a cure-all.

## I. CLIMATE CHANGE AND TRADE: A HOLISTIC APPROACH

American notions of free markets and free trade heavily influenced the formation of the dominant international institutions for managing trade and economic policy since World War II.[32] Likewise the GATT, drafted in 1948,[33] and later institutionalized as the WTO in 1995,[34] was founded on similar principals. It is unlikely that in 1948 the drafters of the GATT could

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29. Jonathan Watts, *China Plots Course for Green Growth amid a Boom Built on Dirty Industry*, THE GUARDIAN, Feb. 4, 2011, http://www.guardian.co.uk/world/2011/feb/04/china-green-growth-boom-industry.

30. NAKHOODA, *supra* note 27, at 1.

31. *See, e.g.*, Brian Copeland & M. Scott Taylor, *Trade, Growth and the Environment*, 42 J. ECON. LITERATURE 7, 67 (2004) (concluding that "it would be unwise for countries to use trade protection as a means to improve their environment").

32. FRED L. BLOCK, THE ORIGINS OF INTERNATIONAL ECONOMIC DISORDER: A STUDY OF UNITED STATES INTERNATIONAL MONETARY POLICY FROM WORLD WAR II TO THE PRESENT 33–38 (1977) (describing the global state-of-play post WWII and the dominant position the United States had in influencing events at Bretton Woods).

33. General Agreement on Tariffs and Trade, Oct. 30, 1947, 61 Stat. A-11, 55 U.N.T.S. 194.

34. Marrakesh Agreement Establishing the World Trade Organization, Apr. 15, 1994, 1867 U.N.T.S. 154.

foresee the technological and logistical advances that facilitate trade today or the environmental impacts of rapidly growing populations and economies—most notably those embodied in current efforts to address climate change. Nor is it likely that the drafters could foresee the massive international market failure that continues to hamper efforts to mitigate climate change.

While an analysis of the GATT and WTO rules is useful, a singular focus on these rules is arguably too narrow a focus when considering the internationally expressed goal to limit global temperature rise from climate change to two degrees Celsius.[35] The existing international governance structures for trade and climate change indirectly promote a narrow analysis because of their respective compartmentalization.[36] In light of the risks posed by climate change, it is important to break down barriers and explore trade policies that will facilitate the efficient reduction of GHG emissions while improving economic and social development. The following discussion examines the link between climate change and trade and illustrates that the compartmentalization of the two is based more on historical association than practical prescription.

International trade now accounts for around twenty-one percent of global GDP.[37] This increase is due to increased production in developing countries like China. While the phenomenon has raised GDP, it has also increased the energy intensity of global GDP.[38] In 2004, 6.2 gigatons (Gt) of $CO_2$ were traded internationally as embodied in consumer products, which accounts for about twenty-three percent of global $CO_2$ emissions from fossil fuels.[39] Chinese exports accounted for 1.4 Gt, or 22.5% of China's total $CO_2$

35. The two degrees Celsius figure corresponds to 450 parts per million (ppm) of $CO_2$ equivalent in the atmosphere, which is the limit established by the United Nations Framework Convention on Climate Change (UNFCCC) negotiations and most recently included in the Copenhagen Accord and the Cancun Agreement. *See* Richard Harris, *Climate-Change Limit: 2 Degrees Celsius*, NAT'L PUB. RADIO, Dec. 10, 2009, http://www.npr.org/templates/story/story.php?storyId=121274647 (discussing the two degrees Celsius figure, which is the international limit used in negotiations at the Copenhagen Accord).

36. This compartmentalization is discussed in part IV of this article.

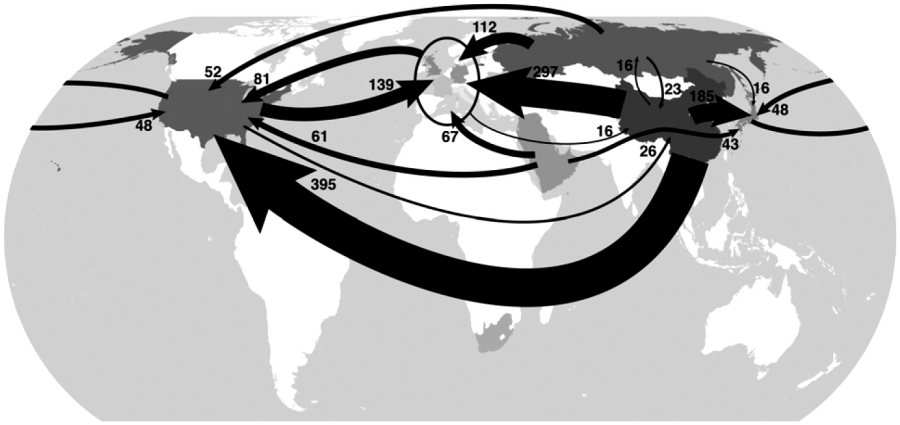
37. *Cf.* Press Release, United Nations Conference on Trade & Dev., South-South Integration is Key to Rebalancing the Global Economy, U.N. Press Release PB/2011/4 (Feb. 2011) ("[T]he GDP of the seven largest developing economies, adjusted for purchasing power parities, has grown from 10.5 per cent of the GDP of the OECD member countries in 1980 to 21 per cent in 2010.").

38. *Id.*

39. Stephen J. Davis & Ken Caldeira, *Consumption-based Accounting of $CO_2$ Emissions*, 107 PROC. NAT'L ACAD. SCI. 5687, 5687–88 (2010), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2851800/pdf/pnas.200906974.pdf. Note, these emissions do not include trade-related emissions from shipping or air travel, which, if included, would add an additional three to four percent to trades' total global contribution to $CO_2$ emissions.

emissions.[40] In comparison, total $CO_2$ emissions from fossil fuels for the world's third and fourth largest emitters in 2006, Russia and India, were only around 1.5 Gt each.[41] The United States imports more Chinese exports than any other country, and while China is a net exporter of emissions, the United States is a net importer.[42] The United States is also the world's second largest emitter of $CO_2$ after China; and together they account for more than forty percent of global emissions.[43]

Figure 1: Largest Interregional Fluxes in Emission Embodied in Trade (Mt $CO_2$ y-1)[44]




From Figure 1, it is important to note that, with the exception of Russia and Saudi Arabia, (for whom the *extraction and processing* of oil and gas dominate exported emissions), all other nations except China are Annex 1 countries trading primarily amongst themselves.[45] Note also that these figures only include emissions from the production or extraction of the traded goods, not the embodied carbon content of oil or coal traded internationally that is released upon combustion. Most obvious is the fact that China, the only non-Annex 1 country with significant exported emissions related to the export of manufactured goods, dominates the export of emissions globally. This fact is, of course, a disincentive for China

40. *Id.* at 5687.

41. INT'L ENERGY AGENCY, $CO_2$ EMISSIONS FROM FUEL COMBUSTION: HIGHLIGHTS 9 (2010), *available at* http://www.iea.org/co2highlights/CO2highlights.pdf.

42. Davis & Caldeira, *supra* note 39, at 5688–89.

43. INT'L ENERGY AGENCY, *supra* note 41, at 46.

44. Davis & Caldeira, *supra* note 39, at 5688.

45. Annex 1 countries are those classified by the Kyoto Protocol as Annex 1, which generally means that they are more developed and subject to mandatory caps on emissions.

to support any international agreement that would place a tax on the embodied carbon of imports.

### *A. The Effects of Trade on Climate Change*

At the center of discussions on trade, development, and the environment, is the environmental Kuznets curve (EKC). The EKC attempts to explain the phenomenon of increased pollution with increased economic activity until a certain level of per capita income or economic development is reached.[46] In theory, after a certain level of material development is achieved, societies will turn their attention to improving the environment around them. While there is substantial research that shows that this phenomenon has occurred in most developed nations in regard to some traditional pollutants, there is little evidence that the EKC applies to GHG emissions.[47] This is especially the case for developed countries when imported emissions are included in the EKC calculation.

A recent report published jointly by UNEP and the WTO does not focus on the legality of trade barriers, but rather examines how trade impacts climate change. Their report uses a "three effects" approach, originally articulated by Grossman and Krueger, to examine the impact of trade on traditional pollutants.[48] The first effect is the *scale effect*, which refers to how emissions grow based on increased economic activity.[49] The second is the *composition effect*, which refers to the impact of trade on the size and sectors that compose a country's production and economy.[50] The third is the *technique effect*, which refers to the manner and technology that a country employs to produce goods or services.[51] It is expected that increased trade will increase the scale of economic activity and that increased economic activity will increase GHG emissions. The remaining two effects, composition and technique, are highly reliant on the individual

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46. Gene Grossman & Alan Krueger, *Economic Growth and the Environment*, 110 QUARTERLY J. ECON. 353, 354 (1995); Copeland & Taylor, *supra* note 31, at 16.

47. MARTIN WAGNER, INST. FOR ADVANCED STUDIES, THE CARBON KUZNETS CURVE: A CLOUDY PICTURE EMITTED BY BAD ECONOMETRICS? 1, 24 (2006), *available at* http://www.ihs.ac.at/publications/eco/es-197.pdf; JEFFREY FRANKEL, HARVARD UNIV., ENVIRONMENTAL EFFECTS OF INTERNATIONAL TRADE 24–25 (2008), *available at* www.regeringen.se/content/1/c6/11/88/18/2093424b.pdf.

48. Gene Grossman & Alan Krueger, *Environmental Impacts of a North American Free Trade Agreement* 3–5 (Nat'l Bureau of Econ. Research, Working Paper No. 3914, 1991).

49. *Id.* at 3.

50. *Id.* at 4.

51. *Id.* at 4–5; LUDIVINE TAMIOTTI ET AL., WORLD TRADE ORG. & UNITED NATIONS ENV'T PROGRAMME, TRADE AND CLIMATE CHANGE 49 (2009), *available at* http://www.wto.org/english/res_e/booksp_e/trade_climate_change_e.pdf.

characteristics of a nation and external policy choices; thus, it is harder to generalize how they will impact GHG emissions in the abstract. However, an examination of real world experience over the past three decades illustrates how these effects have influenced global emissions.

China's rise as the world's factory exemplifies how trade impacts both traditional pollution and GHG emissions. But what are the characteristics of modern globalization and how did they influence China's rise as the world's factory? The World Bank's 2002 report *Globalization, Growth and Poverty: Building an Inclusive World Economy* (the Report) delineated three phases of globalization.[52] The first phase from 1870 to 1914 was propelled by advanced transportation technologies that facilitated the shipping of land resource commodities.[53] Countries like the United States, Australia, and New Zealand grew rich during this period by exploiting domestic natural resources.[54] But, the largest factor contributing to global economic advancement during the first phase of globalization was likely migration, not trade or capital flows.[55] Emigration from European countries raised wages domestically while immigration to resource exporting countries reduced wages and propelled their growth.[56]

For reasons related to the First and Second World Wars and the Great Depression, the Report does not consider the period from 1914 to 1945 an era of globalization. Instead, it jumps to the period from 1950 to 1970 and highlights the very different nature of globalization during this time in comparison to globalization from 1870 to 1914.[57] From 1950 to 1970, developed countries reduced trade barriers and freight charges fell by a third.[58] It is important to note that trade barriers for developed countries fell, but not for many of the soon to be rapidly developing countries like South Korea.[59] By the late 1970's, trade in commodities as a percentage of GDP had returned to pre-WWI levels.[60] The Report, however, notes that trade liberalization was more lopsided than previously described because of restrictions on labor and capital flows that would have benefited less

52. WORLD BANK, GLOBALIZATION, GROWTH AND POVERTY: BUILDING AN INCLUSIVE WORLD ECONOMY 23–24 (2002), *available at* www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2002/02/16/000094946_0202020411335/Rendered/PDF/multi0page.pdf.

53. *Id.* at 24.

54. *Id.* at 25.

55. *Id.* at 26.

56. *Id.* at 25.

57. *Id.* at 28.

58. *Id.*

59. *Id.*

60. *Id.*

developed countries.[61] This meant that countries with surplus labor were restricted to choosing between increased poverty or developing and/or courting manufacturing industries to provide employment. As China's experience illustrates, some countries and some companies have been able to exploit such captive labor as a comparative advantage.

The third phase, or "new wave globalization," began around 1980 and signaled a fundamental shift in global trade.[62] Advances in communication technology and transport allowed for supply chains to be linked across borders.[63] This allowed advanced industrialized methods of production to enter developing countries (*technique effect*).[64] From 1980 to 1998, manufactured goods as a percent of exports from developing countries rose from 25 percent to 80 percent.[65] This was an "astonishing transformation over a very short period."[66]

How did this astonishing transformation impact GHG emissions? Part of the answer is found in Figure 1. Developed countries were able to send the manufacturing of their desired goods to developing countries, thus ridding their country of the environmental externalities of production and influencing the composition of developing countries' industries (*composition effect*). There is no doubt that when corporations located in developing countries' corporations moved manufacturing abroad, the migration contributed to the reduction in traditional pollutants and conformity with the EKC within developed countries.[67] A brief look at China's experience as the world's factory provides insight into just how export-led growth and international trade has impacted China's economic development and how it intersects with China's GHG emissions.

### *B. Case Study: The China Price*

> [The] relentless competition for lower prices has bred what Jim Straus, an Illinois-based businessman who has been connecting Western buyers with Chinese factories for more than a decade, calls "the race to zero." These chains base their business model on providing goods at affordable

61. *Id.*
62. *Id.* at 31.
63. *Id.* at 32.
64. *Id.* at 33.
65. *Id.* at 32.
66. *Id.*
67. This raises the question of whether the EKC is applicable to any pollutants at a global scale. As sulfur emissions declined in developed countries they simultaneously rose in China and other developing countries.

> prices. Shoppers expect continual price declines, so the retailers, and the middlemen that supply them, demand continual price declines from their suppliers. If one factory can't provide that, they find another that can. Retailers come to believe that this process can continue indefinitely. "The mindset of the big box retailers is the race to zero, because they can't get any more for their product. . . . There's no loyalty. They'll eat you up for a nickel. They'll eat you up for a penny."[68]

For years, supply chain circles have bandied the phrase "the China price." It meant that a supplier would have to get to China and find a cheaper means of production or find some other way to be on par with the China price. But, as Alexandra Harney chronicles in her book, *China Price*, the real costs of China's meteoric rise are very human, very real and unsustainable.[69]

Many factories in China survive on very thin profit margins; if they do not get the sale this week they could be out of business next week.[70] Western buyers demand increasingly low prices, and to meet those demands Chinese factories cut every corner that they can. This often involves disregarding labor laws and environmental laws. The environmental costs of development for China are high and widely covered in the Western media.[71] The cost to the lives of workers has received less coverage, but is no less severe. These issues are not only found in China, but they are also indicative of the economic gravity that drives modern globalization and export-oriented development models.

At the center of the free trade model is the ability of international companies and importers to exploit labor surpluses and regulatory gaps between countries as a comparative advantage. This phenomenon is not all bad. It can pull people out of poverty in developing countries, though this sometimes comes at the expense of jobs elsewhere. Additionally, the ability of business to utilize cheaper labor and externalize regulatory costs translates into cheaper gadgets on store shelves for consumers in developed

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68. ALEXANDRA HARNEY, THE CHINA PRICE: THE TRUE COST OF CHINESE COMPETITIVE ADVANTAGE 37 (2008).

69. *Id.* at 56–58.

70. *Id.* at 53–55.

71. Joseph Khan & Jim Yardley, *As China Roars, Pollution Reaches Deadly Extremes*, N.Y. TIMES, Aug. 26, 2007, www.nytimes.com/2007/08/26/world/asia/26china.html; *see also* ELIZABETH ECONOMY, THE RIVER RUNS BLACK: THE ENVIRONMENTAL CHALLENGE TO CHINA'S FUTURE (2005) (exploring further environmental costs).

countries like the United States and thus ameliorates, to some extent, the impact of lost manufacturing jobs or stagnant wages in those economies.

For the purposes of this article, it is important to link the global forces that propelled manufacturing to move to China with increases in GHG emissions. Technological advances, as previously mentioned, permitted the dep loyment of advanced production techniques in China and elsewhere (*technique effect*). This compounded the benefits of moving manufacturing to China, because companies did not have to sacrifice advanced techniques for lower wages; they could co-exist and produce increased profit opportunities. But, advanced techniques transferred to China were focused on increasing production while reducing labor costs and human error, because that was the technology investment that was rewarded with the largest return.

There is evidence that international investment in China has contributed to a reduction in some traditional pollutants within China, primarily because international investors bring cleaner production techniques that are eventually adopted domestically.[72] But at present, without a price on carbon emissions and without international pressure to limit the carbon intensity of products, there is little incentive for manufacturers to advance technologies that aim to reduce GHG emissions throughout a supply chain.[73] As China's experience has illustrated, international trade on a business-as-usual trajectory will likely result in increased carbon emissions because of the increased scale of economic activity and the likely impacts on the composition of the economy, even if carbon intensity falls.[74]

Another important point to note is that the average manufacturer in China, and certainly the average wholesale purchaser of Chinese made goods, does not control, or even have much choice, as to where the electricity for the manufacturing of goods comes from. This is another reason to assume that advanced technologies imported to China for the

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72. *See* Qun Bao et. al, *Foreign Direct Investment and Environmental Pollution in China: A Simultaneous Equations Estimation*, 16 ENVTL. & DEV. ECON. 71, 72–73 (2009) (applying a simultaneous equation estimation technique using panel data of China's twenty-nine provinces for the 1992 through 2004 period to test the existence of these three effects through which foreign direct investment impacts China's level of pollution). On a cumulative basis, emissions in China continue to rise for nearly every pollutant. Sulfur dioxide ($SO_2$) might be one recent exception, but when analyzed in a pollution intensity equation, the argument can be made that international investment reduces pollution.

73. *See* Michael Vandenbergh, *Climate Change: The China Problem*, 81 S. CAL. L. REV. 905, 912–13 (2008) (analyzing the possible use of carbon labeling for products as a means of encouraging manufacturers to reduce GHG emissions in their supply chain).

74. China's carbon intensity, i.e., carbon emissions per unit of GDP output, has fallen significantly over the last three decades. Part II of this article covers this phenomenon in more detail.

production of goods will not be as successful at reducing GHG emissions as they are at reducing traditional pollutants that are within their sole control.

### *C. Leakage*

The term "leakage" is commonly used to refer to the shifting of carbon emissions from an economy with a carbon price to one without a price.[75] In a broader context, leakage is the phenomenon of a regulated entity moving operations or outsourcing operations to a less regulated location. Most of the literature specific to carbon leakage focuses on the limited experience of Europe's Emission Trading System (EU ETS). Most of these assessments have found that leakage was non-existent or minimal for the majority of sectors.[76] However, the EU ETS over-allocated permits and some industries actually profited from the "caps."[77] Since the global economic downturn, the price of emission credits on the EU ETS has plummeted to levels that are arguably ineffective to spur substantial changes in behavior or technological development.[78] Additionally, the EU ETS permits companies to obtain a significant portion of their carbon allowances by purchasing carbon offsets under the Clean Development Mechanism (CDM).[79] In general, permitting offsets through the CDM increases flexibility and reduces the actual reductions required for regulated entities.

It is more accurate to think of leakage as nothing more than continued attempts by profit maximizing entities to find new markets and increase profit margins. Just as companies sought opportunities to find cheaper means of production prior to climate change, companies will also take advantage of regulatory gaps to develop new markets or profit from regulatory gaps, if that is where the greatest rewards are. Generally, when

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75. A more technical definition of leakage is "the ratio of emissions increase from a specific sector outside the country (as a result of a policy affecting that sector in the country) over the emission reductions in the sector (again, as a result of the environmental policy)." JULIA REINAUD, INT'L ENERGY AGENCY, ISSUES BEHIND COMPETITIVENESS AND CARBON LEAKAGE: FOCUS ON HEAVY INDUSTRY 3 (2008), *available at* http://www.iea.org/papers/2008/Competitiveness_and_Carbon_Leakage.pdf.

76. *Id.*

77. *Industry's Effort*, STOPCLIMATECHANGE.NET, http://www.stopclimatechange.net/index.php?id=13 (last visited Apr. 29, 2011).

78. PEW CTR. ON GLOBAL CLIMATE CHANGE, EMISSIONS TRADING IN THE EUROPEAN UNION: ITS BRIEF HISTORY (2009), *available at* http://www.pewclimate.org/docUploads/emissions-trading-in-the-EU.pdf.

79. It is more accurate to say that individual countries within the EU ETS establish a quota for CDM offsets for their regulated industries and that each EU ETS member state permits the use of some offsets. For more on the CDM and its ability to reduce emissions and spur technological development, please see Michael Wara & David Victor, *A Realistic Policy on International Carbon Offsets* (Program on Energy & Sustainable Dev., Working Paper No. 74, 2008), *available at* http://iis-db.stanford.edu/pubs/22157/WP74_final_final.pdf.

companies move production for these reasons, the negative consequences are limited to lost jobs and investment in one country, balanced against an increase of jobs and investment in another country. But, in the context of climate change, this phenomenon can result in leakage and the negative externality of increased GHG emissions globally. More importantly, leakage can actually increase the costs associated with mitigating climate change and hamper the development of low-carbon technologies.

### *D. Leakage as a Barrier to Endogenous Technical Change*

In a recent study, economists focused specifically on how the costs and benefits of different environmental policies (i.e., a carbon tax and clean energy research and development (R&D) spending) influence endogenous technological development, and how endogenous technological responses impact the economic costs of low-carbon development policies.[80] The authors highlight that previous studies on the costs of mitigating climate change, notably by William Nordhaus and Sir Nicholas Stern, used models that did not sufficiently include feedback from endogenous technological development, even though it has been known for years that higher energy prices spur endogenous innovation.[81] Models that do not include the potential for endogenous technical change will tend to overestimate the economic costs of a carbon tax and needed technological development.[82]

Most importantly, the authors argue that, to optimize the economic benefits from endogenous technological development, it is essential to limit opportunities for leakage in international trade.[83] Central to the authors' analysis are the variables of *market size* and *price effects*.[84] Where clean and dirty energy inputs are highly substitutable (i.e., they can achieve the same function) immediate intervention is needed to direct investment and technological development to desired clean inputs.[85] The authors explained:

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80. Daron Acemoglu et al., *The Environment and Directed Technical Change* (Nat'l Bureau of Econ. Research, Working Paper No. 15451, 2009).

81. *Id.* at 1. An example the authors use to illustrate the impact of endogenous technical change is the impact of rising fuel prices on the efficiency of air conditioners and how the real costs of improving efficiency were significantly lower than estimates, because those estimates did not foresee the efficiencies in endogenous technical change.

82. *Id.* at 3, 18.

83. *Id.* at 3–4, 35–39.

84. *Id.* at 1.

85. On the issue of substitutability, generally people want the services that energy provides, e.g., a cool house in the summer or hot water for a shower. For the sole purpose of obtaining energy services, it is inconsequential whether the energy input is coal or any other cleaner source. In this respect, clean and dirty energy inputs are highly substitutable.

> Without intervention, the economy would rapidly head towards an environmental disaster, in particular, because the market size effect and the initial productivity advantage of dirty inputs would direct innovation and production to that sector, contributing to environmental degradation. However, . . . carbon taxes or profit taxes/research subsidies, would be sufficient to redirect technical change and avoid an environmental disaster.[86]

The need to limit leakage from developed to developing countries is derived from the need to limit the market size for dirty inputs. If certain countries initiate a carbon tax, but the rest of the world does not, manufacturers and industries that cater to dirty inputs and/or connect profits to dirty inputs still have a vast market of roughly 5.5 billion people to serve and have an incentive to focus investment on fossil fuels. Applying the traditional Ricardian model of comparative advantage in international trade, policies that only raise the price of fossil fuels in a specific region will then contribute to creating a comparative advantage for regions that have lower fossil fuel costs and can attract manufacturers or industries that require or desire to use dirty inputs and/or produce dirty goods.[87] In both scenarios, capital investment continues to flow toward dirty inputs and undermines the efficiencies found in endogenous technological change.

Another large problem illustrated by the anticipated dominance of gas and the exit of coal from the United States is not leakage per se, but a phenomenon that will have impacts very similar to leakage. This phenomenon can be viewed as a version of the Jevons paradox adapted for the modern interconnected world. Named after the nineteenth century economist and philosopher William Stanley Jevons, the eponymous paradox referred to the phenomenon of increasingly efficient coal boilers actually leading to an overall increase in coal consumption.[88] This phenomenon is precisely what coal companies hope will happen if coal-fired electricity generation can increase its efficiency and reduce carbon emissions, and thus, provide coal with a lifeline in a carbon-constrained world.[89]

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86. Acemoglu et al., *supra* note 80, at 2.

87. *See* L. ALAN WINTERS, INTERNATIONAL ECONOMICS 21–26 (4th ed. 1998) (analyzing and critiquing the Ricardian model).

88. W. STANLEY JEVONS, THE COAL QUESTION: AN INQUIRY CONCERNING THE PROGRESS OF THE NATION AND THE PROBABLE EXHAUSTION OF OUR COAL-MINES 102–16 (1865).

89. The promise of clean coal with carbon capture and sequestration (CCS) is possible; the crux of the issue is whether it can be deployed on a commercial scale before it is too late to make a difference with respect to climate change. One study analyzed the costs of using CCS to achieve the

In an adapted globalized version of the Jevons paradox, it is not only the impact that increased efficiency has on a fuel, but also the decreased demand for fossil fuels in some markets that then lowers the cost of fossil fuels and encourages increased consumption in other markets. Because developing countries have higher expected future demand growth, this could increase the overall consumption of fossil fuels, at least until alternatives become price competitive.[90] This paradox is a vicious cycle because, once alternatives become price competitive, the demand for fossil fuels decreases, pushing prices down to levels that again encourage the use of fossil fuels, especially in economies with little market intervention. This will likely be the case until global supply chains for fossil fuels and related combustion technologies are dismantled.

The previously mentioned example of United States coal companies' increasingly focused investment on expected growing demand in Asia, after experiencing declining coal sales in the United States, is another example of this adapted Jevons paradox to the modern interconnected world. Another example of this adapted paradox that illustrates the same economic forces at work is the United States' continued failure to change its energy policy in response to prolonged spikes in oil prices. Such spikes in prices initially spur renewed interest in kicking the oil habit, but before substantial progress toward an alternative is made, or as soon as prices begin to impact demand, prices fall, demand rises, and the urgency to find an alternative is forgotten. Conversely, if a price floor were placed on oil at the height of the spike, the momentum to deploy alternatives would likely be sustained.

The automobile industry provides an excellent example of how market size can influence R&D investment for specific sectors and thus, direct technical change. In this example, the United States is the global pariah, because both the European Union and China have stricter fuel efficiency

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$CO_2$ reductions equivalent to one Pacala-Socolow stabilization wedge and concluded that it would cost $5.1 trillion over the next fifty years. If $5.1 trillion were to be spent on wind instead of CCS, the equivalent emissions of two stabilization wedges could be sequestered and there would be revenue of $9 trillion in electricity sales from the wind turbines. There is no revenue generated from CCS because the only costs analyzed were the costs of capturing and sequestering carbon, which actually consumes energy. *E.g.*, Costas Tsouris et al., *Is Carbon Capture Sequestration Really Needed?*, 44 ENVTL. SCI. & TECH., 4042, 4042–45 (2010), http://pubs.acs.org/doi/pdf/10.1021/es903626u. The issue of whether clean coal can actually be achieved before it is too late is directly relevant to the need to spur increased innovation as fast as possible, which is exactly what the promotion of endogenous technical change is good at doing.

90. Global demand for fossil fuels is expected to continue to rise over the coming decades with China and other developing countries contributing to the vast majority of that growth. U.S. ENERGY INFO. AGENCY, *supra* note 17, at 9–11.

standards.[91] Prior to 2009, automobile manufacturers had a major incentive to design vehicles to meet the demands of United States consumers, because they were the largest vehicle market. This meant that a large portion of a vehicle manufacture's investments went toward designing and marketing sports utility vehicles to United States consumers, and not toward research and development of more fuel efficient cars or electric vehicles, further delaying their development.

China overtook the United States as the world's largest vehicle market in 2009 and, appropriately, the attention of automobile makers turned to China.[92]

> General Motors . . . may be struggling with sales in a slow-paced domestic market this year. But business is much more robust in China, where GM . . . [is on] track to sell more than 3 million vehicles there in 2015. The Detroit-based manufacturer and its partners are already on pace to sell more than 2 million cars this year—four years earlier than expected, GM said. Last year, it sold 1.83 million cars in the communist nation. "We already have an incredible focus on China and we're going to put as much energy as we can on China," said Kevin Wale, president and managing director for GM China Group.[93]

Luckily for the world, China has relatively strict fuel economy standards and is promoting electric vehicles as aggressively as any nation.[94] Car ownership in China is only a tiny fraction of what it is in the United States and as it grows it will have major implications on world oil prices and emissions.[95]

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91. INT'L COUNCIL ON CLEAN TRANSP., GLOBAL PASSENGER VEHICLES PROGRAM, GLOBAL PASSENGER CAR: FUEL ECONOMY AND GREENHOUSE GAS EMISSIONS STANDARDS 1–2 (2011), *available at* http://www.theicct.org/info/documents/PVstds_update_jan2011.pdf.

92. Tian Ying, *China Ends U.S.'s Reign as Largest Auto Market*, BLOOMBERG NEWS, Jan. 10, 2011, http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aE.x_r_l9NZE.

93. David Schepp, *GM's Big Sales Goal: 3 Million Cars Annually By 2015*, DAILYFINANCE.COM (Apr. 12, 2010, 2:00 PM), http://www.dailyfinance.com/story/company-news/gms-big-goal-in-china-3-million-cars-annually-by-2015/19435715/.

94. Yan Meng, *China Has Largest Electric Vehicle Charging Network*, PEOPLE'S DAILY ONLINE, Mar. 3, 2011, http://english.peopledaily.com.cn/90001/90778/7307489.html.

95. Considering the current composition of China's electric generation sector, even if it were to electrify its automobile sector, this would mean that the sector would run on coal instead of oil or gas and the impact on overall emissions would not necessarily improve, unless international measures are taken to significantly advance clean energy. *E.g.*, Hong Huo et al., *Environmental Implication of Electric Vehicles in China*, 44 ENVTL. SCI. & TECH. 4856, 4856 (2010), *available at* http://pubs.acs.org/doi/pdfplus/10.1021/es100520c.

GM's primary concern is not the GHG emissions that increased car sales will produce, it is that they have a market to sell to. It is thus the role of policymakers to ensure that the cars GM manufactures and sells in China produce as few negative externalities as possible. Even if GM is incentivized by regulators to make electric vehicles for China, there is the possibility that China's reduced demand for oil will then incentivize other growing markets with access to cheaper oil to demand gas guzzling vehicles from GM; and GM arguably has a duty to its shareholders to pursue sales of such vehicles if it will be profitable.

To direct, sufficiently, technological change and keep the overall economic costs of transitioning to a low-carbon world minimal, it is essential that the price of dirty inputs be felt regardless of the market or place of production. The aforementioned examples are just a few of the challenges that promotion of low-carbon development faces so long as there is not a globally effective price on carbon emissions.

## II. WHY IT MATTERS: CHINA'S PLAN AND CHALLENGES TO REFORM

Over the coming two decades, China is expected to spend trillions of dollars on energy related infrastructure projects.[96] It is estimated that over 350 million people will move from the countryside to Chinese cities during the next fifteen years.[97] Nearly forty billion square meters of floor space will be built over the next twenty years in China, the equivalent of ten New York City's.[98] Both the energy consuming infrastructure required to accommodate 350 million additional city dwellers and the increased energy consumption of urban residents in China will have a major impact on future emissions.[99] Yet at present, there is little economic incentive to persuade governments or private investors to invest in more expensive, low-carbon energy infrastructure now to obtain lower emissions in the future.[100]

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96. Tahilyani et al., *supra* note 13.

97. JONATHAN WOETZEL ET AL., PREPARING FOR CHINA'S URBAN BILLION 6 (2009), *available at* www.mckinsey.com/mgi/reports/pdfs/china_urban_billion/China_urban_billion_full_report.pdf.

98. *Id.* at 18.

99. *Id.* at 155–56; *Asia's Alarming Cities*, THE ECONOMIST, July 1, 2010, www.economist.com/node/16481295?story_id=16481295&fsrc=rss.

100. *Asia's Alarming Cities*, *supra* note 99; WHITEHOUSE ET AL., *supra* note 12 ("We need clear and consistent policy frameworks to help unlock the required flow of private capital.").

The terms "energy infrastructure" and "low-carbon or high-carbon infrastructure" as used in this article refer to both large investments that either individually or cumulatively produce energy or electricity and/or consume energy or electricity, and impliedly the fuels used to power them. This would

Examining China's recent development and its ability to develop successfully as a low-carbon society is important for two reasons. First, China is the world's largest emitter of GHGs and $CO_2$, and its emissions are growing faster than any other country with little sign of abating.[101] Second, if China is successful at transitioning to a low-carbon society, the costs of deploying clean energy will have been reduced significantly and China will be a model for the rest of the world, especially the developing world from where the majority of future emissions growth is projected to come.[102] If China is unable to transition to a low-carbon economy, i.e., if emissions are not significantly reduced at least after 2035, that would imply that clean energy technologies have not advanced sufficiently to compete with fossil fuels. But, perhaps what is more important is the implication for mitigation if China's transition is unsuccessful. It would be a severe disincentive for smaller emitters to invest substantially in emission reduction, because their emission cuts would have a much smaller impact on mitigating climate change.[103]

China also has purely domestic reasons that should provide significant motivation for shifting its society to a low-carbon and sustainable path. China already battles severe desertification in the north and severe fresh water shortages as well.[104] These water shortages are exacerbated by increased thermal electricity generation and inefficient energy infrastructure development.[105] In addition, China is very concerned about agricultural self-sufficiency, which climate change potentially threatens. This is especially

include transportation infrastructure, residential and commercial buildings, and electricity generation facilities and equipment.

101. U.S. ENERGY INFO. AGENCY, *supra* note 17, at 123–134.

102. *See id.* at 123 (concluding that emissions from non-OECD countries are expected to comprise around two-thirds of global emissions by 2035).

103. This reasoning was already used by the United States as a justification for not joining the Kyoto Protocol and, more specifically, in the Byrd-Hagel Resolution. S. Res. 98, 105th Cong. (1997). In 1997, the U.S. Senate passed the Byrd-Hagel resolution with a ninety-five to zero vote. It urged the White House not to commit to internationally binding GHG emission reductions unless major developing country parties did so as well.

China currently accounts for around twenty-two percent of world $CO_2$ emissions. Some projections call for China's emissions to peak by 2020 in order to halve global emissions by 2050. The most ambitious projections from Chinese think tanks do not foresee overall $CO_2$ reductions until 2030 at the earliest. David Stanway, *China CO2 Emissions Need to Peak By 2020: IEA*, REUTERS, Jul. 16, 2010, http://reuters.com/article/2010/07/16/us-china-carbon-iea-idUSTRE66F2XC20100716; Jiang Kejun et al., *Technology Roadmap for Low-Carbon Society in China*, 2 J. RENEWABLE & SUSTAINABLE ENERGY 031008, 031008-6 (2010), *available at* http://scitation.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=JRSEBH000002000003031008000001&idtype=cvips&doi=10.1063/1.3458415&prog=normal.

104. *See generally* Keith Schneider et al., *Choke Point China: Confronting Water Scarcity and Energy Demand in the World's Largest Country*, 12 VT. J. ENVTL. L. 713 (2011).

105. *See generally id.*

true in the north and northeast, both are major grain-producing regions where the frequency of drought has risen in recent decades.[106] For the megalopolis Shanghai, and other low-lying coastal cities, it is sea level rise due to climate change that is a major concern.[107]

Chinese leaders take these risks seriously and are taking steps to address them.[108] However, it is worth noting that there are reasons for China to avoid ambitious attempts to mitigate GHG emissions, especially if those measures threaten the ability of China's leaders to control economic growth, which is their mandate for staying in power. Cost-benefit analysis guru Cass Sunstein analyzed China's likelihood of supporting a global climate change agreement that would bind it to aggressive emission cuts and concluded that it would disserve China's interests to bind itself to an international agreement, even if such an agreement would be beneficial to the world as a whole.[109] The costs required to curb China's heavy reliance on coal and the perceived domestic political need for rapid economic growth and stability lessen the likelihood that China will undertake aggressive mitigation action, especially because China's reduced emissions would disproportionately benefit other countries.[110] Sunstein notes that China's low per capita emission rate relative to other major emitters and its developing country status also lessen its moral obligation to cut emissions.[111] It is this argument that China has used in international negotiations to avoid binding targets and to coalesce around the developing country bloc of nations.[112]

China is justified in claiming that it is a developing nation. Of China's 1.3 billion people, nearly 300 million still live on less than $2.00 a day; just under half of those survive at or below the global poverty line of $1.25 a

106. JINXIA WANG ET AL., CLIMATE CHANGE AND CHINA'S AGRICULTURAL SECTOR: AN OVERVIEW OF IMPACTS, ADAPTATION AND MITIGATION 3 (2010), *available at* http://ictsd.org/downloads/2010/06/climate-change-and-chinas-agricultural-sector.pdf. The authors also note that warming could potentially increase arable land in some northern regions.

107. *Rising Seas Threaten Shanghai, Other Big Cities*, ASSOCIATED PRESS, Oct. 18, 2009, www.msnbc.msn.com/id/33368880/ns/us_news-environment/.

108. *See generally* Dongsheng Zang, *Green from Above: Climate Change, New Developmental Strategy, and Regulatory Choice in China*, 45 TEX. INT'L L.J. 201 (2009) (discussing how China's government is addressing climate change).

109. Cass Sunstein, *The Complex Climate Change Incentives of China and the United States* (John M. Olin Law & Econ., Working Paper No. 352, 2007), *available at* http://www.law.uchicago.edu/files/files/352.pdf.

110. *Id.* at 18–19.

111. China's per capita emission rate is close to or just over the global average for per capita emissions. *Id.* at 31.

112. *Id.* at 10.

day.[113] Yet, China is also the third largest luxury goods market in the world[114] and home to more millionaires than the United Kingdom or France.[115] China has a Gini coefficient nearing .50, well above recognized alarm levels.[116] China maintains the world's largest foreign-exchange reserves in excess of $2.5 trillion.[117] While China has invested aggressively in some public infrastructure projects, it has been criticized for keeping the exchange rate of its currency artificially low, limiting investment options, and sitting on its exchange reserves—in essence making its own people poorer than need be and withholding needed social services.[118]

Despite reasons not to aggressively mitigate climate change, China's efforts and achievements are laudable.[119] China has successfully reduced the carbon intensity of its growth continuously over the last three decades.[120] China cut energy intensity by two-thirds per unit of output between 1978

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113. Shaohua Chen & Martin Ravallion, *China Is Poorer Than We Thought, But No Less Successful in the Fight Against Poverty* 11, 16 (Dev. Research Grp., World Bank, Working Paper No. 4621, 2008), *available at* http://elibrary.worldbank.org/docserver/download/4621.pdf?expires=1300674661&id=id&accname=guest&checksum=B404154AB8BCCA170D171ACD96B597CD.

114. *See* Bao Chang, *Luxury Demand May Peak in 2015*, CHINA DAILY, Jan. 22, 2010, http://www.chinadaily.com.cn/bizchina/2010-01/22/content_9360040.htm [hereinafter *Luxury Goods Demand May Peak in 2015*] ("By 2015, 29 percent of global luxury product consumption will come from China, making it the world's largest luxury market . . . ."); Bao Chang, *China's Luxury Goods Market Accounts for 27.5% of Worldwide Total*, PEOPLE'S DAILY ONLINE, Dec. 14, 2009, http://english.peopledaily.com.cn/90001/90776/90882/6841787.html ("Consumption of China's luxury goods accounted for 27.5 percent of the worldwide total, and it is expected that the market will reach 14.6 billion U.S. dollars in China in the next five yeas, which will make the country the largest luxury goods market.").

115. *Luxury Goods Demand May Peak in 2015*, *supra* note 114 ("Although still small in relation to the overall population of China, the nation's high-net-worth category is larger than that of many affluent countries such as France and the United Kingdom.").

116. Xiaomei E., *China's WTO Accession and Sustainable Development: Challenges and Policy Responses,* 43 J. WORLD TRADE 541, 553 (2009).

117. *China's Foreign Exchange Reserves Jump To $2.65 Trillion*, BLOOMBERG NEWS, Oct. 13, 2010, http://www.bloomberg.com/news/2010-10-13/china-s-currency-reserves-surge-to-record-fueling-calls-for-stronger-yuan.html.

118. James Fallows, *The $1.4 Trillion Question*, THE ATLANTIC, Jan./Feb. 2008, www.theatlantic.com/magazine/archive/2008/01/the-14-trillion-question/6582/2/?.

119. *China Unveils Emissions Targets Ahead of Copenhagen*, BBC NEWS (Mar. 25, 2011), http://news.bbc.co.uk/2/hi/8380106.stm. From 1980 to 1989 and again from 1990 to 1999, China halved its emission intensity in $CO_2$ emissions during each ten-year period. Some argue that performance during these two preceding decades suggests that China can easily reduce its emission intensity forty percent to forty-five percent over a fifteen-year period as it pledged to do as part of the Copenhagen Accord.

120. *Id.*; *see also* Joanna I. Lewis, *China's Strategic Priorities in International Climate Change Negotiations*, 31 WASH. Q. 155, 156–57 (2007), *available at* http://www.twq.com/08winter/docs/08winter_lewis.pdf (describing China's reduction in emissions intensity between 1980 and 2000).

and 2000, an unprecedented achievement for a large developing country.[121] Currently, China leads the world in investments in low-carbon energy.[122] Prior to the UNFCCC's Fifteenth Conference of the Parties in Copenhagen, China made a domestic pledge to cut its carbon intensity by at least forty percent from 2005 levels by 2020.[123] China resubmitted this plan as its formal mitigation plan under the Copenhagen Accord. Under the most recent five-year plan (the twelfth in a series of five-year plans), which spans from 2011 through 2015, China will aim to cut energy and carbon intensity by 16 and 17 percent respectively.[124]

During the eleventh five-year plan, China fell just short of meeting its target of cutting energy intensity by twenty percent from 2006 to 2010.[125] China's official numbers report a decrease of 19.06% for that period, even after Premier Wen Jiabao urged the need to use an "iron fist" to meet the country's target following a spike in energy intensity in late 2009.[126] China's close but unsuccessful attempt to meet its energy intensity target for 2010 and some of the draconian measures taken by local governments to help meet the target illustrate the increasing challenges China faces as it attempts to reduce energy and carbon intensity.[127] China's energy consumption is a unique beast because it is very closely tied to China's overall economic structure and investment patterns. China's industrial

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121. C. FRED BERGSTEN ET AL., CHINA'S RISE: CHALLENGES AND OPPORTUNITIES 138–139 (Peterson Inst. for Int'l Econ. & Ctr. for Strategic and Int'l Studies eds., 2008).

122. Alex Morales, *China 'Winning the Green Economy Race,' UN Climate Chief Says*, BLOOMBERG, Jan. 27, 2011, http://www.bloomberg.com/news/2011-01-27/china-winning-the-green-economy-race-un-climate-talks-chief-says.html (reporting that China spent $51.1 billion on low-carbon energy in 2010, far more than any other country).

123. *China Unveils Emissions Targets Ahead of Copenhagen, supra* note 119.

124. Chris Buckley, *China Vows to Cut Energy, Carbon Intensity by 2015*, REUTERS, Feb. 27, 2011, http://www.reuters.com/article/2011/02/27/us-china-energy-carbon-idUSTRE71Q0MD20110227.

125. *A Review of the 11th Five-Year Plan*, CHINA DAILY, Mar. 2, 2011, http://www.chinadaily.com.cn/2011-03/02/content_12099327.htm.

126. Buckley, *supra* note 124; Li Woke, *Energy Efficiency Drops Despite New Green Regulations*, GLOBAL TIMES, Aug. 5, 2010, http://en.huanqiu.com/business/china-economy/2010-08/559822.html.

127. China had some very successful programs under the eleventh five-year plan. *See* Lewis, *supra* note 120, at 158–61 (noting that the Top-1000 program cut energy use at China's thousand largest enterprises; these enterprises accounted for a third of China's energy use). But because of the incentive system used to effectuate the plan, some local governments cut power to factories and citizens, causing social unrest and diesel prices to spike as factories began to use generators to replace electricity. Alex Wang, *What to Make of China's Efforts to Meet Its Energy Intensity Targets*, NAT. RESOURCES DEF. COUNCIL (Oct. 21, 2010), http://switchboard.nrdc.org/blogs/awang/chinas_actions_on_climate_chan_1.html; *Blackouts Trigger Diesel Shortage in China*, NEWS.GOOGLE.COM (Nov. 7, 2010), http://www.google.com/hostednews/afp/article/ALeqM5hHhxWVSH_9B3xZACyFBLgc2IrIjw?docId=CNG.74bac5b4cc9462fd7346e1c94b90120a.491.

sector comprises nearly sixty-four percent of China's primary energy demand, significantly larger than any other major developing country and far more than any developed country. This phenomenon is driven by China's domestic policies, which have made investment in industry an imbalanced driver of GDP growth.[128] In recent years, investment has focused on energy-intensive industries, which contributes to China using five times the energy to produce the same economic output as Japan.[129] Some argue that China maintains an artificially low exchange rate relative to other currencies and that this acts as an export subsidy to many of these heavy, energy-consuming industries.[130] The fact that China's emissions are so closely tied to the core economic policies that have helped China achieve its remarkable growth means that transitioning to a low-carbon society will require China to rebalance its entire economic structure.

China's twelfth five-year plan is ambitious and contains lofty language aimed at rebalancing China's economy and shifting it from energy-intensive sectors to service sectors and household consumption. But so too did China's eleventh five-year plan, which promoted the theories of Scientific Development (科学发展) and Eco-civilization (生态文明).[131] Even though China did not succeed in making significant progress toward an economic transformation during the eleventh five-year plan, it did manage to reduce energy intensity.[132] And the lack of progress in curbing heavy industry investment is often attributed to the steps China took to stave off the global economic crisis of 2008, including the government's $586 billion stimulus package, which spurred massive infrastructure development.[133] Despite a commonly-held notion that China's authoritarian leaders are capable of making policy and enforcing policy at will, this is not actually the case. China's heavy reliance on the five-year plan and its

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128. BERGSTEN ET AL., *supra* note 121, at 140–42.; *see also* Michael Pettis, *China Must Bridge the Growth Gap*, FIN. TIMES, Mar. 14, 2011, http://www.ft.com/cms/s/0/94fe455e-4e70-11e0-98eb-00144feab49a.html (describing China's investment-driven growth model).

129. BERGSTEN ET AL., *supra* note 121, at 141. As the authors note, this is partially attributable to less efficient factories and plants in China, but more attributable to the composition of China's economy.

130. Shakeb Afsah & Kendyl Salcito, *Fate of China's CO2 Sealed with Its Currency Regime*, $CO_2$ SCORECARD (Mar. 3, 2011), http://www.co2scorecard.org/home/researchitem/18.

131. Zang, *supra* note 108, at 212.

132. Woke, *supra* note 126.

133. David Barboza, *China Plans $586 Billion Economic Stimulus*, N.Y. TIMES, Nov. 9, 2008, http://www.nytimes.com/2008/11/09/business/worldbusiness/09iht-yuan.4.17664544.html. There is some analysis indicating that China's stimulus encouraged industrial investment and harmed energy intensity in the short-term, but that it will have overall efficiency benefits in the long-term. *More Stimulus Needed for Energy Conservation in China*, WORLD WILDLIFE FED'N (Jan. 26, 2011), http://wwf.panda.org/wwf_news/?199171/More-stimulus-needed-for-energy-conservation-in-China.

accompanying performance based management system often encourages short-term fixes over long-term solutions.

To help ensure that important targets set forth in the five-year plan are met, China's leaders primarily rely on an incentive based system that links cadre promotions to achieving specific targets. This performance management system is enforced entirely within China's government and party bureaucracy and is in contrast to a system rooted in law and enforced systematically by specialized regulatory agencies and the judicial system.[134] Because China has yet to develop a broad independent regulatory regime and judiciary, it has had difficulty achieving goals that are not directly tied to the plan's cadre performance system. Even when a target is achieved pursuant to the plan's performance system, there is the risk that the gains are short-lived. After focused efforts to meet the eleventh five-year plan's energy intensity goal during the last part of 2010, pent-up energy demand skyrocketed in the first quarter of 2011 raising energy intensity and fresh concerns regarding the long-term effectiveness of the plan's target system.[135]

Additionally, within China's elite structure there are diverse interests, not to mention the invested interests of lower-level cadres in local government who will go to great lengths to protect the subsidies and profits they enjoy under the current energy-intensive growth model.[136] The dominant players in China's coal and oil industries are state-owned companies whose chief officers are also high-level Communist Party officials. It has been argued that these companies, especially oil companies, have significant pull and autonomy when it comes to national energy policy.[137] Both the scale of China's projected fossil fuel consumption and the scale of domestic reform that will be required to shift successfully to a low-carbon society are huge. The question is whether the international community should passively sit back and watch China's ambitious plans

134. Adam Moser, *Insights into the Role of Law and Plan in China*, CHINA ENVTL. GOVERNANCE (Dec. 7, 2010), http://chinaenvironmentalgovernance.com/2010/12/07/insights-into-the-role-of-law-and-plan/ (discussing the difference of law and plan in China, how the two are enforced, and why reliance on law offers a more sustainable path forward).

135. *TABLE-China's Power Consumption Breakdown for March*, REUTERS, Apr. 14, 2011, http://af.reuters.com/article/energyOilNews/idAFL3E7FE09K20110414; *see New Analysis: China's Q1 Power Consumption Indicates Emissions Challenges*, XINHUA, Apr. 15, 2011, http://news.xinhuanet.com/english2010/china/2011-04/15/c_13829494.htm ("China's practice of rationing power to achieve its national goal of cutting carbon dioxide emissions in the fourth quarter of last year restrained the demand of industries that consumed much energy. But part of the restrained production capacity of such enterprises was released in the first quarter this year.").

136. Pettis, *supra* note 128.

137. Xiaofei Li, *State Companies Hold Power over Chinese Energy Policy*, OIL & GAS J., Feb. 7, 2011.

unfold, or actively engage in assisting China's low-carbon development. There is an existing consensus on the need to further develop clean-energy technology in order to facilitate further low-carbon development globally.[138] But as the preceding discussion on leakage and its associated risks explains, the best way to help China will be to correct the global market failure that is climate change.

## III. THE MARKET FAILURE IN THE INTERNATIONAL TRADE AND DEVELOPMENT CONTEXT

The continued negative impacts of the global failure to price carbon emissions is evinced in the schizophrenic nature of energy investment in Asia and globally. While China installed nearly 19 GW of wind power in 2010, it also added nearly three times that in coal-fired power and sold and/or financed nearly $55 billion worth of coal-fired power to India.[139] Of course, rapidly growing economies like China and India need to build reliable base load generation.[140] But the crux of the problem is that investment capital for energy infrastructure projects is limited, so one project happens at the expense of others.[141] For every dollar spent on dirty inputs, one less dollar is spent on propelling endogenous technical change in clean energy. Considering the recognized public good in low-carbon development, why is low-carbon infrastructure development not promoted more aggressively globally?

One answer is that low-carbon and high-carbon energy projects are competing technologies in a marketplace and market actors are making rational decisions based on the information available to them. This is, of course, the common logic used to explain free trade and free markets. But climate change clearly presents a tragedy of the commons—a tragedy facilitated by a market failure.[142] When this happens at a national level, governments will often intervene to correct the market failure. But even this

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138. Michael Levi et al., *Globalizing the Energy Revolution: How to Really Win the Clean-Energy Race*, FOREIGN AFF., Nov./Dec. 2010, at 111, 121.

139. Mehrota, *supra* note 8; Nina Chestney, *Global Wind Power Grows 24 Percent on China Boost*, REUTERS, Apr. 6, 2011, http://www.reuters.com/article/2011/04/06/us-china-wind-idUSTRE73521E20110406.

140. In rapidly developing nations like China and India, domestic sources of energy, i.e., coal, will continue to be developed for both economic and national security reasons. But the critical questions are for how long, in what way, and at the expense of what other forms of energy?

141. Dobbs et al., *supra* note 12; WHITEHOUSE ET AL., *supra* note 12.

142. Hufbauer & Kim, *supra* note 21. It is generally accepted that climate change due to the continued use of fossil fuels represents a market failure, because the real cost associated with GHG emissions is not internalized in the price of fossil fuels.

can be difficult. For example, the United States has had immense difficulty implementing a coherent domestic policy to address climate change. At the international level, correcting a global market failure is even more difficult.[143]

Generally, free markets and free trade can serve the public interest. But, there are certain industry and investment sectors that traditionally have been prone to inefficiencies and natural monopolies when left to predominantly free market forces.[144] Railroads, the electricity sector and other public utilities, which are generally investment intensive, fall into this category. It is no coincidence that increased government regulation over these sectors is also premised on the fact that these sectors generally provide services that are "affected with the public interest."[145] Or as the Honorable Richard Cudahy wrote regarding a specific, large part of energy infrastructure:

> Electric power is an infrastructure industry. This means that it is a major element in the "underlying foundation or basic framework" of the economy and our very culture. The difference between an electrified economy and a non-electrified economy is profound—think of a gas or candle-lighted operating room versus a non-airconditioned [sic] Houston.
>
> The foundational nature of the electric power industry is important because the more a technology like electricity goes to the roots of the economy, the more it spawns "externalities"—social benefits and social costs which do not figure in conventional economic analyses of the system employing the technology.[146]

The fact that electricity and energy infrastructure go to the very core of a society is another reason to address climate change as a market failure and

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143. This is due to issues such as free-riding that are more pronounced at the international level. *See* Scott Barrett, *Creating Incentives for Cooperation: Strategic Choices*, *in* PROVIDING GLOBAL PUBLIC GOODS: MANAGING GLOBALIZATION 308 (Inge Kaul et al. eds., 2003) (discussing the free-riding issue in international fisheries).

144. *See generally* THE END OF A NATURAL MONOPOLY: DEREGULATION AND COMPETITION IN THE ELECTRIC POWER INDUSTRY (Peter Grossman & Daniel Cole eds., 2003); JOSEPH P. TOMAIN & RICHARD D. CUDAHY, ENERGY LAW IN A NUTSHELL 120 (2004).

145. *See* Munn v. Illinois, 94 U.S. 113 (1876) (discussing how private property ceases to be *juris privati* when "affected with a public interest").

146. Richard Cudahy, *Retail Wheeling: Is This Revolution Necessary?* 25 ENERGY L.J. 161, 164 (2004).

core human and economic development issue.[147] Additionally, despite efforts to deregulate electricity markets in the United States and elsewhere, these sectors remain heavily regulated, even subject to rate regulation. Clearly, at the national level there is recognition that these sectors are discernibly different from other economic sectors, and thus, justify increased market intervention.

At the international level and specifically in regard to climate change, the justification for extensive market intervention is even more pronounced than it is at the national level. This is because the benefits of building energy infrastructure are concentrated domestically within a nation, whereas the negative externalities of GHG emissions are spread globally. Today, because of international commodity markets, global communication and logistics, and increased understanding of trans-boundary environmental impacts, domestic choices about energy infrastructure development influence events and lives well beyond national borders in ways unseen in previous eras.

### *A. Justifications for Regulation: Smartphones Versus Energy Infrastructure*

Although it is impracticable for an international body to regulate energy infrastructure that operates solely within a nation's borders, making a cogent distinction between energy-infrastructure related sectors and goods in other sectors can still be useful in regulating the international trade in such goods. But making this distinction requires overcoming the commonly-held dogmatic belief that traditional free trade policies will automatically optimize the public good regardless of sector, and that a disruption of current free trade orthodoxy will be more detrimental to human development than under-mitigated climate change. The following discussion examines whether it is wise to use the same international trade policies that apply to a smartphone and its supply chain to govern trade in goods that will significantly determine the future of GHG emissions. Clearly, the externalities attached to the decision to build low-carbon or high-carbon energy infrastructure are far greater than those attached to the decision to buy an iPhone or a Blackberry.

It is disingenuous to equate international trade and investment in energy infrastructure with the international trade in consumer goods. Consumer goods are abundant, available in all shapes and sizes, and generally

147. An example of how energy infrastructure, not just electricity, influences culture is evident when examining how the United States' development of the automobile, highways, and domestic oil production influenced suburban sprawl and continuing dependence on individual car ownership, and fostered a now heavy addiction to imported oil.

purchased without debt financing. In contrast, energy-producing and energy-consuming infrastructure is generally heavily financed. Even constructing an individual house usually requires a mortgage—a mortgage that generally does not reward additional investments in energy efficiency.[148] Most importantly, the infrastructure and energy systems built today will influence GHG emissions for the next forty years and longer. Conversely, consumer goods, for better or worse, go from cutting edge to irrelevant within a few years, if not months.

Another illustration of this difference is the power and choice consumers exercise when buying consumer goods versus their purchase of electricity and other forms of energy. In the case of electricity generation, a project developer will propose a project to investors; if investors are comfortable with the risks and the likely rate of return, the project will get financed. Then, after years of coal, gas, or uranium extraction and the construction of a power plant, eventually the grid will be supplied with electricity and, finally, hundreds of thousands of consumers will turn on lights and pay someone for the privilege. Conversely, in the case of a smartphone, engineers and designers assess recent consumer trends and substantial market data. They search for the latest materials and then release the phone into a market where it competes with hundreds of other mobile phone devices for the attention of a consumer who will use the phone for two years before upgrading.

Establishing that there is a meaningful distinction between trade in energy-infrastructure-related goods and trade in consumer goods is only the first step. The next step requires recognizing that low-carbon development (climate change mitigation) is a public good.[149] Once low-carbon development is internalized as a public good, then the regulation of international trade and finance for energy infrastructure development becomes more akin to regulating the global commons and less like the regulation of trade in consumer goods.[150] Of course, the development of low-carbon infrastructure does not happen without available technology and building know-how. Therefore, the building and design of low-carbon

148. DAVID GOLDSTEIN, INVISIBLE ENERGY: STRATEGIES TO RESCUE THE ECONOMY AND SAVE THE PLANET 51 (2009).

149. On low-carbon development as a public good, see INT'L BANK FOR RECONSTRUCTION & DEV., WORLD BANK, PHASE II: THE CHALLENGE OF LOW-CARBON DEVELOPMENT 4 (2010), *available at* http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/02/08/000333037_20110208014639/Rendered/PDF/594600PUB0ID1810Box358282B01PUBLIC1.pdf and Barrett, *supra* note 143, at 319–21 (discussing the concept of public goods in respect to climate change and trade).

150. This is because energy-consuming and electricity-producing infrastructure will determine future GHG emissions more than any other single sector, and thus, the condition of the global commons.

infrastructure is, for all intents and purposes, for the public good. However, there is not yet an explicit recognition within the global market of the value associated with low-carbon development. This is of course because the global market has yet to internalize the associated costs and risks inherent in carbon-intensive infrastructure.

## IV. INTERNATIONAL CAPACITY: THE WTO AND UNFCCC

The most substantial efforts to date to recognize the role of international trade in promoting low-carbon development are ongoing negotiations within the WTO to designate a category for environmental goods (EGs) under the harmonized system. Unfortunately, progress toward this goal has been extremely slow and difficult.[151] The end goal, after designating a category for EGs, is to lower or eliminate tariffs and non-tariff barriers, and thus promote the wide-scale trade and deployment of environmentally-friendly goods, which ideally is inclusive of clean/renewable energy equipment.[152] A 2007 World Bank study concluded that the removal of all trade barriers on select low-carbon energy-related technologies would result in increased trade flows of up to 13 percent in countries with high GHG emissions.[153] But after ten years of the Doha mandate's non-agricultural market access (NAMA) negotiations, there has yet to be agreement as to what goods to designate as EGs, ostensibly because some EGs have multiple uses that may not benefit the environment.[154]

The WTO's evinced difficulty in doing what it is supposed to do (i.e., lower trade barriers) does not bode well for the its ability to deal with the unconventional challenges it will likely face in the near future. While the 2007 World Bank study found an increase in trade for EGs if all trade barriers are eliminated, the actual impact of reduced trade barriers is not likely to propel significantly low-carbon development at the scale required to stabilize global emissions at 450 ppm.[155] Larger drivers of increased trade

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151. RENE VOSSENAAR, INT'L CTR. FOR TRADE & SUSTAINABLE DEV., CLIMATE-RELATED SINGLE-USE ENVIRONMENTAL GOODS 1–2 (2010), *available at* http://ictsd.org/downloads/2010/11/rene_vossenaar__web7.pdf.

152. WORLD BANK, INTERNATIONAL TRADE AND CLIMATE CHANGE: ECONOMIC, LEGAL, AND INSTITUTIONAL PERSPECTIVES 70 (2008).

153. *Id.* at 13.

154. VOSSENAAR, *supra* note 151, at 1.

155. VEENA JHA, INT'L CTR. FOR TRADE & SUSTAINABLE DEV., ENVIRONMENTAL PRIORITIES AND TRADE POLICY FOR ENVIRONMENTAL GOODS: A REALITY CHECK 33 (2009), *available at* http://ictsd.org/downloads/2008/11/ictsd-veena-jha_final-integrated-cover.pdf.

in EGs and all low-carbon infrastructure development are economic growth and demand.[156] But based on the historic example of China and other countries, developing countries are likely to opt for the cheapest and most dependable energy options available to them. This preference, and the current tendency of the international trade regime to encourage fossil fuel use, invariably threatens the increasing development of renewable energy based solely on lowering tariffs. If the cost of low-carbon energy infrastructure does not decline significantly or if its adoption is not incentivized sufficiently, there is little reason to believe that demand for EGs will rise in the short-term, regardless of tariffs.

In contrast to the WTO, the UNFCCC's central obligation is to address climate change. But, like the WTO, it has primarily attempted to do so by marginalizing discussions regarding trade and competiveness with regard to climate change.[157] The policy stance taken by the UNFCCC on trade and climate change is arguably counterproductive to achieving a global climate deal. Article 3.5 of the UNFCCC states that trade measures cannot be taken if they are intended to protect domestic industry.[158] Yet, a nation's ability to protect its domestic industry while imposing strict limits on GHG emissions would likely encourage ambitious emission cuts and control carbon leakage and, thus, ensure the global efficacy and efficiency of a treaty. Considering the delicate state that UNFCCC negotiations are currently in, it is unlikely that the body will begin to address directly the issues of trade and leakage as some have requested.[159]

The goals of the WTO and the UNFCCC differ in many ways, but are there other institutional traits that encourage a compartmentalization of trade and climate change? Professor Steve Charnovtiz has described the differences between the UNFCCC regime and the WTO as follows:

> The climate regime is driven by the need to correct market failure. Therefore, governments want maximum flexibility at the national level in using economic instruments to influence individual behavior. By contrast, the trade regime is not a response to market failure; it is a response to government failure, that is, the distortions of policy fomented by mercantilism and protectionism. Thus, the

156. *Id.* at 14–15.

157. REINAUD, *supra* note 75, at 97.

158. JOANNA DEPLEDGE, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, TRACING THE ORIGINS OF THE KYOTO PROTOCOL: AN ARTICLE-BY-ARTICLE TEXTUAL HISTORY 50 (2000), *available at* http://unfccc.int/resource/docs/tp/tp0200.pdf.

159. FRANKEL, *supra* note 47, at 8 (suggesting that the UNFCCC should directly address trade issues to better facilitate meaningful policy).

> trading system often seeks to disable economic instruments at the national level. Unlike the climate regime, the trading system does not aspire to change the behavioral incentives for individual economic actors. Another difference between the two regimes is cultural. In the climate regime, science plays a central role in measuring the problem, and in evaluating policy responses. In the trading system, science plays no role in rulemaking.[160]

Charnovitz notes that the WTO aims to correct government failure, but the notion that governments always fail by not fully liberalizing trade policy is controversial. Top economists have noted that many of the world's successful economies, including the United States, South Korea, and China, achieved their dominance by protecting key economic sectors.[161]

Charnovitz also highlights that science plays no role in WTO rule-making. But is this actually the case? It might depend on the definition of rule-making, but science in conjunction with the precautionary principal has played a role in disputes between the United States and European Union involving GMOs, beef hormones, and chemicals. Perhaps what Charnovitz is referring to is the fact that the WTO is essentially a political body, and thus pursues policies based on unscientific beliefs (i.e., free trade in and of itself is a public good) or that as a political body its decisions are not likely to be in optimal accord with the science. But in this regard the UNFCCC is not that different. Science should inform policy within the UNFCCC, but negotiations within the UNFCCC are inherently political, at least as much as WTO negotiations.

Of course, an optimal outcome would be for international institutions to remedy the market failure surrounding carbon-intensive development and increase free trade for low-carbon environmental goods in a way that makes everyone happy. But what is the likelihood that this can be achieved?

The relatively successful outcome at the Sixteenth Conference of the Parties in Cancun, (COP 16), Mexico in December 2010 provided a small ray of hope for what was otherwise a dismal year for addressing global climate change. Unfortunately, the light from Cancun was short-lived. Only

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160. Steve Charnovitz, *Trade and Climate: Potential Conflicts and Synergies, in* BEYOND KYOTO: ADVANCING THE INTERNATIONAL EFFORT AGAINST CLIMATE CHANGE 141, 143 (Pew Ctr. on Global Climate Change, 2003), *available at* http://www.pewclimate.org/docUploads/Trade%20and%20Climate.pdf.

161. HA-JOON CHANG, BAD SAMARITANS: THE MYTH OF FREE-TRADE AND THE SECRET HISTORY OF CAPITALISM (2007); DANI RODRIK, UNITED NATIONS DEV. PROGRAM, THE GLOBAL GOVERNANCE OF TRADE: AS IF DEVELOPMENT REALLY MATTERED 17, 26 (2001), *available at* http://www.wcfia.harvard.edu/sites/default/files/529__Rodrik5.pdf.

two weeks after the close of COP 16, the United States formally filed its request for consultations with the WTO alleging that China provided illegal export subsidies to its wind industry and failed to translate the text of those subsidy measures into one of the WTO's official languages.[162]

The Cancun Agreements are generally considered a success because they kept the UNFCCC framework alive, which illustrates just how pessimistic hopes were going into COP 16. Indeed, with the exception of agreement on REDD+ and breaking ground on how to achieve "consensus" but not unanimity, COP 16 punted most of the tougher issues to the next major round of negotiations. The most critical issue left unaddressed is what to do when the Kyoto Protocol expires in 2012. The crux of the dispute over Kyoto's renewal is whether major developing-country emitters, like China, should join developed countries in committing to internationally-binding emission targets.

## V. THE PROMOTION OF BORDER TARIFFS AS A SUBOPTIMAL, BUT PRAGMATIC WAY FORWARD

One potential measure that could accomplish the goal of internalizing the risks associated with increased GHG emissions would be the placement of an international price on carbon emissions. Many experts with many diverse views have called for a price on carbon in one form or another, and elaborate plans have been proposed for how to best implement a carbon price internationally.[163] Even the hydrocarbon giant ExxonMobil supports an upstream carbon tax.[164] Energy companies want direction more than anything else; they want policy certainty so that they know where to direct their research and development spending. And for many policymakers, an optimal international climate change agreement would contain a broad carbon price sufficient to shift global development onto a low-carbon path.

But what if an international agreement with carbon caps or an international carbon price cannot be reached? Or, if an agreement is reached, what if it is perceived by some countries to be insufficient?

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162. Request for Consultations by the United States, *China—Measures Concerning Wind Power Equipment*, WT/DS419/1 (Jan. 6, 2011), *available at* www.worldtradelaw.net/cr/ds419-1(cr).pdf.

163. *See generally* POST-KYOTO INTERNATIONAL CLIMATE POLICY: IMPLEMENTING ARCHITECTURES FOR AGREEMENT 1 (Joseph E. Aldy & Robert N. Stavins eds., 2010) (attempting to define an "international policy architecture" to solve the Global Climate Crisis through a collection of works from the Harvard Project on International Climate Agreements).

164. Steven Mufson, *Exxon Chief Embraces Carbon Tax*, POST GLOBAL, Jan. 9, 2009, http://newsweek.washingtonpost.com/postglobal/energywire/2009/01/exxon_chief_embraces_carbon_ta.html.

Despite the revitalization of United Nations-led climate negotiations in Cancun, significant barriers to reaching an international agreement on climate change remain, and these barriers could very well result in a less-than-optimal outcome. In such a case, there should be a viable Plan-B approach to achieve climate change mitigation.

A Plan-B approach to international climate change mitigation may not be the most desirable means for reducing GHG emissions. However, if certain countries or regions desire to pursue mitigation and wish to do so in a manner that will be effective globally, then border adjustment measures, et cetera, are a pragmatic means to move climate change mitigation efforts forward.[165] Additionally, border adjustments offer a means to internationalize domestic policies that seek to price carbon emissions and signal to investors that low-carbon investment is more valued than high-carbon investment. Doing so respects China's sovereignty as well as the sovereignty of other nations and, most importantly, encourages China to transform its economy from one heavily reliant on energy-intensive industry to a more sustainable model.[166] This is not to mention the benefits that an internationally effective price on carbon would have on directing the needed technical change that promises to make China's low-carbon transition easier.

The ability to send this market signal is key to shifting private research and development spending to clean energy and propelling endogenous technical change.[167] By restricting leakage and sending a strong market signal, border adjustments can actually benefit developing countries. Indeed, border adjustments are promoted here only as a means of increasing the uptake of low-carbon energy infrastructure to enhance endogenous technical change and reach economies of scale, thereby increasing their market competitiveness.

The promotion of border adjustments as a means of moving international climate change policy forward and reducing carbon emissions is controversial because it conflicts directly with a dogmatic belief in the curative qualities of free trade. Additionally, some argue that the

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165. Jeffrey Frankel, *Global Environment and Trade Policy*, *in* POST-KYOTO INTERNATIONAL CLIMATE POLICY: IMPLEMENTING ARCHITECTURES FOR AGREEMENT 150 (Joseph E. Aldy & Robert N. Stavins eds., 2010) (listing the many different names used to refer to green tariffs and border adjustment measures and articulating how they differ). Frankel is not cited here as supportive of the idea that border adjustments are a pragmatic means of moving climate mitigation forward.

166. Granted, the United States and other developed nations have egregiously unsustainable per capita emission rates and, because of their earlier industrialization, should be more capable of leading with the most significant and immediate reductions. Border tariffs can just as easily be justified to encourage the United States to do more as well.

167. Acemoglu et al., *supra* note 80, at 3.

bureaucracy that would be required to oversee a border tariff program would be prohibitive. But this problem solves itself. Society is faced with an unprecedented market failure. GHG emissions should be priced to counteract the market failure, and revenue generated through a carbon tax or tariffs could either go to private businesses or administrative bodies established to oversee the implementation of a carbon price. Either way, it pays for itself.

Many free trade ideologues argue that restraints on trade will harm global development and thus, increase poverty. Increased poverty is a legitimate concern, but it is far less likely than reduced profit margins for many developed-country multi-national companies, which have generally benefited more than any other group from lower tariffs during contemporary globalization. Of course this argument is heard far less because it engenders far less sympathy. Increasingly, the dogmatic pursuit of free trade for its own sake is being challenged. Prominent development economists argue that most of the world's dynamic and successful economies, including the United States, achieved their status by strategically protecting infant industries and important sectors from competition.[168]

There are also convincing reasons to discount the purported gains from the last four decades of free trade policies. When China's statistics are removed from global poverty eradication figures, it becomes clear that there has been little progress toward achieving the millennium development goals. It has also been convincingly argued that the majority of the increases in internationally traded goods are attributable to the phenomenon of vertically-specialized industry sectors which developed in many countries after World War II, rather than tariff reductions.[169] Additionally, Ha-Joon Chang argues that many developing countries historically grew their economies faster with high tariffs than with low tariffs.[170]

## CONCLUSION

The current paradigm for global trade is as antagonistic to low-carbon development as it is supportive of it. Considering the risks that climate change presents to human development, the global economy's reliance on trade should be actively leveraged to promote low-carbon development.

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168. CHANG, *supra* note 161; RODRIK, *supra* note 161, at 24.

169. KEI-MU YI, CAN VERTICAL SPECIALIZATION EXPLAIN THE GROWTH OF WORLD TRADE? (1999), *available at* http://www.newyorkfed.org/research/staff_reports/sr96.pdf.

170. CHANG, *supra* note 161, at 26–29.

This is especially the case with China, where decisions made today about energy infrastructure investment will greatly influence GHG emissions for decades to come. The commonly promoted idea that all goods and all sectors should be treated equally under the global trade regime finds no practical support at the national level and even less support when the global externalities of certain sectors are critically analyzed, e.g., goods and services related to energy infrastructure.

In a less than perfect world, GHG based border tariffs are a pragmatic option for mitigating climate change. The promotion of border tariffs is far more pragmatic than the Panglossian belief that, *sans* intervention, the market will produce sufficient technological solutions to address climate change. The continued dogmatic belief in a free trade system for all sectors as the best option for addressing climate change will be far more harmful to the world's poor and the global commons than well-managed border adjustment tariffs.