



## THE U.S., DEVELOPING COUNTRIES, AND CLIMATE PROTECTION: LEADERSHIP OR STALEMATE?

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**“I oppose the Kyoto Protocol because it exempts 80 percent of the world, including major population centers such as China and India.”<sup>1</sup>**

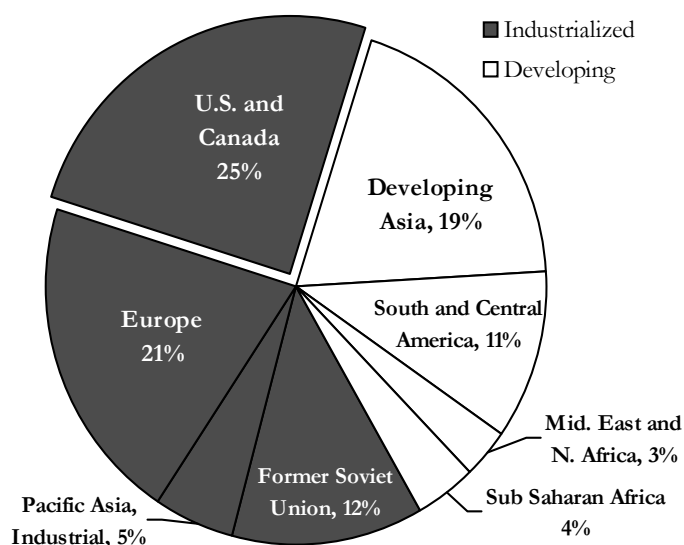
*UNITED STATES PRESIDENT GEORGE W. BUSH*

Remember the old business adage? Only 20 percent of a company's products will result in 80 percent of its profits.<sup>2</sup> This adage illustrates the flaw in the President's complaint about the Kyoto Protocol. In business and elsewhere, the *minority* of factors often produce the *majority* of results. Why then, when it comes to global climate change, does the United States focus so much attention on the large portion of the world that has contributed relatively little to global warming? The United States has expressed reluctance to support an international climate change agreement until China, India, and other developing countries adopt emission controls. Is this good policy, or just convenient politics?

This Issue Brief explores the United States' position on developing countries in climate protection efforts. Over the *long term*, most countries, including developing ones, will need to do more to rein in their greenhouse gas emissions. To get the ball rolling in the *near term*, however, we conclude that climate protection will require the initial leadership of a few countries that bear historical responsibility for the problem and that have considerable capability to act. Such leadership would create the conditions for a dialogue among all countries on the timing, conditions, and circumstances for more formal involvement of key developing countries.

**Figure 1** The Contributors to Climate Change

Percent of Cumulative Global Carbon Dioxide Emissions From Industrial Sources and Land Use Changes, 1900-1999



**Notes:** Data includes net CO<sub>2</sub> emissions from fossil fuel combustion (1900-1999) and from changes in land use (1900-90), such as harvesting of forest products, clearing for agriculture, and vegetation regrowth.

**Source:** World Resources Institute. *Underlying Data*, Marland et al. and Houghton et al., see *Data Sources*.

## PAST, PRESENT, AND FUTURE CARBON EMISSIONS

Who is responsible for global climate change?<sup>3</sup> The answer is more difficult than it appears, because *past* emissions account for today's global warming. Humans are driving global climate change through the historical buildup of heat-trapping gases in the atmosphere. Since the industrial revolution, the amount of carbon dioxide (the chief human-related greenhouse gas) in the atmosphere has risen more than 30 percent.<sup>4</sup>

Cumulative carbon emissions over the last 100 years, shown in Figure 1, are a realistic proxy of relative contributions to atmospheric change. During this period, the industrialized countries, home to 20 percent of the world's population, are responsible for about 63 percent of net carbon emissions from fossil fuel burning and land use changes. North America and Europe have contributed about 25 and 21 percent respectively, and the 140 or so developing countries have contributed a combined 37 percent. Table 1 shows historical emissions (from fossil fuels only) at the country level.<sup>5</sup> Of the top 20 emitters, only 4 are developing countries. China and India, the countries singled out by President Bush, have contributed only 7.0 and 2.0 percent respectively to the accumulation of carbon in the atmosphere, despite the fact that they are home to 40 percent of the world's population.

Disparities are also significant with respect to the *present*-day emissions currently driving global warming. At one end of the spectrum, 135 small, mostly poor countries produce less than 5 percent of global carbon emissions. Most carbon emissions now originate from 20 or so countries, which are either rich, highly populated, or both.<sup>6</sup> (See Table 1,

1999 columns.) Among these countries, the United States is the largest emitter, at 25 percent of the global total. Carbon emissions from the U.S. electric power sector alone exceed the combined annual emissions of Argentina, Brazil, Indonesia, Mexico, South Africa, and South Korea, some of the largest developing nations.<sup>7</sup> The combined emissions of the two largest countries, China and India, amount to about three-fifths of U.S. emission levels (or, 15 percent of the global total).

*Future* emissions profiles will eventually determine the extent of global climate change. Although future emission forecasts are notoriously unreliable, they do

suggest that over the longer term controlling emissions from both industrialized and developing countries will be necessary to protect the climate. This is primarily because carbon emissions are growing more rapidly in developing countries than in the industrialized world. Figure 2 shows projected carbon increases over the next 10 years for the United States and others. Expected growth in Russia, the European Union, and Japan is relatively small. The United States, on the other hand, is expected to add about 300 million tons of carbon to its tab by 2010. India and China, with their more than 2.2 billion people (8 times the U.S. population), are together

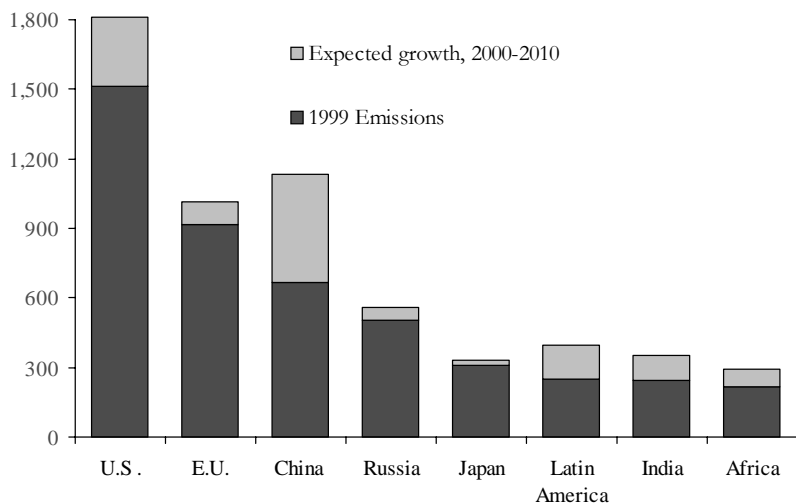
**Table 1. Top Historical Emitters of Carbon from Fossil Fuels**  
*Millions of Tons of Carbon, Estimates*

Country/Region	--- 1900-1999 ---		--- 1999 ---	
	Total Emissions	Percent of Total	Total Emissions	Emissions per Capita (tons)
1. United States	77,320	30.3%	1,520	5.6
2. <i>European Union</i>	56,280	22.1%	915	2.4
3. Russia	22,721	8.9%	400	2.7
4. Germany	18,644	7.3%	230	2.8
5. China	17,786	7.0%	669	0.5
6. United Kingdom	14,336	5.6%	152	2.6
7. Japan	9,360	3.7%	307	2.4
8. France	7,241	2.8%	109	1.8
9. Ukraine	5,981	2.3%	104	2.1
10. Canada	5,831	2.3%	151	4.9
11. Poland	5,198	2.0%	85	2.2
12. India	5,098	2.0%	243	0.2
13. Italy	4,189	1.6%	121	2.1
14. South Africa	3,153	1.2%	99	2.2
15. Australia	2,736	1.1%	94	5.0
16. Czech Republic	2,565	1.0%	29	2.8
17. Mexico	2,529	1.0%	101	1.0
18. Belgium	2,426	1.0%	38	3.7
19. Netherlands	2,331	0.9%	64	4.1
20. Spain	2,288	0.9%	82	2.1
<b>Top 20</b>	<b>211,736</b>	<b>83.1%</b>	<b>4,597</b>	<b>1.3</b>
<b>Rest of World</b>	<b>43,109</b>	<b>16.9%</b>	<b>1,544</b>	<b>0.6</b>
<b>World Totals</b>	<b>254,845</b>		<b>6,141</b>	<b>1.0</b>

Source: World Resources Institute estimates. Underlying data: see *Data Sources*

Notes: European Union is shown together, and separately where appropriate.

**Figure 2** 1999 Carbon Emissions and Expected Growth by 2010



**Notes:** Shows carbon emissions associated with fossil fuel combustion; projections are Energy Information Administration *reference case* scenarios.

**Sources:** World Resources Institute. *Underlying data source:* U.S. DOE, Energy Information Administration, International Administration, *International Energy Outlook 2001*.

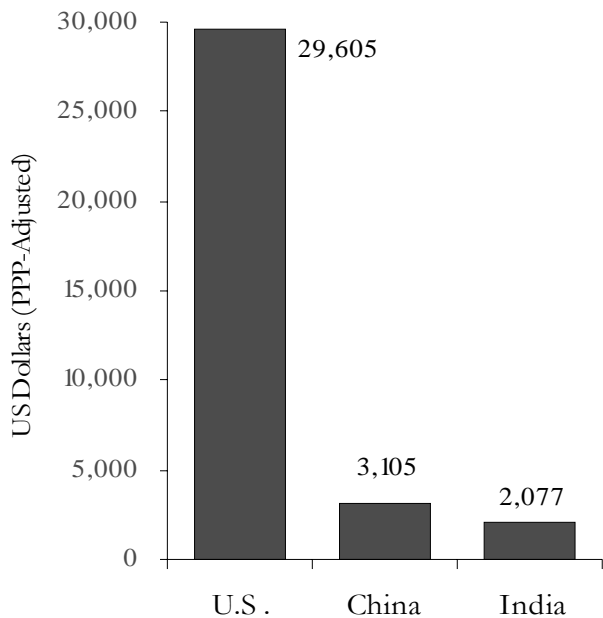
expected to increase their emissions by about 570 million tons. Even in 2010, their emissions in total terms are only about four-fifths of the U.S. total. Thus, despite faster emissions growth in some developing countries, the United States will remain the world's largest annual and historical contributor of carbon emissions for many years to come.<sup>8</sup>

### CAPABILITIES: WHO CAN AFFORD TO ACT?

All countries should take action to protect the climate system “in accordance with their common but differentiated responsibilities and respective capabilities.”<sup>9</sup> The United States has agreed to this principle, as has the rest of the world, in the 1992 Framework Convention on Climate Change, signed by President George H.W. Bush and ratified by the Senate. This principle means that all countries need to act, but that two criteria should guide the scale of each country's actions. The first criteria—*responsibility*—lies chiefly with the United States and other industrialized countries that are historically responsible for the atmospheric buildup of greenhouse gases, although this responsibility will shift gradually over the coming decades. The second criteria—*capabilities* to protect the climate—deserves equal attention. Not surprisingly, like responsibility, capability is greater in wealthier than poorer nations.

Basic economic and social comparisons give us some indication of countries' capabilities to control emissions. For lack of a better measure, annual income per person broadly reflects a country's financial resources, and may even to some degree be suggestive of technical skills and administrative capacity—all vital prerequisites for climate protection. Figure 3 illustrates that incomes in

**Figure 3** Annual Income Per Person, 1998



**Note:** PPP is purchasing power parity, see endnote 10.

**Source:** UNDP, *Human Development Report 2000* (New York: United Nations, 2000).

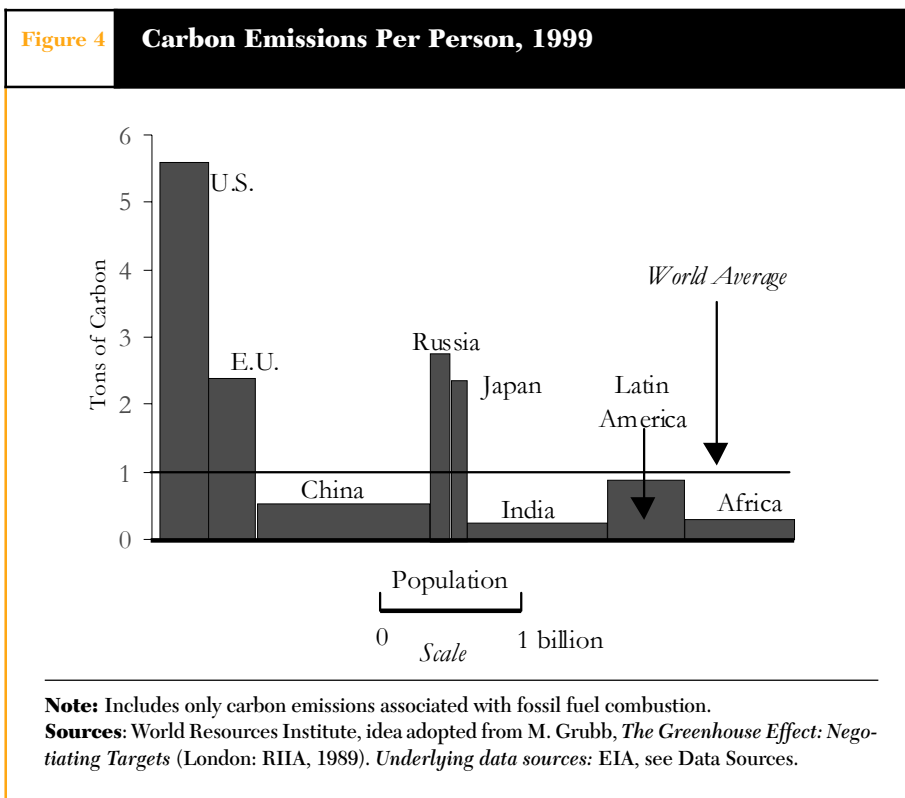
China and India are about 9 and 14 times less, respectively, than U.S. levels, even when adjusted to reflect purchasing power of different currencies.<sup>10</sup> Overall, personal income levels in the United States average 10 times those in developing countries, and 30 times those in the least developed countries.<sup>11</sup> Table 2 illustrates broader social and economic conditions in developing countries, including some that are urgent national and local priorities. Poverty, civil unrest, HIV/AIDS crises, and other issues will override, politically and financially, most efforts to control greenhouse gases.

Emissions tell us something about capabilities, especially when they are expressed in *per capita* form. In 1999, U.S. emissions averaged about 5.6 tons of carbon per head. This is about 20 times the average Indian and more than 10 times the average Chinese person. Figure 4 shows broader global comparisons. Although all emissions contribute equally to global warming, such large disparities reveal the social character of carbon emissions, which differs widely from country to country. For example, around the world, most people view U.S. carbon emissions as largely resulting from luxuries that are unavailable to most people in developing nations, while those emissions in poor nations are primarily for basic human needs such as food, warmth, and shelter.

Not surprisingly, a key reason why per capita (and total) emissions are low in developing countries is that many energy-using technologies have not yet widely penetrated their economies. (See Figure 5.) Motor vehicle ownership, in particular, is 100 times higher in the United States than in China and India.

<b>Table 2. Human Poverty in Developing Countries</b>	
<i>Number of people in the developing world who...</i>	
Subsist on less than \$1 per day	1.3 billion
Lack access to safe drinking water	1.3 billion
Lack access to health services	0.9 billion
Are living with HIV/AIDS	28.5 million
Lack access to sanitation	2.6 billion
Lack access to electric power services	2 billion

**Sources:** UNDP *Human Development Report* 2000 and 1996; *World Energy Assessment*, UNDP, UNDESA, WEC (New York: United Nations, 2001). **Note:** As of 1998, total population of developing countries is approximately 4.58 billion.



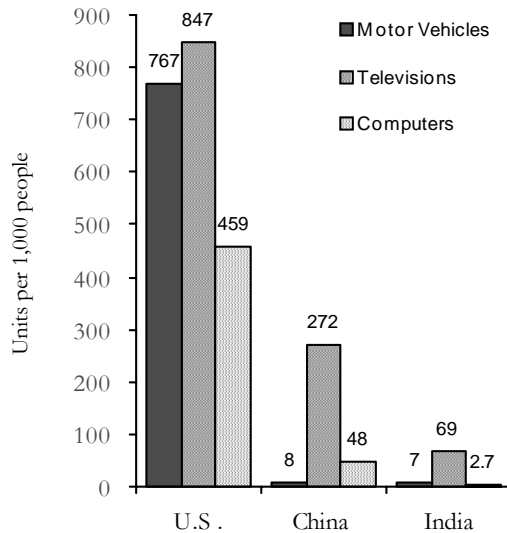
These technologies, and others such as refrigerators and air conditioners, will continue to penetrate developing countries, at least insofar as energy infrastructure allows. One-third of the world's population does not yet have access to electric power services—a true energy crisis.<sup>12</sup> Given these circumstances, many developing countries assert their “right to develop.” Although many developing countries are taking

action to curb emissions (*see discussion below*), they are fearful of near-term legally binding emission constraints, as they have seen little evidence of leadership by the industrialized countries that are most responsible for the problem of climate change.

Finally, to the extent that developing countries must address climate change, emission controls are not the priority.

Figure 5

### Penetration of Energy Intensive Goods



**Note:** Comparisons are for year 1998.

**Source:** World Resources Institute. *Underlying data source:* World Bank, *World Development Indicators 2000* (Washington, DC: World Bank, 2000). Print Edition and CD-ROM.

As noted, emissions are typically low to begin with. But the more pressing climate change issue in developing countries is *adaptation* to the physical impacts of climate change. According to the most recent report of the Intergovernmental Panel on Climate Change (IPCC), climate change impacts—current and future—will fall disproportionately across countries, with the poorer ones bearing the brunt of the burden. (See Box 1.) Given that climate change impacts result primarily from the behaviors of other nations, this can carry vexing ethical (if not legal) implications. In a letter to President George W. Bush, six senior leaders of major American faith communities wrote: “Projected impacts of global warming on the most poor and vulnerable are ethically unacceptable. Domestic and international action is urgently required. The United States has a moral responsibility to lead the world’s nations and to serve its people.”<sup>13</sup>

### Box 1 Facing the Rising Tide of Climate Change Impacts

According to the Intergovernmental Panel on Climate Change (IPCC)—the authoritative scientific voice on climate change—without active efforts to reduce emissions, the planet is expected to warm by an unprecedented 2.5 to 10 degrees F over this century. The projected rate of warming is much larger than the observed changes during the 20th century and is very likely to be without precedent at least during the last 10,000 years. This will bring uncertain, but potentially devastating consequences to communities around the globe, both in the industrialized and developing worlds.

Just as nations vary in their susceptibility to a foreign military strike, infectious diseases, and other threats, countries also differ in their *vulnerability* to these impacts. The IPCC concludes that de-

### LEAKY TARGETS?

Despite the different responsibilities and capabilities of countries, a major concern of an emission control regime that does not include all countries is the *leakage* issue, whereby industries shift their production to countries that do not have emission limits. Leakage may represent double trouble: the environmental benefits of the treaty would be undercut, and the competitiveness of U.S. industry would suffer likewise. Just how plausible are these problems?

The IPCC recently examined the potential for emissions leakage from industrialized to developing countries. Within the specific context of the Kyoto Protocol, the IPCC concluded that “the possible relocation of some carbon-intensive industries to non-Annex I [i.e., de-

veloping countries, especially the least developed, are the most vulnerable to climate change impacts. This is due to such factors as technology, education, wealth, infrastructure, skills, and access to resources, shortages of which will cause the poor to suffer disproportionately from climate change. Impacts that the IPCC foresees include sea level rise, reduced food production, water shortages, and infrastructure damage from tropical storms. Climate change threatens the very existence of some countries, such as small island and low-lying coastal states.

**Sources.** Intergovernmental Panel on Climate Change. *Climate Change 2001: The Scientific Basis and Climate Change 2001: Impacts, Adaptation and Vulnerability*. Summaries for Policymakers (Geneva: IPCC, 2001). Available online at: <http://www.ipcc.ch/> (June 13, 2001).

veloping] countries and wider impacts on trade flows in response to changing prices may lead to leakage in the order of 5-20 percent.”<sup>14</sup> The worst case estimate of 20 percent leakage would mean, in other words, that a *five percent reduction* in greenhouse output in the industrialized world (roughly what the Kyoto treaty calls for) leads to a *one percent increase* in the developing world. This would be significant, although not highly damaging environmentally.

There are a number of reasons, according to the IPCC, why leakage would be substantially lower than 20 percent. Such high-end estimates may not include important assumptions, such as transfer of environmentally sound technology or the existence of international emissions trading (which is part of the Kyoto agreement). Potential leakage can also be minimized through prudently designed domestic regulations. If history is any guide (e.g., 1990 U.S. Clean Air Act Amendments), the United States and other countries will build special adjustment provisions into legislation for those industries that will be significantly affected.

Generally speaking, most emissions in the United States result from inherently domestic activities, where leakage is either difficult or impossible. Transportation, heating, cooling, lighting, and other activities cannot move south. However, in energy-intensive industries, which represent about 20 percent of U.S. emissions, international competitiveness is an important concern.<sup>15</sup> Will carbon constraints in the United States cause companies to flee to unregulated countries, thereby undercutting U.S. competitiveness? The evidence suggests that this is not likely.<sup>16</sup>

Many factors go into foreign direct investment decisions. Labor costs and skills, market size, political stability, income levels, physical infrastructure, and a wide range of government policies

*Carbon considerations are unlikely to drive foreign investment decisions.*

(e.g., tax, financial, and investment policies) are typically the main investment considerations.<sup>17</sup> Energy prices are also a factor. However, it is unlikely that energy prices would rise to the top of a decisionmaking calculus. Even in energy-intensive sectors, energy costs account for between 10 and 20 percent of the value of sales—not trivial, but hardly dominant either. And where there is substantial foreign direct investment in energy-intensive industries, such investments are better explained by other factors. For example, U.S. investments in Brazilian primary metals and chemical industries are more likely to occur because of market size and growth potential, rather than lower energy costs. Over the past decade, most developing countries have drastically reduced energy price subsidies, causing energy prices to climb. Overall, most U.S. foreign direct investment goes to other industrialized countries, where energy costs are typically higher.<sup>18</sup>

Recent analysis by the Innovest Strategic Value Advisors, an international investment research firm, suggests that failure to control emissions domestically may actually hurt U.S. competitiveness over the long term. Emission constraints can have a dynamic effect on technological progress and the development of new

markets, such as those for renewable energy. According to Innovest, “by insulating power producers from the need to address greenhouse gas emissions domestically, the administration may have reduced the attention that U.S. companies will pay towards cleaner power generation technologies and in doing so, dilute their ability to compete in these fast growing businesses abroad.”<sup>19</sup>

## THE DEVELOPING COUNTRIES ACT

The view that developing countries should adopt legal emission commitments carries the implicit assumption that such actions would lead to a better global environmental outcome. Two factors make this assumption suspect. First, emission projections vary wildly for developing countries, confounding efforts to make reliable forecasts that could form the basis of legal commitments. According to the U.S. Department of Energy, China’s emission levels in the year 2020 could range anywhere from 1,115 to 2,059 million tons of carbon.<sup>20</sup> Translating such shaky numbers to legally binding emission controls presents substantial technical difficulties, as well as environmental and economic risks for the country in question.<sup>21</sup> Dubious projections, combined with the capacity deficits discussed above, suggest that the ingredients for firm legal commitments do not exist yet in developing countries. Although uncertainties over emission projections are common in many developing countries, they are much smaller in mature industrialized countries, where economic and emission growth rates are steady and relatively predictable year to year.<sup>22</sup>

Second, and perhaps more significantly, developing countries are actually already taking substantial actions to reduce emissions growth, even in the absence of international commitments.<sup>23</sup> Although Mexico, India, Thailand, the Philippines, and Indonesia rely on coal and oil for electricity, they have all made national goals (targeted locally) to increase renewable energy and improve energy efficiency. Thailand and Brazil have made comprehensive, successful national efforts at demand-side management. In Argentina, 10 percent of the automobile fleet runs on compressed natural gas. India has implemented natural gas use for heavy vehicles in its major cities and for most of New Delhi's public transport system. Many countries—including Indonesia, an OPEC nation—are phasing out fossil fuel subsidies. These measures should not be taken for granted. They have required leadership and entailed political and economic costs, for which these countries deserve recognition.

China's actions are nothing short of remarkable. The world's most populous country reduced its emissions, in absolute terms, by 19 percent from 1997 to 1999. This is simply unprecedented, especially considering that China's economy grew rapidly over the same period.<sup>24</sup> Although the exact causes of the emissions decline are not certain, China has been engaged in sweeping energy policy reforms over the last two decades to promote energy efficiency and conservation.<sup>25</sup> Measures taken include the following: reductions in fossil fuel subsidies; research, development and demonstration projects; a national information network with efficiency ser-

*China has reduced its greenhouse gas emissions by 19 percent since 1997.*

vice and training centers; tax reforms; equipment standards; and special loan programs, among other initiatives. These measures represent emission savings equal to nearly the entire U.S. transportation sector, about 400 million tons of carbon per year.<sup>26</sup>

The coordinated, economy-wide Chinese strategy differs remarkably from the U.S. approach. Over the past decade, the United States has undertaken many emission reduction programs. These programs, such as the One Million Solar Rooftops and wind power initiatives, are worthwhile and should continue. However, this patchwork of ef-

forts has, collectively, not led to actual emission reductions.<sup>27</sup> Many measures are voluntary and they are not coordinated economy-wide. As a result, U.S. emissions have risen every year

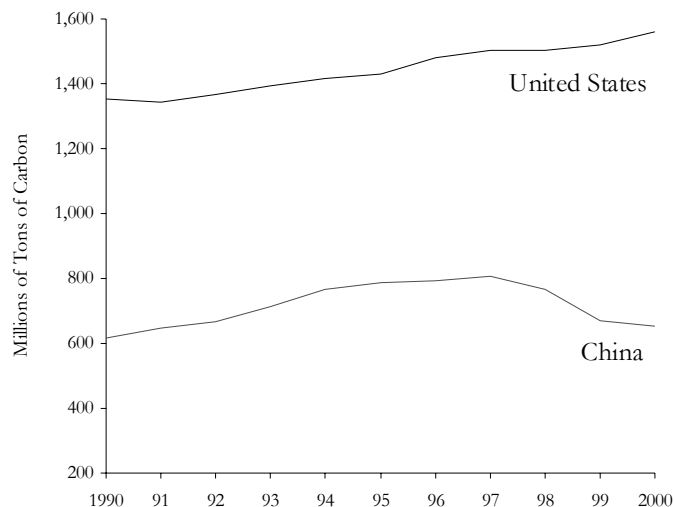
since 1991. The contrasts with China are striking. (See Figure 6.)

Finally, notwithstanding their smaller responsibilities and capabilities, most developing countries accept the need for global efforts to restrain greenhouse gas emissions. Their current reluctance to take on legally binding emission targets is based in part on the lack of leadership evidenced by richer, developed countries in tackling climate change.

### CARBON HYPOCRISY

The Bush Administration's 2001 *Report of the National Energy Policy Develop-*

**Figure 6** Emission Trends, 1990-2000



**Note:** Includes carbon emissions from fossil fuel combustion. Figures for 2000 are WRI estimates, based on EIA "200 Flash Estimate," June 2001.

**Source:** World Resources Institute. Underlying data source: EIA, see Data Sources.

ment Group does not provide optimism that the United States will alter its carbon emission trajectory and begin to take climate protection seriously. A main focus of the report is on expanding domestic fossil fuel consumption to meet increasing energy demands. Although a new national energy strategy is surely needed, the carbon-intensive one outlined by the Bush Administration is certain to increase greenhouse gas emissions. According to the Department of Energy, consumption of coal (the highest carbon fuel) for electric power is projected to increase 25 percent by 2020.<sup>28</sup> The U.S. government forecasts emission levels in 2020 that are 35 percent higher than current levels.<sup>29</sup>

There is a misalignment between these domestic energy plans and the United States' stated international climate change commitments. The United States has actually committed in the 1992 Climate Convention to "adopt national policies and take corresponding measures on the mitigation of climate change by limiting its . . . emissions of greenhouse gases." Given the carbon consequences of U.S. energy use, it is striking that President Bush's 170-page National Energy Policy report does not contain a single mention of the 1992 Climate Convention, or its objective—stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous human-caused climate change. Nearly 10 years later, this landmark agreement seems to have no impact on U.S. policymaking.

Climate policy perversities extend to U.S. engagement with developing coun-

tries. The United States has sought one set of objectives on climate change—developing country engagement—while at the same time financing billions of dollars worth of carbon-intensive investment in those countries. The U.S. Over-

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seas Private Investment Corporation (OPIC) and Export-Import Bank of the United States (Ex-Im) provided loans or guarantees for projects worth \$7.7 billion in energy-intensive sectors in India and China between 1994 and 2001.<sup>30</sup> Over this same period, OPIC and Ex-Im have supported projects totaling \$27 billion in the energy-intensive sectors of all developing countries combined. By comparison, little has been provided to promote renewable energy technologies. Export credit agencies from all industrialized countries (OPIC and Ex-Im included) participated in renewable energy projects worth only \$2 billion during the 1994 to 1999 period.

Not all of this fossil fuel investment is categorically bad for climate protection, and indeed OPIC and Ex-Im are more environmentally conscious than many of their overseas counterparts. However, the sheer magnitude of the carbon-intensive flows, and the paltry renewables investment, illustrate a clear inconsistency within U.S. policymaking. On the

one hand, the U.S. justifies domestic inaction on global warming because developing countries are not doing more. On the other hand, U.S. government agencies use taxpayer dollars to finance expanded fossil fuel use in poor countries without also providing strong incentives for clean energy technology. All export credit agencies need standards and guidelines to assess the greenhouse gas impacts of different investment options.

## A PATH FORWARD

Minimizing the damage to the Earth's climate will take an unprecedented degree of cooperation and concerted effort over the next 100 years. In practical terms, protecting the atmosphere will require reducing global emissions by late in this century to levels that are one-third of what they are today. Emissions reductions do not need to be steep or expensive. But they do need to begin as soon as possible, and continue for the better part of this century. Decade by decade, industrialized countries must gradually reduce emissions, while developing countries curb the expected increase in their emissions to the slowest sustainable rate.



Both industrialized and developing countries will need to make investments in equipment and infrastructure that emit little or no greenhouse gases. The industrialized countries can reduce emissions by replacing old and inefficient equipment with a new generation of technologies that can promote economic growth without threatening the planet. Developing countries don't have to follow the time-worn, environmentally damaging path of the United States and Europe. They can leapfrog over the age of heavy pollution and choose smarter ways of growing. The immediate benefits will be less air pollution, healthier communities, and a safer climate.

The United States has a critical role to play internationally. In cooperation with other industrialized countries, the United States can usher in a new era of cooperation on climate protection with the following steps:

- § **Recognize and build on climate-friendly policies already being undertaken in developing countries.** In many cases, voluntary policies and programs are effectively reducing emissions growth and delivering such benefits as reduced air pollution and lower fuel costs. This is also the most practical and realistic way for most developing countries to contribute to climate protection in the near term.
- § **Foster technical cooperation programs to assist poor countries in adapting to climate change and reducing emissions.** Other, non-climate priorities will continue to dominate the development agenda in developing countries for some time to come. To support emission reductions and ad-

*The U.S. should attend to curbing its own prodigious output of greenhouse gases before asking developing countries to do more.*

aptation to inevitable climate change impacts, the United States and other wealthy countries will need to fund, and help design, effective technology transfer and assistance programs.

- § **Promote climate protection in developing countries that is supportive of economic and social development.** One such example is Kyoto's Clean Development Mechanism—an elegant diplomatic solution with strong interest from developing countries and the U.S. private sector. Another example is structuring future developing country emission targets in terms of carbon intensity (i.e., emissions per unit of economic output), rather than strict emission limits. This added flexibility would have environmental benefits and ensure that emission cutbacks do not entail economic harm.<sup>31</sup>
- § **Create an open dialogue on the criteria for more formal developing country involvement.** Such criteria as historical emissions, income, emissions per capita, and vulnerability, among others should be used to help determine the conditions under which countries should be expected to make formal commitments to reduce emissions or carbon intensity.

A short-term focus on developing country commitments may be politically expedient for those in the United States and elsewhere who remain opposed to climate protection. However, substantively it is misguided, and it has precipitated an outcome where no one acts, and everyone loses. The United States

should instead attend to curbing its own prodigious output of greenhouse gases. This is not only a prerequisite for protecting the global climate, it is a catalyst for other countries to do more. And it offers U.S. companies an opportunity to gain a competitive edge in new markets for clean technologies.

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## NOTES

1 Letter from President George W. Bush to Senators Hagel, Helms, Craig, and Roberts. March 13, 2001.

2 The "80-20 rule" is known as the Pareto principle, named for the Italian economist Vilfredo Pareto. Pareto first noticed that 80 percent of Italy's land was owned by 20 percent of its population, and later noticed similar patterns in wealth and income. Since Pareto, this principle has been applied to aspects of business management and elsewhere.

3 For a more complete treatment of this subject, see D. Austin, G. Parker and J. Goldemberg, *Contributions to Climate Change: Are Conventional Metrics Misleading the Debate?* (Washington, DC: World Resources Institute, 1998).

4 Oak Ridge National Laboratory. Carbon Dioxide Information Analysis Center. *Trends: A Compendium of Data on Global Change*. Available online at <http://cdiac.esd.ornl.gov/trends/trends.htm>. Methane emissions have risen about 110 percent.

5 Historical land use change and forestry data is not available at the country level.

6 EIA, *International Energy Annual 1999*. Table H1: World Carbon Dioxide Emissions from the Consumption and Flaring of Fossil Fuels.

7 U.S. power sector emissions come from U.S. EPA, *Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 1999* (Washington DC: EPA, 2001): executive summary, Table ES-5. 1999 U.S. power plant emissions are about 533 million tons of carbon (MtC). The combined emissions of the six developing countries in 1999, according to EIA's *International Energy Annual 1999*, was 496 MtC.

8 EIA, *International Energy Annual 1999*. Table A10. According to these

figures, U.S. emissions in 2020 will still exceed China's (the second largest emitter) by more than 20 percent.

9 Emphasis added. See *United Nations Framework Convention on Climate Change*, 1992. Available online at: <http://www.unfccc.de>. See Article 3, paragraph 1.

10 PPP is purchasing power parity, which reflects the domestic buying power of currencies. Without PPP adjustments (i.e., using market exchange rates), U.S. incomes are about 41 and 72 times those in China and India respectively.

11 United Nations Development Programme, *Human Development Report 2000* (New York: United Nations, 2000).

12 *World Energy Assessment*, U.N. Development Programme, U.N. Department on Economic and Social Affairs, and the World Energy Council (New York: United Nations, 2001): 7.

13 Religious Leaders' Statement on Climate Change, Letter to the President, March 29, 2001. The letter to Bush was signed by leaders of the National Council of Churches of Christ in the USA, the Christian Church (Disciples of Christ), the African Methodist Episcopal Church, the Metropolitan Orthodox Church in America and the Jewish Theological Seminary. The Jewish Council for Public Affairs wrote separately voicing its concerns. Eric Pianin, "Coalition Raps Bush On Global Warming," *Washington Post* (March 29, 2001).

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