

EarthTrends: Featured Topic

Title: **CLIMATE PROTECTION IN A DISPARATE WORLD**

Author(s): Kevin A. Baumert and Nancy Kete

Editor(s): Christian Layke and Wendy Vanasselt

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Emissions of greenhouse gases—carbon dioxide, methane, and others—have increased dramatically in the last century through fossil fuel burning and land-use changes. Human activity has pushed atmospheric concentrations of carbon dioxide—the chief greenhouse gas—to more than 30 percent above pre-industrial levels—370 parts per million today compared to about 280 in 1750 (CDIAC 2001) (1). These increases have already brought changes to the earth's climate. Nine of the ten hottest years since 1860 (when temperature records began being kept) occurred between 1990 and 2000. Continued accumulation of greenhouse gases is expected to lead to rising temperatures, more severe weather events, increased ecosystem stresses, shifting precipitation patterns, increased ranges of infectious diseases, coastal flooding, and others impacts that we are only beginning to understand. These changes will bring uncertain, but potentially devastating, consequences to communities around the globe, both in the industrialized and developing worlds.

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 during the 21st century. This rate of warming is much larger than the observed changes during the 20th century and is very likely to be without precedent during at least the last 10,000 years.

The international community began attempts to address climate change in 1992 with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC). With more than 185 member countries, including the United States, this agreement has near universal acceptance. The UNFCCC defined an overall objective of stabilizing atmospheric greenhouse gas concentrations at safe levels and committed the signatories to cooperative action to halt climate change. Furthermore, industrialized countries pledged to return their emissions to 1990 levels by the year 2000.

But in 1997, it became clear that a more ambitious and mandatory reduction target would be needed to control

climate change. Recognizing the greater need for greenhouse gas emission controls, UNFCCC parties adopted the Kyoto Protocol, which aims to reduce the emissions in industrialized nations by about 5 percent below 1990 levels between 2008-2012. An innovative and complex agreement, the Kyoto Protocol employs a set of market based mechanisms that facilitate international cooperation on climate protection and aim to reduce the economic cost of emission controls.

At the seventh Conference of the UNFCCC in 2001, countries finally adopted the implementation rules of the Kyoto Protocol accord, paving the way for its long anticipated entry into force in late 2002. Controversially, in March 2001, the United States announced that it would not support the Kyoto agreement, in part because of the lack of developing country commitments and the potential economic cost of implementation. Overall, the Kyoto treat is still insufficient to achieve the UNFCCC's long-term objective, in part because only about 35 industrialized countries have

committed to a short-term emission control strategy.

The cost of emission is an issue central for many countries. There are literally dozens of economic projections of the costs and benefits of a climate policy. Some studies project high economic costs from even small reductions in greenhouse gases (GHGs). Other studies show GHG reduction imposing negligible costs, while generating secondary benefits in the form of cleaner air and water—benefits that would otherwise be achieved by other means. The results depend on the underlying assumptions built into the economic models, and one cannot rely on a single study for a meaningful understanding of the issue.

Recent independent analyses show that cost-effective domestic measures and the flexibility mechanisms that are a part of the Kyoto agreement will avoid significant economic damage. The likely small cost of implementation is further justified by the benefit of avoiding the potentially sever costs of inaction on global warming. WRI concludes that if realistic assumptions are made about the flexibility of the U.S. economy, sensible cost-effective policies would impose moderate costs for climate protection (Austin and Repetto 1997).

While cost estimates may vary, there is emerging economic consensus regarding

the timing of emission reduction efforts. Attaining any given concentration level in the atmosphere will be cheaper the sooner we start. Delay only locks in more carbon-emitting infrastructure, and postpones relevant technological innovation (Austin 1997).

It is also clear that mitigating the dangers of climate change will take concerted effort and an unprecedented degree of cooperation among countries. In practical terms, protecting the atmosphere will require reducing global emissions by late in this century to levels

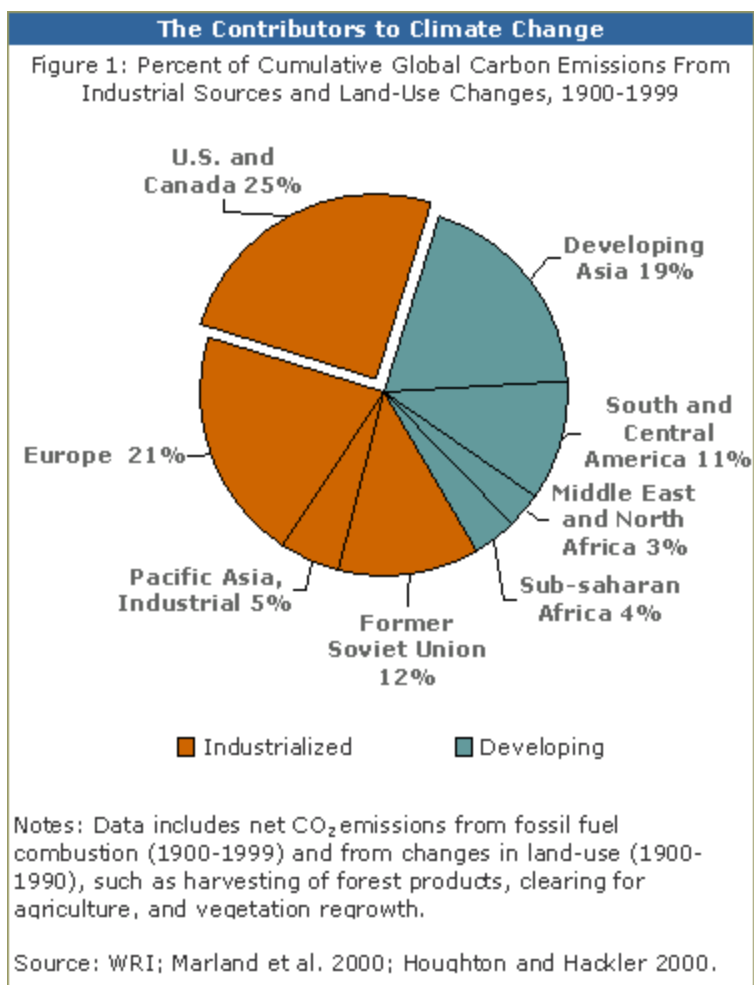
that are one-third of what they are today.

All countries, including developing ones, will eventually need to control their greenhouse gas emissions. Leadership by the wealthier, more industrialized countries is required for initial efforts in climate protection, however. These countries bear historical responsibility for the climate problem and have considerable capability to act.

Past Carbon Emissions

Who is responsible for global climate change (2)?

Greenhouse gasses have been



building in the atmosphere since the beginning of the industrial age, and current emissions continue to add to that accumulation. Clearly, all countries are not equally culpable for the accumulation that has occurred over the last 250 years.

The last 100 years' cumulative emissions (see Figure 1) serves as a meaningful indicator of relative contributions of different countries and regions. Developed countries, home to 20 percent of the world's people, are responsible for about 63 percent of net carbon emissions from fossil fuel burning and land use changes since 1900. North America and Europe contributed 25 and 21 percent respectively, and the 140 or so developing countries contributed a combined 37 percent. Figure 2 shows historical emissions from fossil fuels for selected countries (3). Of the top 20 emitters, only 4 are developing countries. China and India, the world's two most populous countries and home to 40% of the world's population, have contributed only 7 and 2 percent, respectively, to atmospheric carbon accumulation since 1900.

Current Carbon Emissions

There are also significant disparities in current emissions. Most current carbon emissions originate from 20 or so countries that are either rich, highly populated, or both,

Wealthy and Populous Countries are World's Largest Emitters				
Figure 2: Top 20 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 European Union	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
Top 20	211,736	83.1%	4,597	1.3
Rest of the World	43,109	16.9%	1,544	0.6
World Total/Avg.	254,845		6,141	1.0

Notes: EU is shown together and separately where appropriate.
Source: WRI estimates.

while 135 small and mostly poor countries produce less than 5 percent of global carbon emissions (EIA 1999) (see Figure 2). The United States is the world's largest emitter, accounting for 25 percent of the global total. Carbon emissions from the U.S. electric power sector alone exceed the combined annual

emissions of seven of the largest developing nations: Argentina, Brazil, Indonesia, Mexico, South Africa, and South Korea (U.S. EPA 2001) (4). The combined emissions of the two most populous countries, China and India, amount to only about three-fifths of U.S. emission levels or

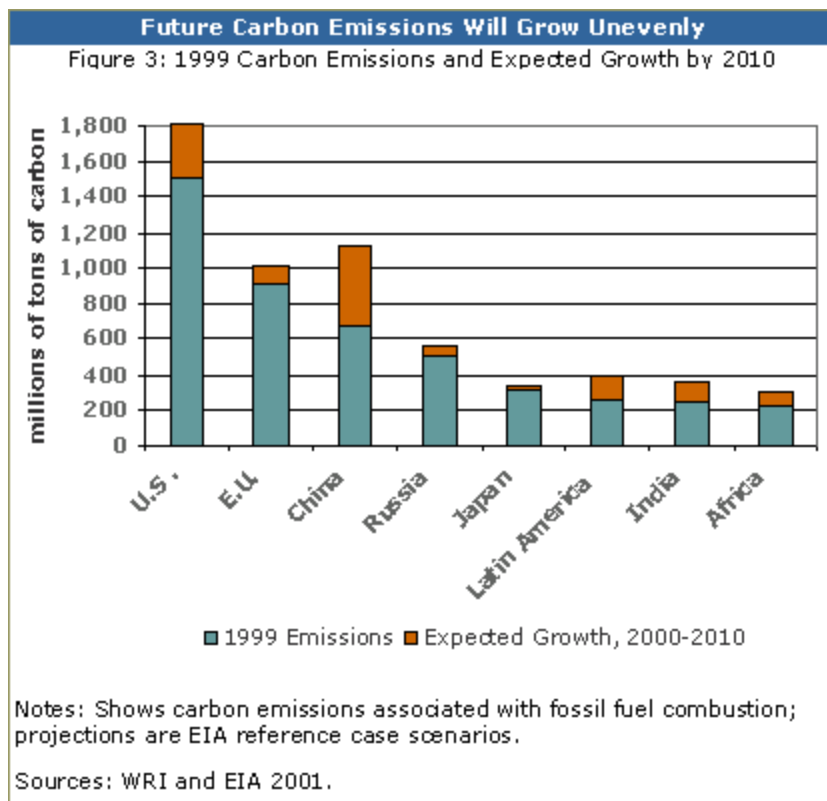
about 15 percent of the global total.

Future Carbon Emissions

Future emissions profiles will determine the end extent of global climate change. While national emission forecasts are unreliable, their nearly universal growth strongly suggests that controlling future emissions from both industrialized and developing countries will be necessary to protect the climate. Figure 3 shows projected carbon increases over the next 10 years. Growth in annual emissions from most developed countries such as Russia, the European Union, and Japan is expected to be relatively small at around 200 or fewer million tons of carbon annually, while emissions in the United States—due to high fossil fuel use and an expanding economy—are expected to increase substantially, by 300 million tons annually. India and China, with populations of more than 2.2 billion, are together expected to increase their emissions by about 570 million tons. Emissions in other developing regions, while growing rapidly in percentage terms, will add relatively small amounts in absolute terms (EIA 1999).

Capabilities: Who Can Afford to Act?

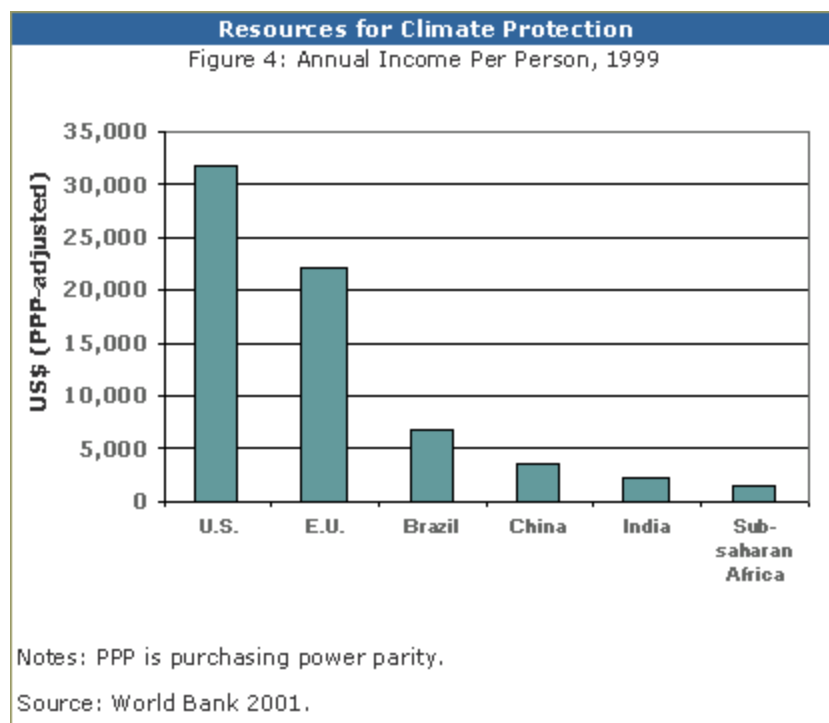
All countries should take action to protect the climate



system "in accordance with their common but differentiated responsibilities and respective capabilities" (6). The world agreed to this principle in the 1992 Framework Convention on Climate Change in an effort to distribute the burden of climate protection fairly across countries. Essentially, it means that all countries need to act, but that two criteria—responsibility and capability—should guide the scale of each country's actions. The first criterion speaks to industrialized countries' responsibility for the accumulation of greenhouse gases in the atmosphere to date. This responsibility will shift gradually over the coming decades as economies and per capita wealth grow in populous

developing countries. The second criterion, capability to protect the climate, also places the onus for action on developed countries.

Economic and social comparisons give some indication of countries' abilities 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.. The U.S. is the richest country in the world with many European countries close behind. Incomes in China and Sub-Saharan Africa are., respectively, about 9 and 14 times less than they are in the U.S, even when adjusted to



Competing Social and Economic Priorities
Figure 5: Human Poverty in Developing Countries

NUMBER OF PEOPLE IN THE DEVELOPING WORLD WHO ...	
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

Notes: As of 1998, total population of developing countries is approximately 4.58 billion.
Sources: UNDP 1996; UNDP 2000; UNDP et al. 2001.

reflect purchasing power of different currencies (Figure 4) (7). Overall, personal income levels in high-income regions average 14 times those in Low Income regions (World Bank 2001). Developing countries have urgent social and health issues that must take priority, in the near term, over efforts to control greenhouse gases. Figure 5 illustrates some of the

broader social and economic conditions in developing countries.

Most people assume that developed-world carbon emissions result from "luxury" use of energy while emissions from poorer nations are primarily for basic human needs such as food, warmth, and shelter. There's truth to that assumption. While some

of the greater emissions in richer countries in fact arise from the greater level of industrial and other economic activity, large amounts of emissions are associated with individuals driving large cars long distances, heating large homes, eating an affluent diet, and consuming other comparatively luxurious goods.

Large disparities in per capita carbon emissions reveal this social character of carbon emissions. In 1999, U.S. emissions averaged about 5.6 tons of carbon per head. The average citizen of the European Union emitted less than half that amount. The average Indian emitted only a quarter of a ton, and the average Chinese person a half a ton, or one-tenth of the U.S. per capita emissions. Figure 6 shows broader global comparisons. Although all emissions contribute equally to global warming, large disparities in emissions by country provide an indication of which countries should conceivably be able to make the largest cuts in their emissions.

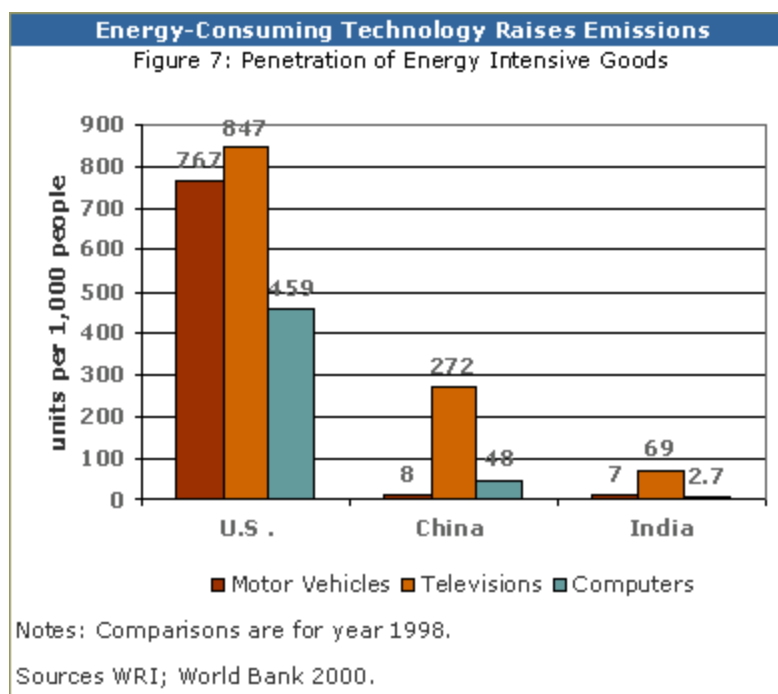
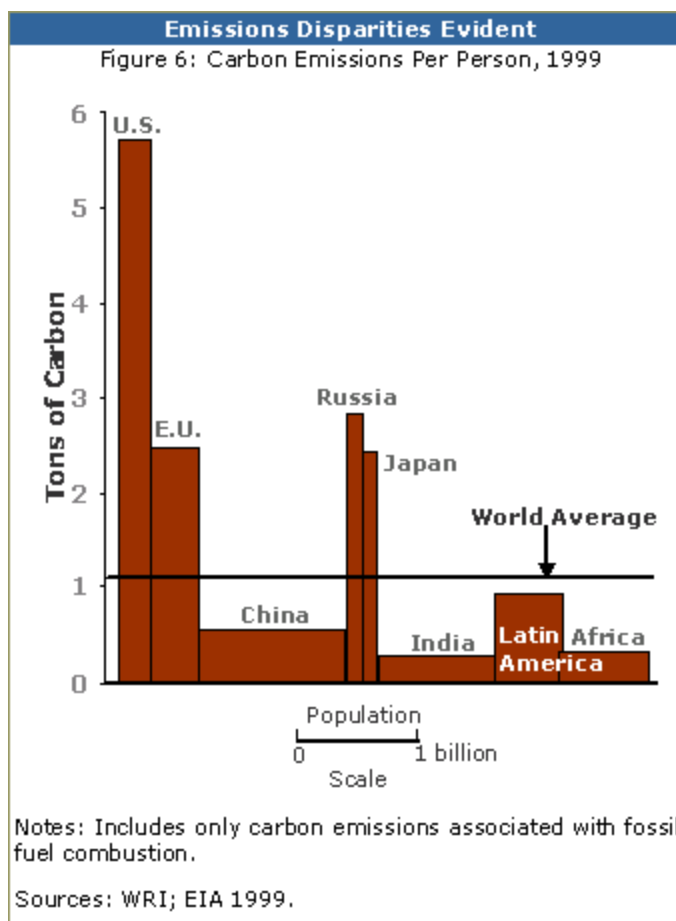
One reason why per capita emissions are low in developing countries is that many energy-consuming technologies have not yet penetrated widely (see Figure 7). Motor vehicle ownership, in particular, is 100 times higher in the United States than in China and India. One-third of the world's population does not yet have access to electric power services—a true energy

crisis (UNDP et al. 2001:7). Given these circumstances, many developing countries assert their "right to develop." Although many developing countries are taking action to curb emissions, 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.

A Path Forward

A short-term focus on developing country commitments may be politically expedient for those in industrialized countries who remain opposed to climate protection. However, substantively it is misguided, and could continue to precipitate an outcome where no one acts, and everyone loses. Developed countries should attend to curbing their 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 while offering local companies an opportunity to gain a competitive edge in new markets for clean technologies.

Beyond reforming policies and making investments such as equipment and infrastructure that emit little or no greenhouse gases in order to reduce greenhouse gas emission, developed countries can help promote economic growth in developing countries without threatening the planet.



Important actions include facilitating attempts by developing nations to keep growth in greenhouse gas emissions to a minimum by, for example, transferring technologies to replacing old and inefficient equipment. Developing countries don't have to follow the same environmentally damaging path of the United States and Europe but instead can leapfrog the age of heavy pollution and choose smarter ways of growing economically. The immediate benefits will be less air pollution, healthier communities, and a safer climate.

The international community 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 adaptation to inevitable climate change impacts, developed 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 some developed country's private sector, including that in the U.S. 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 (Baumert et al. 1999).

- 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.

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NOTES

1. Methane emissions have risen about 110 percent.
2. For a more complete treatment of this subject see Austin, D., G. Parker, and J. Goldemberg. 1998. Contributions to Climate Change: Are Conventional Metrics Misleading the Debate? Washington, DC: WRI.
3. Historical land-use change and forestry data is not available at the country level.

4. 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.
5. According to these figures, U.S. emissions in 2020 will still exceed China's (the second largest emitter) by more than 20 percent.
6. Emphasis added. See United Nations Framework Convention on Climate Change.(1992). Online at: <http://www.unfccc.de>. See Article 3, paragraph 1.
7. 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.