CHAPTER 4

Per Capita Emissions

As described in the preceding chapter, countries with large populations, large economies, or both tend to be the largest emitting countries. Under such circumstances, focusing only on absolute emission levels only gives a partial understanding of the greenhouse gas picture. Accordingly, this chapter examines GHG emissions *per capita*.

Only a handful of the countries with the largest *total* emissions also rank among those with the highest per capita emissions (Figure 4.1). Among the 25 major emitters, *per capita* emissions vary widely, with Australia, the United States and Canada having the highest per capita emissions (ranking 4th, 6th, and 7th globally). Their per capita emissions are more than twice those of the EU (37th globally), six times those of China (99th globally), and 13 times those of India (140th globally). When all countries are ranked on a per capita basis, the upper tiers show considerable diversity (Figures 4.1 and 4.2):

- Four of the five highest per capita emitters are the gulf states of Qatar, United Arab Emirates, Kuwait, and Bahrain, largely the result of small populations producing highly GHG-intensive commodities for export.
- A number of small-island states rank relatively high, including Trinidad & Tobago (10th), Antigua & Barbuda (12th), Singapore (18th), Palau (23rd), and Nauru (24nd). Some of these countries are industrialized (despite their non-Annex I status under the UNFCCC), with high population densities (but low total populations). Some are also producers of energy-intensive exports.
- Several economies in transition with significant fossil fuel resources also rank relatively high, including Estonia (14th), the Czech Republic (17th), Turkmenistan (19th), and Russia (22th).
- Some advanced developing economies have per capita emissions commensurate with those of many industrialized countries. Singapore ranks higher than most EU members. South Korea has the same per capita emissions as the United Kingdom, Taiwan's match the EU average, and South Africa's are just slightly below.

In general, there is a relatively strong relationship between *emissions* per capita and *income* per capita, with wealthier countries having higher emissions per capita. This is due to higher rates of consumption and more energy-intensive lifestyles, although other

Figure 4.1. Emissions Per Capita, 2000

Country	GHGs (Tons CO_2 Equiv.)	(Rank)	CO_2 Only (Tons)	(Rank)
Qatar	67.9	(1)	60.0	(1)
United Arab Emirates	36.1	(2)	25.2	(3)
Kuwait	31.6	(3)	26.8	(2)
Australia	25.6	(4)	17.3	(7)
Bahrain	24.8	(5)	20.6	(4)
United States	24.5	(6)	20.4	(5)
Canada	22.1	(7)	17.1	(8)
Brunei	21.7	(8)	13.7	(10)
Luxembourg	21.0	(9)	19.2	(6)
Trinidad & Tobago	19.3	(10)	16.7	(9)
New Zealand	18.9	(11)	8.6	(32)
Antigua & Barbuda	18.5	(12)	4.9	(62)
Ireland	17.3	(13)	10.9	(18)
Estonia	16.6	(14)	11.3	(17)
Saudi Arabia	16.4	(15)	13.4	(11)
Belgium	14.5	(16)	12.2	(14)
Czech Republic	13.9	(17)	12.1	(15)
Singapore	13.9	(18)	13.1	(12)
Turkmenistan	13.8	(19)	7.8	(40)
Netherlands	13.5	(20)	10.9	(19)
Finland	13.3	(21)	10.9	(20)
Russia	13.2	(22)	10.6	(21)
Palau	12.9	(23)	12.7	(13)
Nauru	12.8	(24)	11.4	(16)
Denmark	12.5	(25)	9.7	(27)
Germany	12.3	(27)	10.4	(22)
United Kingdom	11.1	(32)	9.4	(30)
South Korea	11.1	(33)	9.9	(26)
EU-25	10.5	(37)	8.5	(34)
Japan	10.4	(39)	9.5	(29)
Poland	9.8	(43)	7.8	(41)
Ukraine	9.7	(44)	6.3	(47)
South Africa	9.5	(46)	7.9	(39)
Spain	9.4	(47)	7.5	(44)
Italy	9.2	(48)	7.7	(42)
France	8.7	(50)	6.2	(48)
Argentina	8.1	(52)	3.9	(70)
Iran	7.5	(60)	5.3	(56)
Turkey	5.3	(75)	3.3	(78)
Mexico	5.2	(76)	3.9	(71)
Brazil	5.0	(83)	2.0	(100)
China	3.9	(99)	2.7	(88)
Indonesia	2.4	(122)	1.4	(111)
Pakistan	2.1	(131)	0.8	(132)
India	1.9	(140)	1.0	(120)
Developed	**14.1**		**11.4**	
Developing	**3.3**		**2.1**	
World	**5.6**		**4.0**	

Notes: Countries shown are the top 25 per capita emitters, plus other countries among the top 25 *absolute* emitters. Countries not among the top 25 absolute emitters are shown in italics. Emission figures exclude CO_2 from international bunker fuels and land use change and forestry.

factors such as energy endowments (Chapter 8), trade (Chapter 9), population density, and geography also influence a country's per capita emissions.

As with total emissions, per capita figures can vary considerably depending on which gases are considered. The gap in per capita emissions between wealthy and less wealthy countries generally widens when only energy-related CO_2 emissions are considered. For instance, when counting only energy-related CO_2, compared to all gases, the per capita emissions of China, India, and Brazil drop 31, 47, and 60 percent, respectively, while in the EU, the United States and Japan, they drop only 19, 17, and 9 percent. The major influences here are CH_4 and N_2O emissions from agriculture, which comprise a larger share of GDP in developing countries than in developed countries (see Chapter 15). Counting CO_2 from land-use change also has a dramatic effect on per capita emissions, as it represents an estimated one-third of all emissions from developing countries, whereas developed countries may be net absorbers. There are significant uncertainties, however, in country-level estimates of CO_2 from land-use change (see Chapter 17).

As illustrated in the decomposition analysis in Chapter 2, population growth—either through higher birth rates or immigration—can be a significant driver of GHG emissions growth (Figure 2.8, p.15). This is particularly the case in developing countries, but also in "new world" industrialized countries such as the U.S., Canada, and Australia. In other countries, such as Japan, European nations, and Economies in Transition (EITs), population has been relatively stagnant and thus has had little influence on absolute emissions. However, in South Africa, population growth was by far the largest contributor to emissions growth since 1990.

Accordingly, examining per capita emission trends serves to nullify the effect of population growth. Figure 4.3 compares absolute and per capita emission changes from 1990 to 2002 for the U.S. and EU. For the U.S., CO_2 emissions growth was 18 percent in absolute terms but only 2 percent in per capita terms. For the EU, on the other hand, the effect of population growth is not especially large, as absolute CO_2 emissions declined 2 percent compared to a 5 percent decline in per capita terms. As a result, the gap between the EU and U.S. in terms of CO_2 growth is significantly narrower when analyzed from a per capita perspective (7 percentage point difference rather than 20 percentage points). Similar examples can be seen with other countries and regions. With respect to population growth, the "new world" industrialized countries—such as the U.S., Canada, Australia, and New Zealand—actually appear more comparable to developing countries than to the EU and Japan (Figure 4.4).

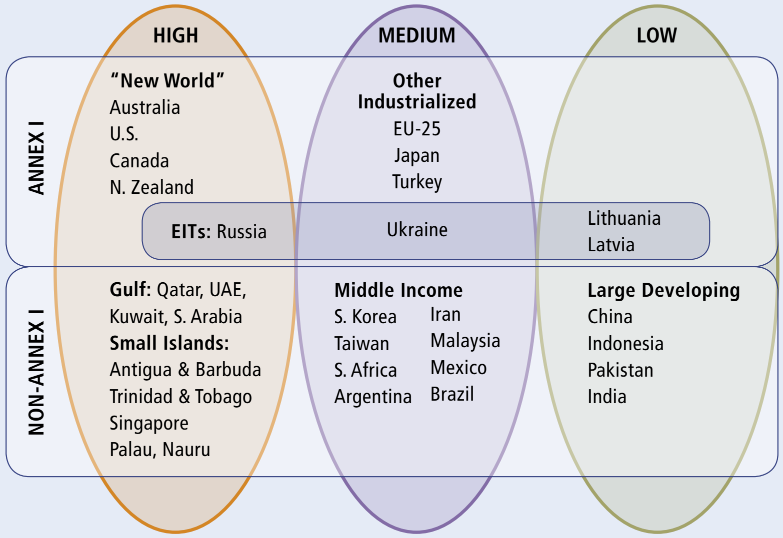
Implications for International Climate Cooperation

International agreements predicated on equal per capita emission entitlements are unlikely to garner consensus. Since the 1980s, a number of proposals have been advanced to address the problem of global climate change by equalizing emissions per capita across countries.[23] These approaches have received considerable support from a range of governments and NGO groups. While the operational details of these proposals often differ, they tend to share the method of allocating emission allowances to countries in proportion to population size (either immediately, or after some period of gradual convergence from present levels), while total allowable emissions globally contract over time. To the extent that these proposals require similar obligations for countries with similar per capita emission levels, they are unlikely to garner widespread support. Those countries with large populations and relatively low levels of economic development would receive apparent benefits, whereas other countries with small populations, high emissions, or both, could be significantly burdened. Absent significant adjustments, such proposals cannot take into account national circumstances faced by Parties, an established principle within the UNFCCC.[24]

However, it is important to note that the implementation of virtually any national or international climate change policies is likely to have the effect of promoting a convergence in per capita emission levels over time. Considering that over the long term net emissions must fall to zero, convergence is a corollary of climate protection.

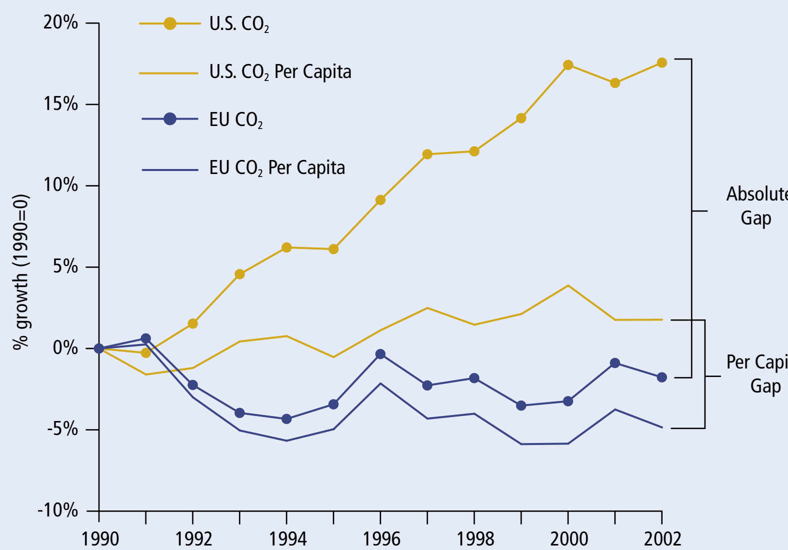
Differentiated per capita GHG emission targets would reduce the effects of population growth on the commitments of Parties. Though not widely discussed in climate policy debates, population growth, as shown, can have a significant effect on the capacity of countries to achieve similar near-term emission

Figure 4.2. GHG Emissions per Capita: Selected Country Groupings
Top 25 emitting countries, plus selected other high per capita emitters



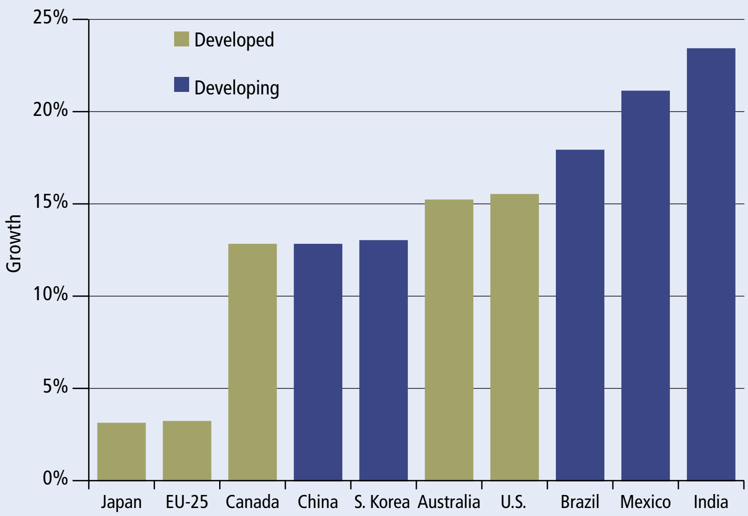
Sources & Notes: WRI, CAIT. "High" GHG per capita countries are those with values from 12.8 to 67.8 tCO_2 eq./person. "Medium" countries are those with values 5.0 to 12.8 tCO_2 eq./person. "Low" values are those countries from 0 to 5.0 tCO_2 eq./person. Figures are for 2000, and include the six GHGs. CO_2 from land use change and forestry and international bunkers are not included.

Figure 4.3. Influence of Population in CO_2 Trends, 1990–2002
EU-25 v. United States



Source: WRI, CAIT.

Figure 4.4. Population Growth, 1990–2002
Selected developed and developing countries



Source: WRI, CAIT.

limits. For instance, under the Kyoto Protocol the United States, Japan, Canada, and the EU initially agreed to emission limitations of similar magnitude (ranging from -6 to -8 percent below 1990 levels), creating the perception of similar levels of stringency. Yet, the United States and Canada are growing countries, and this growth in population plays a major role—along with many other factors—in the relative difficulty of achieving targets.

If governments seek to adopt a new round of fixed emission limitations, particularly among industrialized countries, this population factor might warrant more attention. For instance, emission targets might be framed in terms of emissions per capita, rather than absolute emissions. This would eliminate population growth as a relevant factor in achieving (or not achieving) a national target.

To be sure, the purpose of such an approach would primarily be to address the likely misperceptions associated with adopted emission targets. Invariably, governments, observers, and the media tend to attach value judgments to target levels, which is one reason for the similarity of targets adopted by the major industrial powers in Kyoto. As a practical matter, population growth is reasonably predictable and varies little from year-to-year. Thus, it could easily be implicitly built into absolute emission targets. Yet, this might convey a false sense of disparity across countries. At least in part, this could be remedied by adopting country-by-country targets in per capita terms, which would be simple and more easily comparable across countries.