



# Who Should Pay? Climate Finance Fair Shares

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## Abstract

The scale, source, and allocation of climate finance have been contentious aspects of the Paris Agreement and its implementation. Central to these are questions of “fair shares”: who might contribute what and whether the group of contributors should be expanded. New analysis presented here concludes that there is a case for non-traditional donors providing 20-30 percent of any total, with this finding robust to a variety of different measures of historical emissions, cut-off dates, and income. China, Russia, South Korea, Saudi Arabia, Taiwan, Poland, the United Arab Emirates, and Mexico consistently feature in the top 20. Developed countries, however, should continue to take primary responsibility, with the United States shouldering at least 40 percent of the burden in virtually all scenarios. The politics of climate finance will continue to be difficult, but it is hard to escape the conclusion that both the United States and China will need to provide more.

## Who Should Pay? Climate Finance Fair Shares

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## Introduction

The scale, source and allocation of climate finance have been contentious aspects of the Paris Agreement and its implementation. Even while developed countries struggle to deliver the promised \$100bn per year, discussions around the New Collective Quantified Goal (NCQG) that will replace it have already started, alongside parallel developments of a new Fund to address loss and damage (L&D) agreed at COP27. Central to these are questions of ‘fair shares’: who might contribute what and whether the group of contributing donors should be expanded. This note briefly summarises recent work on such ‘fair shares’, before presenting the results of a new model to inform both the ongoing NCQG and L&D debates.

Its key conclusions are that there is a case for non-traditional donors providing 20–30 percent of any total, with this finding robust to a variety of different measures of historical emissions, cut-off dates and income. China, Russia, South Korea, Saudi Arabia, Taiwan, Poland, the United Arab Emirates and Mexico consistently feature in the top 20, but current donors should continue to take primary responsibility, with the USA shouldering at least 40 percent of the burden in virtually all scenarios. However, the politics continue to be difficult. In a context where current commitments fall significantly short of needs even without taking loss and damage into account, progress in negotiations is likely to require both additional commitments from existing donors as well as contributions from new ones. Excluding all LICs, LMICs, LDCs and SIDS would be a pragmatic way forward, but it is hard to escape the conclusion that both the USA and China will need to provide more. Finally, any analysis of “fair shares” should also take into account differences in the ways in which climate finance is counted and scored, which can make a substantial difference to the ‘value’ of contributions from individual donors.

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## Background

It is widely accepted that climate finance ‘*fair shares*’ should reflect both levels of emissions (a measure of responsibility) and levels of income (a measure of capability to provide finance). The debate remains contentious, however, particularly in the context of loss and damage, with developed countries resisting links to words such as ‘liability’ or ‘compensation’.<sup>1</sup> Nevertheless, the underlying principles are important and analysis can still inform discussion of contributions without implying obligation.

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1 The Paris Agreement decision text (para.52) notes that Article 8 of the Agreement (concerning loss and damage) “*does not involve or provide a basis for any liability or compensation*”, while even some advocates of greater climate finance and loss and damage—notably Avinash Persaud, architect of the Bridgetown Agenda—have acknowledged that an emphasis on reparations is unhelpful and that the focus should instead be on global solidarity, while noting the effects of climate change are currently most severe in poor countries yet caused chiefly by rich countries.

A number of organisations have previously estimated what climate finance ‘fair shares’ might look like, primarily in the context of GCF replenishments or the \$100bn goal and generally focused on the 23 ‘Annex II’ countries required by the UNFCCC to provide climate finance.<sup>2</sup>

ODI, OXFAM, WRI and ETH Zurich (summarised in this [WRI review](#) by Bos and Thwaites, 2021) have all used data on historical emissions and income as the basis for ‘fair share’ contributions. Overall shares have been calculated as the simple average of their shares of each indicator, but each organisation has introduced variations:

- ODI also included population (to reflect ability to respond to climate change);<sup>3</sup>
- OXFAM also included ODA (as a measure of willingness to pay);
- WRI adjusted their average shares by an emissions/hd ‘scaling factor’ (reducing the fair shares of those countries with below average per capita emissions in order to both incentivize countries to undertake domestic mitigation action, and improve fairness for countries that may have high aggregate emissions but larger populations);
- ETH Zurich also construct a ‘dynamic’ model that uses projected GDP in 2030 (less expected climate damages), and adds projected emissions through to 2030 (to reward countries with ambitious mitigation targets and relieve countries with a high degree of climate vulnerability).

The year 1990 was typically favoured as the cut-off year for historical emissions (prior to which emissions are not counted), as this was the year when the first IPCC report was published (providing a clear scientific consensus that could be used politically to justify domestic action), although WRI chose the average of the shares of cumulative historical emissions since both 1850 and 1990. All models cover the set of 23 Annex II countries, although ETH Zurich’s analysis covers both a larger group of 49 developed countries, and a fuller set of 164 countries (essentially all countries bar 32 LDCs with 2014 GHGs/hd already in line with a carbon budget consistent with the Paris Agreement). Details and data sources are summarised in Annex 1.

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2 The 23 Annex II countries are developed countries that were members of the OECD in 1992 and are obliged by the UNFCCC to provide climate finance to developing (non-Annex I) countries, as well as to promote the development and transfer of environmentally friendly technologies to both developing countries and EIT Parties (the ‘economies in transition’ which, along with the OECD nations, comprise the Annex I countries). But while the \$100bn goal (which originated under the auspices of the UNFCCC Convention) has been the sole responsibility of those 23 Annex II countries, upcoming decisions on the NCQG and Loss and Damage Fund are less clearly fixed in the same framework, creating scope to redefine the set of potential contributors.

3 ODI (Colenbrander et al., 2021) comment however that their preferred indicator is just cumulative emissions, on grounds that this metric already partially captures both income and population (given the close relationship between greenhouse gas emissions and economic activity in the past). They argue that while GNI reflects potential economic capabilities to provide finance, it disadvantages populous countries with relatively low per capita incomes and countries that have a relatively clean energy supply. They also suggest that while population reflects capabilities to respond to climate change (given the importance of human capital), it disadvantages countries with larger populations and lower per capita incomes or emissions (but is included in their index to highlight inequalities among so-called developed countries that need to be surfaced as responsibility for the climate finance goal is apportioned).

While their models differ in composition and data sources/definitions, WRI's comparative analysis notes that when applied to the 23 Annex II countries "there is a significant degree of alignment for the major economies".<sup>4</sup> However, even for the G7 the highest share from the different models is 17–46 percent larger than the smallest, and for some other countries the differences are much larger (see details in Annex 1).

Robinson et al. (2021) adopted a slightly different approach in a paper that also sought to quantify the damages caused by country emissions. Their analysis focused solely on historical emissions (though with a 1979 cut-off date rather than the 1990 applied by the others, and with a discount rate applied to reduce the 'value' of older emissions), and was applied to *all* countries.<sup>5</sup> The countries with the largest share of global liability in their baseline scenario are China, USA, Russia and India. Capacity to pay is recognised as a politically important factor, but not factored into the model.

More recently, ODI (Colenbrander et al., 2022) have applied their 'fair shares' model to the question of which countries should be added to the set of climate finance donors (noting that a number of non-Annex II countries already do so voluntarily). But rather than considering the three metrics (cumulative emissions, GNI and population) separately, they now consider GNI *per capita* (reflecting ability to pay) and cumulative emissions *per capita* since 1990 (reflecting historic responsibility), and identify which non-Annex II countries exceed Annex II countries on both metrics. They concluded that "There is a clear case for Israel, Qatar and Singapore to start contributing climate finance as they all have higher incomes and cumulative emissions per person than at least five of the countries who are expected to provide climate finance under the UN climate convention. Brunei, Kuwait, South Korea and the United Arab Emirates also exceed at least three established donors on both criteria. Strikingly, China does not qualify under our criteria." However, their results are significantly affected by the use of *per capita* metrics for both indicators, which understates China's contribution to global emissions and effectively means that population is double-counted to China's benefit. While *per capita* emissions is the fairest comparative measure of individual and country behaviour, it seems inappropriate to use both *per capita* GNI and *per capita* emissions in this context.

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## New analysis

This new analysis builds on these earlier models. Its purpose is not to derive a definitive 'fair shares' result, but to illustrate the implications of different technical and moral choices and to

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4 One notable feature common to all is that the USA's 'fair share' exceeds 40%, well above the USA's actual 12% share of climate finance averaged over the period 2016–18.

5 The model estimates the damage caused by each country's historical emissions in \$ terms using a social cost of carbon, and uses this to determine each country's share of the total liability. The year 1979 was chosen as the cut-off date because this was when (based on analysis of text in international discussions at the UN General Assembly) there was a step-change in climate awareness. The published model allows the user to explore the effects of changing both cut-off date and discount rate. A similar approach has been employed recently by Clements et al. (2023), although with emissions counted from 1958 and without any discounting of historical emissions.

present a range of possible outcomes. It covers all countries, and allows different measures of emissions and income to be tested (including different cut-off dates and the possible discounting of historical emissions). A further innovation is to capture both responsibility *and* capability by *multiplying* cumulative emissions and GNI/capita together (rather than treating them as separate equally weighted metrics), such that two countries with the same historical emissions would have 'fair shares' in proportion to their per capita incomes. This avoids the population 'double counting' problem flagged above.<sup>6</sup> An alternative formulation that combines cumulative emissions/hd and aggregate GNI is also considered.

ODA is not included because we are more interested in what countries *should* contribute, rather than what current levels of ODA provision suggest they may be willing to contribute. Nor does the analysis factor in projected reductions in emissions (which some have favoured in order to incentivise bolder ambition), on the grounds that any financial commitments are likely to be subject to regular review and that it would be better to revise 'fair shares' on the basis of actual emissions performance rather than projected targets.

The remainder of this section discusses the alternative options in more detail:

## Responsibility

### – Which measure of emissions?

The most reliable measure of emissions covers CO<sub>2</sub> *excluding* land use change, and this is used in the baseline scenario. Alternative options are CO<sub>2</sub> *including* land use change, and *all* GHGs in terms of CO<sub>2</sub>e (which is the target measure used in most NDCs). Data for all options going back to 1850 (1750 in the case of CO<sub>2</sub> excluding land use change) are now readily available from [Our World in Data](#) which has a valuable [discussion](#) of methods and sources (CO<sub>2</sub> data are sourced from the Global Carbon Project, and GHG data from the CAIT Climate Data Explorer).

### – What cut-off year for counting historical emissions?

Most analysts have focused on the period since 1990 as this was the year when the first IPCC report was published, providing a clear scientific consensus that could be used politically to justify domestic action. Data is also generally better since 1990. However, alternative dates can also be justified. Robinson et al. (2021) identified 1979 as the year when there was a clear uptick in the frequency with which world leaders at the UN General Assembly meetings refer to climate-related issues (also the year when the first World Climate Conference of the World

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<sup>6</sup> The problem with using per capita income *and* per capita emissions can be illustrated as follows: consider two countries A and B, with the same GNI/hd and emissions/hd, but with A having twice the population (and therefore twice the aggregate GNI and aggregate emissions) of B. If GNI/hd and emissions/hd are used, both countries would have equal responsibility for contributing climate finance in \$ terms, but B's burden would be twice as high in both per capita terms and as a percentage of GNI. Conversely, using aggregate emissions and per capita GNI does *not* disadvantage more populous countries because the consequent 'fair share' estimate is effectively spread across a larger number of people.



Meteorological Organization took place), and this is used in the baseline. Some have suggested earlier dates on the basis that developed countries industrialised on the back of fossil fuel powered growth, although this will also be reflected in their increased capability to pay.

– *Whether/how to discount the ‘cost’ of historical emissions?*

Whether to attach less weight to historical emissions is contested. In their assessment of liability, Robinson et al. (2021) noted that the greater the existing carbon stock in the atmosphere, the more damaging does each additional tonne become, and therefore favoured ‘discounting’ historical emissions (or rather, the social cost of carbon applied to such emissions), even while recognizing that emissions contribute equally to that stock. Clements et al. (2023), however, reached opposite conclusions, arguing that undiscounted emissions provide a more level playing field in assessing the climate debt of different countries.<sup>7</sup> Analysis here uses undiscounted flows in the baseline scenario, but explores the effects of using both a 1.4 percent discount rate (in line with the Stern report to better reflect the prescriptive priorities of a social planner who treats all generations equally), and the 3 percent rate used in Robinson et al’s earlier analysis (from the ‘descriptive’ or more market-based rates used by the US Interagency Working Group).<sup>8</sup> The higher the rate, the less weight is given to older emissions.

– *Which set of countries to consider?*

In principle, all countries should be included in any assessment of responsibility, and the baseline analysis does just this.<sup>9</sup> However, there may be (largely political) reasons for introducing some exclusions when calculating and presenting results to inform climate finance negotiations, recognising for example the case for excluding certain groups of countries (such as LDCs or LICs), or possibly individual countries, because of their significance for negotiations or wider geopolitical concerns. The model therefore allows for specific countries and/or groups of countries to be excluded.<sup>10</sup>

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7 In a very recent paper, Burke et al. (2023) apply a different approach, directly quantifying GDP losses from past emissions but *increasing* their present value (analogous to an unpaid debt accruing interest). They also conclude however that emissions prior to the early 1990s may have had global *benefits* (because average global temperatures were *below* the optimal level, although clearly that will vary by geography). So while they also note that the present value of future damages from a marginal past emission is at least an order of magnitude larger than the present value of *past* damage from the same emission (suggesting that settling debts for past *damages* will not settle debts for past *emissions*), this may not apply to emissions prior to the early 1990s.

8 See Robinson et al. (2021) for a full discussion.

9 Our World in Data has emissions data for 220 countries and territories, although not all are parties to the UNFCCC or Paris Agreement, or have readily available income data.

10 The five group options are LICs, LICs/LMICs, LICs/LDCs, LICs/LDCs/SIDS, or LICs/LMICS/LDCs/SIDS (accounting for multiple group membership where applicable). It’s worth noting that while Taiwan has been included because of its high emissions and wealth, it is not a UN member state and its ability to contribute to UN-created funds or be counted towards meeting UNFCCC goals may be limited. Further developments of the model could also explore imposing caps on individual country shares.

## Capability

– *Which measure of GNI/hd?*

Most analyses to date have used the latest current US\$ measure of GNI (usually the Atlas measure used by the World Bank to set the thresholds for its low, middle and high income categories), and this is used as the baseline indicator. However, a PPP\$ measure (used for estimating consistent poverty rates and to reflect differences in purchasing power parity, which tends to compress differences between rich and poor countries) is a better comparative measure of development and used as an alternative option.<sup>11</sup> Data are for 2021 wherever available.

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## Results

Results are presented as “fair share percentages”, independent of the scale of any future climate finance or L&D commitments. Table 1 summarises results for the top 20 countries in Scenario 1 (the baseline scenario using undiscounted cumulative CO<sub>2</sub> emissions since 1979, per capita GNI in 2021 US\$/hd and covering all countries). It shows both the values and ranks of the emissions and income components individually, and each country’s overall share and rank. It also reports shares for different income groups, other development and organisational groups, and region.<sup>12</sup> Results for all countries are provided in Annex 2.

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11 Alternatives based on GDP (as applied by ETH Zurich), or on GNI averaged over recent years (as applied by WRI), are highly unlikely to make much difference and have been excluded for simplicity.

12 International transport (which accounts for 3.1% of total CO<sub>2</sub> emissions in the baseline case) is excluded from this analysis, as are some individual countries which either do not appear in World Development Indicators (about 15 small islands/overseas territories) or for which income data are not available (North Korea, plus Syria, Cuba, Andorra, Liechtenstein and Greenland for PPP\$ scenarios). Collectively these countries account for 0.2% of CO<sub>2</sub> emissions in the baseline case (0.5% using PPP\$ GNI), almost entirely from North Korea, Syria and Cuba. Income data for Taiwan have been sourced from the Asian Development Bank’s ‘Key Indicators Database’.

**TABLE 1. Fair shares results, Scenario 1 (Baseline: CO<sub>2</sub> emissions, 1979 cut-off date, undiscounted, 2021 GNI US\$/hd, all countries)**

	Cumulative Emissions			Income		Overall Fair Share <sup>A</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	230,181	19.6%	1	70,930	7	16,327	46.9%	1
China	229,325	19.5%	2	11,880	72	2,724	7.8%	2
Japan	49,330	4.2%	5	42,650	27	2,104	6.0%	3
Germany	39,040	3.3%	6	51,660	18	2,017	5.8%	4
Canada	22,145	1.9%	8	48,310	21	1,070	3.1%	5
United Kingdom	22,665	1.9%	7	44,480	25	1,008	2.9%	6
Russia	78,194	6.7%	3	11,610	73	908	2.6%	7
Australia	14,333	1.2%	18	57,170	13	819	2.4%	8
France	16,779	1.4%	12	44,160	26	741	2.1%	9
Italy	17,771	1.5%	11	35,990	29	640	1.8%	10
South Korea	17,882	1.5%	10	35,110	30	628	1.8%	11
Netherlands	7,076	0.6%	26	55,200	14	391	1.1%	12
Saudi Arabia	15,654	1.3%	16	21,540	47	337	1.0%	13
Spain	11,339	1.0%	21	29,690	36	337	1.0%	14
Taiwan	8,506	0.7%	24	32,312	33	275	0.8%	15
Poland	15,552	1.3%	17	16,850	60	262	0.8%	16
Belgium	4,925	0.4%	33	50,490	19	249	0.7%	17
United Arab Emirates	4,803	0.4%	35	41,770	28	201	0.6%	18
Switzerland	1,794	0.2%	62	90,600	3	163	0.5%	19
Mexico	16,745	1.4%	13	9,590	80	161	0.5%	20
<b>Top 20 total</b>	<b>824,038</b>	<b>70.2%</b>					<b>90.2%</b>	
<b>By income group</b>								
HIC	558,342	47.6%	1			29,694	85.4%	1
UMIC	425,371	36.2%	2			4,590	13.2%	2
LMIC	142,355	12.1%	3			419	1.2%	3
LIC	7,941	0.7%	4			3	0.0%	4
<b>Total categorised*</b>	<b>1,134,009</b>	<b>96.6%</b>				<b>34,706</b>	<b>99.8%</b>	
<b>By devt group</b>								
LDC	6,623	0.6%	3			10	0.0%	3
LLDC	23,948	2.0%	1			137	0.4%	2
SIDS	6,673	0.6%	2			170	0.5%	1
<b>By institutional group</b>								
OECD	539,310	45.9%	2			28,535	82.0%	2
EU	175,368	14.9%	6			6,926	19.9%	5
BRICS	389,143	33.1%	5			3,960	11.4%	6
G7	397,911	33.9%	4			23,906	68.7%	4
G20	881,570	75.1%	1			30,030	86.3%	1
Annex II	457,850	39.0%	3			26,917	77.4%	3

**TABLE 1. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By region</b>								
ECA	312,881	26.7%	2			8,501	24.4%	2
N.Am	252,349	21.5%	3			17,399	50.0%	1
LAC	57,457	4.9%	6			542	1.6%	5
EAP	363,846	31.0%	1			7,022	20.2%	3
SA	58,160	5.0%	5			123	0.4%	7
MENA	69,397	5.9%	4			1,068	3.1%	4
SSA	25,713	2.2%	7			127	0.4%	6
<b>Total categorised*</b>	<b>1,139,804</b>	<b>97.1%</b>				<b>34,782</b>	<b>100.0%</b>	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

The key points to note are that:

- The USA has the largest ‘fair share’ (47 percent) by a very large margin, but China comes second with nearly 8 percent.
- The current set of Annex II climate finance providers account for only about 77 percent of the total. This suggests a strong justification for seeking to expand the contributor base.
- In addition to China, other non-Annex II donors that would feature in the top 20 are Russia, South Korea, Saudi Arabia, Taiwan, Poland, UAE and Mexico. Collectively (including China), these countries account for c.16 percent of the total. This list has some overlap but also some significant differences with the ODI suggestions cited earlier.
- The fair share of LMIC countries is very small (1.2 percent), and zero for LICs.

## Sensitivity analysis

While this baseline scenario broadly balances developed and developing country interests, many of the parameter choices can be contested. The model underpinning this analysis allows the effects of different choices to be explored (see [online spreadsheet](#)). This section explores the effects of changing some of those choices in eight further scenarios. Table 2 presents the shares and ranks for the 29 countries that appear in at least one ‘top 20’ list (reporting totals for each scenario’s ‘top 20’ as well as for the original baseline scenario ‘top 20’), and also for the main income and institutional groups (including the current set of Annex II countries). The final columns report the fair shares range for each across all nine scenarios, the percentage difference between the maximum and minimum shares, and the number of times each country appears in the top 20.

A brief commentary on each scenario follows. Tables for each individual scenario are given in Annex 3.

### *Changing the measure of emissions*

- Including land use change to our measure of CO<sub>2</sub> emissions has limited effect, reducing somewhat the fair share of current Annex II countries to 74.7 percent and increasing those of countries such as Brazil and Indonesia. Applying the 'all GHGs' measure has similar (though slightly larger) effects, with the Annex II share falling to 73.5 percent (Scenario 2).

### *Changing the measure of income*

- Using a PPP\$ measure has a more pronounced effect with a bigger shift away from Annex II countries, whose fair share falls to 64.3 percent with the USA dropping to 37.2 percent. India and Türkiye now feature in the top 20 (although with less than 1 percent each). China's share rises to 10.1 percent (Scenario 3).

### *Changing the structure of the model (emissions and income)*

- Applying the alternative structure in which cumulative CO<sub>2</sub> emissions *per capita*<sup>13</sup> are combined with current *aggregate* GNI makes virtually no difference to the results (Scenario 4).<sup>14</sup>

### *Changing the cut-off date*

- Choosing the more recent 1990 cut-off date used by most other analysts yields virtually no change to the top 20 rankings and only a small fall in Annex II fair shares (to 75.8 percent), China's share rises to 9.1 percent (Scenario 5). Choosing a much earlier 1900 cut-off date has a more significant impact with higher shares for the early industrialisers (USA, UK, Germany and France) as the overall Annex II share rises to 83 percent. China's share drops as to 5.1 percent although still ranks 3rd. Sweden, Denmark and Czechia replace UAE, Switzerland and Mexico at the foot of the top 20 table (Scenario 6).

### *Changing the discount rate*

- Applying the 1.4 percent discount factor to historical emissions makes little difference, with the rank and shares of each top 20 country virtually unchanged (Scenario 7). Effects are a little more pronounced with a 3 percent discount rate, with the Annex II share falling to 75.4 percent as (notably) China's share rises to 9.3 percent (Scenario 8). The effects of discounting would of course be greater if an earlier cut-off date were selected.

### *Excluding specific groups of countries*

- Excluding the poorest and most vulnerable countries makes very little difference to the baseline results. The shares of the LIC and LDC groups individually are zero, while those of

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<sup>13</sup> Our World in Data only report per capita figures for CO<sub>2</sub>, not the alternative measures of emissions.

<sup>14</sup> Only if cumulative *per capita* CO<sub>2</sub> emissions are combined with current *per capita* GNI figures do results differ significantly: Qatar, UAE, Kuwait and Bermuda all appear in the top 6, while the USA drops to 3rd (with only a 4.3% share) the UK to 27th, and China to 77th. But as discussed earlier, the effective double-counting of population makes this approach flawed, and it should therefore be ignored.

the LMICs and SIDS are negligible. Collectively, all four groups account for just 1.7 percent of the baseline 'fair share', so excluding them all makes very little difference to the shares of others (Scenario 9).

What is striking is that while the fair shares for individual countries do vary (by more than double in some cases), there is remarkable stability across the set of 'top 20' (with 16 countries appearing in the top 20 in all nine scenarios), and almost all scenarios result in a fair share for non-Annex II donors of 20–30 percent. The USA has by far the largest fair share across all scenarios (range 37–50 percent), with China second with 5–10 percent.

The analysis to date assigns equal weight to the emissions and income components (such that two countries with the same historical emissions would have 'fair shares' in proportion to their per capita incomes), but the model also allows the power of the income term to be adjusted to give it greater or lesser weight.<sup>15</sup> Indeed, Colenbrander et al. (2021) have suggested that fair shares should be based on historical emissions alone, on the grounds that this metric already partially captures both income and population (given the close relationship between greenhouse gas emissions and economic activity in the past). Others have sought to emphasize capacity to pay. Scenarios 10–12 (in Annex 3) illustrate the effects of changing these weights. Raising income to the power of two<sup>16</sup> significantly increases the Annex II share to 92 percent (Scenario 10), while reducing the weight on income (raised to the power of 0.5) reduces the Annex II share to 62 percent (Scenario 11). Removing income altogether (by raising income to the power of zero) such that fair shares are based only on emissions reduces the Annex II share to 40 percent, with China on a par with the USA at about 20 percent each (Scenario 12).<sup>17</sup>

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15 Because the emissions and income terms are multiplied together, adjusting the relative weights requires at least one of the terms (income in this case) to be raised to the power of 'x', with its weight being enhanced if  $x > 1$ , neutral (ie. equally weighted) if  $x = 1$ , and reduced if  $x < 1$ . Setting  $x = 0$  effectively causes the income term to disappear from the equation altogether. This approach to adjusting weights is widely applied in resource allocation formulae (for example, the World Bank's IDA resource allocation formula, described in Annex 3 of the IDA20 replenishment document).

16 This is effectively the same as doubling, in that in the case of two countries with equal emissions but one (A) having twice the per capita income of the other (B), A's fair share is twice that of B's when the terms are equally weighted, but four times B's share when raised to the power of 2. However, this is not generally true because of the quadratic nature of the formula: raising the income weight to 3 would make A's share eight (not six) times higher than B's, while lowering to 0.5 would make A's share 1.4 times larger than B's.

17 Even if the cut-off date is also set earlier to 1900, the Annex II share remains less than 50%.

**TABLE 2. Summary results across nine different scenarios**

Scenario	S1: Baseline		S2: All GHGs		S3: PPP\$/hd		S4: CO <sub>2</sub> /hd, GNI		S5: 1990 Cut-off		S6: 1900 Cut-off		S7: 1.4% Disc.rate		S8: 3% Disc.rate		S9: Excluding LIC/LMIC/LDC/SIDS		Range	Top 20	
A: SUMMARY RESULTS																					
	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Min-Max <sup>A</sup>	Max/min (% diff)	No.times Top 20
<b>Top 20</b>																					
United States	46.9%	1	43.1%	1	37.2%	1	48.1%	1	46.3%	1	50.6%	1	46.5%	1	46.0%	1	47.8%	1	37.2%–50.6%	36%	9
China	7.8%	2	8.2%	2	10.1%	2	7.2%	2	9.1%	2	5.1%	3	8.5%	2	9.3%	2	8.0%	2	5.1%–10.1%	97%	9
Japan	6.0%	3	4.9%	4	5.0%	5	5.2%	3	6.1%	3	4.9%	4	6.0%	3	6.0%	3	6.2%	3	4.9%–6.2%	25%	9
Germany	5.8%	4	5.1%	3	5.4%	4	5.1%	4	5.2%	4	7.8%	2	5.6%	4	5.4%	4	5.9%	4	5.1%–7.8%	52%	9
Canada	3.1%	5	3.7%	5	2.7%	6	3.3%	5	3.1%	5	2.8%	6	3.1%	5	3.1%	5	3.1%	5	2.7%–3.7%	38%	9
United Kingdom	2.9%	6	2.9%	7	2.6%	7	2.8%	6	2.7%	6	4.8%	5	2.8%	6	2.7%	6	2.9%	6	2.6%–4.8%	82%	9
Russia	2.6%	7	2.6%	8	5.8%	3	2.3%	8	2.3%	8	2.4%	8	2.5%	7	2.4%	8	2.7%	7	2.3%–5.8%	156%	9
Australia	2.4%	8	3.5%	6	1.8%	11	2.6%	7	2.5%	7	1.9%	9	2.4%	8	2.4%	7	2.4%	8	1.8%–3.5%	90%	9
France	2.1%	9	2.1%	9	2.0%	8	2.1%	9	1.9%	10	2.7%	7	2.1%	9	2.0%	10	2.2%	9	1.9%–2.7%	39%	9
Italy	1.8%	10	1.6%	11	1.9%	10	1.6%	11	1.8%	11	1.5%	10	1.8%	11	1.8%	11	1.9%	10	1.5%–1.9%	24%	9
South Korea	1.8%	11	1.5%	12	1.9%	9	1.7%	10	2.1%	9	1.2%	11	1.9%	10	2.0%	9	1.8%	11	1.2%–2.1%	80%	9
Netherlands	1.1%	12	1.1%	13	1.0%	16	1.1%	14	1.1%	12	1.1%	12	1.1%	12	1.1%	13	1.1%	12	1.0%–1.1%	11%	9
Saudi Arabia	1.0%	13	0.9%	14	1.7%	12	1.3%	12	1.1%	13	0.6%	16	1.0%	13	1.1%	12	1.0%	13	0.6%–1.7%	166%	9
Spain	1.0%	14	0.9%	15	1.1%	15	0.9%	15	1.0%	14	0.8%	15	1.0%	14	1.0%	14	1.0%	14	0.8%–1.1%	39%	9
Taiwan	0.8%	15	0.7%	18	1.3%	14	0.7%	17	0.9%	15	0.5%	17	0.8%	15	0.9%	15	0.8%	15	0.5%–1.3%	140%	9
Poland	0.8%	16	0.7%	16	1.3%	13	0.6%	19	0.7%	17	0.8%	14	0.7%	16	0.7%	16	0.8%	16	0.6%–1.3%	102%	9
Belgium	0.7%	17	0.7%	17	0.7%	21	0.7%	18	0.7%	16	1.0%	13	0.7%	17	0.7%	17	0.7%	17	0.7%–1.0%	44%	8
United Arab Emirates	0.6%	18	0.6%	21	0.8%	18	1.1%	13	0.7%	18	0.4%	24	0.6%	18	0.7%	18	0.6%	18	0.4%–1.1%	204%	7
Switzerland	0.5%	19	0.4%	28	0.3%	39	0.5%	22	0.5%	20	0.5%	21	0.5%	20	0.4%	20	0.5%	19	0.3%–0.5%	54%	5
Mexico	0.5%	20	0.6%	19	0.7%	19	0.5%	21	0.5%	19	0.3%	25	0.5%	19	0.5%	19	0.5%	20	0.3%–0.7%	114%	7
Denmark	0.4%	21	0.4%	27	0.3%	35	0.4%	24	0.4%	24	0.5%	20	0.4%	22	0.4%	24	0.4%	21	0.3%–0.5%	40%	1
Czechia	0.4%	23	0.3%	32	0.6%	23	0.4%	30	0.3%	29	0.5%	19	0.4%	25	0.4%	26	0.4%	23	0.3%–0.6%	71%	1
Sweden	0.4%	25	0.5%	26	0.3%	38	0.4%	26	0.4%	26	0.5%	18	0.4%	26	0.4%	27	0.4%	25	0.3%–0.5%	53%	1
Qatar	0.4%	27	0.5%	23	0.5%	28	0.8%	16	0.4%	21	0.2%	30	0.4%	24	0.4%	21	0.4%	27	0.2%–0.8%	247%	1
Brazil	0.3%	30	1.6%	10	0.5%	27	0.3%	34	0.3%	30	0.2%	31	0.3%	31	0.3%	29	0.3%	29	0.2%–1.6%	623%	1
India	0.3%	31	0.5%	25	0.8%	17	0.3%	33	0.4%	25	0.2%	34	0.3%	29	0.4%	25			0.2%–0.8%	293%	1
Kuwait	0.3%	33	0.3%	33	0.4%	31	0.5%	20	0.3%	32	0.2%	37	0.3%	34	0.3%	33	0.3%	31	0.2%–0.5%	150%	1
Turkey	0.3%	35	0.3%	34	0.7%	20	0.3%	35	0.3%	34	0.2%	38	0.3%	33	0.3%	32	0.3%	33	0.2%–0.7%	262%	1
Indonesia	0.2%	46	0.6%	20	0.4%	32	0.2%	45	0.2%	42	0.1%	50	0.2%	45	0.2%	43			0.1%–0.6%	482%	1
Top 20 total (each scenario)	90.2%		87.2%		85.8%		89.8%		90.0%		92.0%		90.1%		90.0%		91.7%		85.8%–92.0%	7%	
Top 20 total (baseline scenario)	90.2%		86.0%		85.2%		89.4%		90.0%		91.7%		90.1%		90.0%		91.7%		85.2%–91.7%	8%	

TABLE 2. (Continued)

Scenario	S1: Baseline		S2: All GHGs		S3: PPP\$/hd		S4: CO <sub>2</sub> /hd, GNI		S5: 1990 Cut-off		S6: 1900 Cut-off		S7: 1.4% Disc.rate		S8: 3% Disc.rate		S9: Excluding LIC/LMIC/LDC/SIDS		Range	Top 20	
A: SUMMARY RESULTS	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Min-Max <sup>A</sup>	Max/min (% diff)	No.times Top 20
<b>By income group</b>																					
HIC	85.4%	1	81.3%	1	75.4%	1	86.1%	1	84.2%	1	89.4%	1	84.7%	1	83.8%	1	86.4%	1	75.4%–89.4%	19%	
UMIC	13.2%	2	16.0%	2	21.1%	2	12.4%	2	14.2%	2	9.6%	2	13.9%	2	14.6%	2	13.4%	2	9.6%–21.1%	121%	
LMIC	1.2%	3	2.3%	3	3.3%	3	1.2%	3	1.3%	3	0.9%	3	1.3%	3	1.3%	3	0.0%	3	0.0%–3.3%	–	
LIC	0.0%	4	0.1%	4	0.0%	4	0.0%	4	0.0%	4	0.0%	4	0.0%	4	0.0%	4	0.0%	3	0.0%–0.1%	–	
Total categorised	99.8%		99.7%		99.8%		99.8%		99.8%		99.8%		99.8%		99.8%		99.8%		99.7%–99.8%	0%	
<b>By devt group</b>																					
LDC	0.0%	3	0.2%	3	0.1%	3	0.0%	3	0.0%	3	0.0%	3	0.0%	3	0.0%	3	0.0%	2	0.0%–0.2%	–	
LLDC	0.4%	2	0.6%	1	0.9%	1	0.4%	2	0.4%	2	0.3%	2	0.4%	2	0.4%	2	0.4%	1	0.3%–0.9%	172%	
SIDS	0.5%	1	0.5%	2	0.6%	2	0.6%	1	0.5%	1	0.4%	1	0.5%	1	0.5%	1	0.0%	2	0.0%–0.6%	–	
<b>By institutional group</b>																					
OECD	82.0%	2	78.1%	2	70.7%	2	81.4%	2	80.6%	2	87.1%	2	81.2%	2	80.2%	2	83.5%	2	70.7%–87.1%	23%	
EU	19.9%	5	19.0%	5	20.1%	5	18.4%	5	18.5%	5	24.2%	5	19.3%	5	18.7%	5	20.3%	5	18.4%–24.2%	32%	
BRICS	11.4%	6	13.2%	6	17.7%	6	10.5%	6	12.4%	6	8.2%	6	12.0%	6	12.7%	6	11.3%	6	8.2%–17.7%	117%	
G7	68.7%	4	63.4%	4	56.8%	4	68.2%	4	67.1%	4	75.2%	4	67.8%	4	66.8%	4	69.9%	4	56.8%–75.2%	32%	
G20	86.3%	1	84.5%	1	82.1%	1	85.4%	1	86.3%	1	87.8%	1	86.3%	1	86.3%	1	87.3%	1	82.1%–87.8%	7%	
Annex II	77.4%	3	73.5%	3	64.3%	3	77.0%	3	75.8%	3	83.3%	3	76.4%	3	75.4%	3	78.7%	3	64.3%–83.3%	30%	
<b>By region</b>																					
ECA	24.4%	2	23.8%	2	29.0%	2	22.5%	2	22.6%	2	28.3%	2	23.7%	2	23.0%	2	24.6%	2	22.5%–29.0%	29%	
N.Am	50.0%	1	46.8%	1	39.9%	1	51.3%	1	49.4%	1	53.4%	1	49.6%	1	49.1%	1	50.9%	1	39.9%–53.4%	34%	
LAC	1.6%	5	3.7%	4	2.4%	5	1.7%	5	1.6%	5	1.2%	5	1.6%	5	1.6%	5	1.4%	5	1.2%–3.7%	213%	
EAP	20.2%	3	21.1%	3	22.2%	3	18.9%	3	22.1%	3	14.5%	3	21.1%	3	22.0%	3	19.9%	3	14.5%–22.2%	53%	
SA	0.4%	7	0.6%	7	0.9%	6	0.4%	7	0.4%	6	0.2%	7	0.4%	6	0.4%	6	0.0%	7	0.0%–0.9%	–	
MENA	3.1%	4	3.4%	5	4.9%	4	4.8%	4	3.5%	4	2.0%	4	3.3%	4	3.5%	4	2.8%	4	2.0%–4.9%	145%	
SSA	0.4%	6	0.7%	6	0.7%	7	0.4%	6	0.4%	7	0.3%	6	0.4%	7	0.4%	7	0.3%	6	0.3%–0.7%	134%	
Total categorised	100.0%		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%		100.0%–100.0%	0%	

Note: <sup>A</sup>Min excludes 0 where countries not in sample.



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## Summary and conclusions

The key conclusion from this analysis is that there is a powerful argument in favour of expanding the current set of climate finance providers (and potential contributors to any Loss and Damage fund) in the future, with there being a case for non-Annex II donors providing 20–30 percent of the total. This finding is robust to a variety of different measures of historical emissions, cut-off dates and income, with China, Russia, South Korea, Saudi Arabia, Taiwan, Poland, the United Arab Emirates and Mexico consistently featuring in the top 20. Brazil and Indonesia become significant when measures of emissions including land use change or all GHGs are used (although arguably the global benefits that their forests provide should also be taken into account), while India and Türkiye also make the top 20 if PPP\$ measures of per capita income are used. That said, the analysis confirms that developed countries should continue to take primary responsibility, with the USA in particular shouldering at least 40 percent of the burden in virtually every scenario.

The politics of making this happen however will continue to be difficult. China and other developing countries continue to resist calls for any expansion of the donor group (although some differences are beginning to emerge<sup>18</sup>), while the USA in particular has resisted any link to ‘reparations’.<sup>19</sup> Much of this debate has been in the context of the proposed new Loss and Damage Fund, although in principle the same logic underpinning this analysis applies to all climate finance. Moreover, contributors to any Loss and Damage Fund could in principle also be eligible as potential recipients. But in a context where current commitments fall significantly short of needs, even without taking loss and damage into account, progress in negotiations is likely to require both additional commitments from existing donors as well as contributions from new ones. Excluding all LICs, LMICs, LDCs and SIDS would be a pragmatic way forward, but it is hard to escape the conclusion that both the USA and China will need to provide more.

Finally, it is worth noting that this is not the only aspect of “fair shares” when considering donor contributions. It is also necessary to assess the provision of climate finance on a comparable basis that adjusts for differences in grant equivalence and scoring methodology (notably regarding the scoring of programmes with a ‘significant’ Rio marker and the treatment of core contributions to the MDBs), which can be shown to make a very substantial difference to the ‘value’ of contributions from current donors. But that will be the subject of another paper.

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18 This [Bloomberg](#) article notes that some developing countries such as Ghana are now calling for the pool of contributors to be widened to include major economies such as China, the world’s biggest source of climate-warming gases.

19 Recent reporting [here](#) of negotiations on the proposed Loss and Damage Fund illustrate these various positions, while the USA’s position on ‘reparations’ is clearly reported [here](#).

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## Annex 1: Summary of previous ‘fair shares’ models

TABLE A1.1. Summary features and data sources of previous ‘fair shares’ models

	Income	Emissions	Population	ODA	Construction	Coverage
<b>Oxfam (2019)</b>	Nominal GDP (2018)	Cumulative CO <sub>2</sub> emissions 1990–2016		Total ODA 2014–2017	Simple average of 3 indicators	15 GCF contributors (but other Annex II countries provided)
<b>ODI (2021)</b>	GNI (2020) (current US\$, WB Indicators)	Cumulative CO <sub>2</sub> emissions 1990–2019 (Global Carbon Budget)	Population (2020) WB Indicators		Simple average of 3 indicators	23 Annex II countries
<b>WRI (2018)</b>	GNI 2011–2016 avg)	Average of average annual GHG emissions over both 1850–2016 and 1990–2016 (including LULUCF), from Potsdam Institute for Climate Impact Research (PIK)	GHG/hd (2011–2016) scaling factor that favours countries with below average emissions/hd		Simple average of income and emissions indicators, multiplied by the GHG/hd scaling factor	23 Annex II countries
<b>ETH Zurich—static (2019)</b>	GDP (2017), US\$ (constant 2010 prices), WB Indicators	GHGs (1990–2014), excl LULUCF, from WRI’s 2018 CAIT Climate Data Explorer			Simple average	Two versions: i) the Cancun scope covering 49 developed countries, ii) the Paris scope covering ‘all’ 164 countries (excl 32 LDCs with 2014 GHGs/hd already in line with Paris Agreement carbon budget)
<b>ETH Zurich—dynamic (2019)</b>	Projected 2030 GDP less expected climate damages	As above, but with addition of projected emissions to 2030			Simple average	As above

Sources: Oxfam: Kowalzig (2019); ODI: Colenbrander et al. (2021) [ODI have recently updated their analysis with cumulative CO<sub>2</sub> emissions 1990–2021, and 2021 figures for GNI and population (Pettinotti et al., 2023), but their estimated fair shares are virtually unchanged]; WRI: Waslander and Quijano Vallejos (2018); ETH Zurich: Egli and Stünzi (2019).

**TABLE A1.2. Comparison of climate finance effort-sharing approach results**

	Oxfam Potential Distribution Key	ODI Composite Index	WRI Indicative Minimum Threshold	ETH Zurich Static Allocation Mechanism	ETH Zurich Dynamic Allocation Mechanism	Average of Different Effort Sharing Approaches*	Max/Min (% Diff)
<b>Australia</b>	2.93%	2.92%	3.78%	3.67%	3.78%	3.35%	29%
<b>Austria</b>	0.86%	0.83%	0.72%	0.79%	0.74%	0.78%	19%
<b>Belgium</b>	1.26%	1.13%	1.16%	1.08%	1.03%	1.14%	22%
<b>Canada</b>	3.84%	4.15%	4.96%	4.67%	4.77%	4.43%	29%
<b>Denmark</b>	1.03%	0.61%	0.63%	0.66%	0.63%	0.73%	69%
<b>Finland</b>	0.67%	0.55%	0.76%	0.57%	0.54%	0.63%	40%
<b>France</b>	5.53%	5.46%	4.61%	5.04%	4.88%	5.12%	20%
<b>Germany</b>	10.56%	8.29%	8.65%	8.07%	7.62%	8.78%	39%
<b>Greece</b>	0.51%	0.80%	0.56%	0.69%	0.70%	0.64%	57%
<b>Iceland</b>	0.04%	0.04%	0.31%	0.03%	0.03%	0.10%	934%
<b>Ireland</b>	0.58%	0.51%	0.71%	0.64%	0.52%	0.58%	39%
<b>Italy</b>	3.86%	4.80%	3.44%	4.28%	3.95%	4.01%	39%
<b>Japan</b>	9.81%	11.77%	9.46%	11.72%	10.73%	10.44%	25%
<b>Luxembourg</b>	0.18%	0.08%	0.40%	0.11%	0.11%	0.19%	381%
<b>Netherlands</b>	2.43%	1.75%	1.91%	1.80%	1.66%	1.94%	46%
<b>New Zealand</b>	0.36%	0.42%	0.75%	0.48%	0.47%	0.50%	108%
<b>Norway</b>	1.46%	0.60%	0.63%	0.72%	0.73%	0.86%	142%
<b>Portugal</b>	0.42%	0.69%	0.42%	0.54%	0.49%	0.51%	65%
<b>Spain</b>	2.48%	3.49%	2.16%	3.00%	2.87%	2.75%	62%
<b>Sweden</b>	1.97%	0.90%	0.82%	0.89%	0.88%	1.14%	140%
<b>Switzerland</b>	1.47%	0.94%	0.86%	0.92%	0.89%	1.04%	71%
<b>United Kingdom</b>	7.72%	5.85%	6.45%	5.58%	5.30%	6.33%	46%
<b>United States</b>	40.05%	43.41%	45.88%	44.04%	46.67%	44.00%	17%
<b>Total Annex II countries</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	

Notes: \*Average relates to simple average of four models (using ETH Zurich dynamic, not static variant); G7 countries shaded green.

Sources: WRI (2021) Table 32 (<https://datasets.wri.org/dataset/climate-finance-100billion-breakdown>); Author's calculations (final column).

## Annex 2: Full country results for baseline Scenario 1

TABLE A2.1. Full country results for baseline Scenario 1

All Countries	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
World	1,173,974	100.0%						
Afghanistan	190	0.0%	121	390	202	0.1	0.0%	165
Albania	209	0.0%	119	6,110	105	1.3	0.0%	109
Algeria	4,429	0.4%	37	3,660	132	16.2	0.0%	66
Andorra	15	0.0%	182	46,530	22	0.7	0.0%	126
Angola	602	0.1%	88	1,710	161	1.0	0.0%	112
Anguilla	4	0.0%	208					
Antigua and Barbuda	14	0.0%	183	15,780	62	0.2	0.0%	148
Argentina	6,271	0.5%	27	9,960	76	62.5	0.2%	43
Armenia	242	0.0%	111	4,850	117	1.2	0.0%	110
Aruba	53	0.0%	159	29,390	37	1.6	0.0%	105
Australia	14,333	1.2%	18	57,170	13	819.4	2.4%	8
Austria	2,781	0.2%	47	52,760	17	146.7	0.4%	22
Azerbaijan	1,677	0.1%	65	4,900	116	8.2	0.0%	75
Bahamas	97	0.0%	140	26,490	41	2.6	0.0%	98
Bahrain	855	0.1%	78	22,950	45	19.6	0.1%	60
Bangladesh	1,563	0.1%	68	2,570	146	4.0	0.0%	86
Barbados	47	0.0%	161	16,900	59	0.8	0.0%	118
Belarus	3,215	0.3%	43	6,940	96	22.3	0.1%	56
Belgium	4,925	0.4%	33	50,490	19	248.7	0.7%	17
Belize	17	0.0%	180	6,070	106	0.1	0.0%	161
Benin	114	0.0%	135	1,350	169	0.2	0.0%	153
Bermuda	23	0.0%	177	122,470	1	2.8	0.0%	94
Bhutan	20	0.0%	178	3,040	144	0.1	0.0%	171
Bolivia	518	0.0%	92	3,290	140	1.7	0.0%	104
Bonaire Sint Eustatius and Saba	3	0.0%	210					
Bosnia and Herzegovina	710	0.1%	81	6,810	97	4.8	0.0%	84
Botswana	154	0.0%	127	6,430	102	1.0	0.0%	113
Brazil	14,297	1.2%	19	7,740	92	110.7	0.3%	30
British Virgin Islands	5	0.0%	201					
Brunei	259	0.0%	108	30,320	35	7.9	0.0%	76
Bulgaria	2,573	0.2%	49	11,200	74	28.8	0.1%	53
Burkina Faso	72	0.0%	152	830	184	0.1	0.0%	172
Burundi	12	0.0%	188	220	203	0.0	0.0%	202
Cambodia	178	0.0%	122	1,580	163	0.3	0.0%	142
Cameroon	227	0.0%	115	1,590	162	0.4	0.0%	139
Canada	22,145	1.9%	8	48,310	21	1,069.8	3.1%	5

TABLE A2.1. (Continued)

All Countries	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
Cape Verde	14	0.0%	184	3,190	142	0.0	0.0%	177
Central African Republic	8	0.0%	193	480	199	0.0	0.0%	201
Chad	34	0.0%	166	640	191	0.0	0.0%	187
Chile	2,286	0.2%	52	14,780	64	33.8	0.1%	52
China	229,325	19.5%	2	11,880	72	2,724.4	7.8%	2
Colombia	2,785	0.2%	46	6,190	103	17.2	0.0%	64
Comoros	5	0.0%	202	1,580	163	0.0	0.0%	197
Congo	99	0.0%	139	1,970	157	0.2	0.0%	151
Cook Islands	2	0.0%	213					
Costa Rica	231	0.0%	114	12,310	71	2.8	0.0%	93
Cote d'Ivoire	306	0.0%	104	2,420	150	0.7	0.0%	124
Croatia	843	0.1%	80	17,630	57	14.9	0.0%	67
Cuba	1,180	0.1%	74	8,920	84	10.5	0.0%	71
Curacao	220	0.0%	117	18,430	54	4.1	0.0%	85
Cyprus	264	0.0%	107	28,470	38	7.5	0.0%	77
Czechia	5,900	0.5%	30	24,430	43	144.1	0.4%	23
Democratic Republic of Congo	110	0.0%	137	550	196	0.1	0.0%	170
Denmark	2,225	0.2%	53	68,300	8	152.0	0.4%	21
Djibouti	16	0.0%	181	3,080	143	0.1	0.0%	176
Dominica	5	0.0%	203	7,790	91	0.0	0.0%	180
Dominican Republic	705	0.1%	82	8,100	90	5.7	0.0%	83
East Timor	9	0.0%	190	1,140	175	0.0	0.0%	195
Ecuador	1,137	0.1%	75	5,960	107	6.8	0.0%	81
Egypt	6,013	0.5%	28	3,350	139	20.1	0.1%	57
El Salvador	208	0.0%	120	4,260	123	0.9	0.0%	115
Equatorial Guinea	146	0.0%	130	5,150	111	0.8	0.0%	122
Eritrea	19	0.0%	179	610	194	0.0	0.0%	194
Estonia	990	0.1%	76	26,460	42	26.2	0.1%	54
Eswatini	38	0.0%	164	3,650	133	0.1	0.0%	157
Ethiopia	257	0.0%	109	940	181	0.2	0.0%	147
Faroe Islands	26	0.0%	174					
Fiji	39	0.0%	163	4,500	121	0.2	0.0%	152
Finland	2,346	0.2%	51	53,510	16	125.5	0.4%	26
France	16,779	1.4%	12	44,160	26	741.0	2.1%	9
French Guiana	26	0.0%	175					
French Polynesia	27	0.0%	171	18,560	53	0.5	0.0%	132
Gabon	225	0.0%	116	6,440	101	1.5	0.0%	107
Gambia	14	0.0%	186	740	189	0.0	0.0%	196
Georgia	409	0.0%	98	4,700	119	1.9	0.0%	101
Germany	39,040	3.3%	6	51,660	18	2,016.8	5.8%	4

TABLE A2.1. (Continued)

All Countries	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
Ghana	348	0.0%	103	2,280	152	0.8	0.0%	120
Greece	3,527	0.3%	41	20,000	50	70.5	0.2%	41
Greenland	24	0.0%	176	34,800	31	0.8	0.0%	117
Grenada	8	0.0%	194	8,590	88	0.1	0.0%	167
Guadeloupe	79	0.0%	147					
Guatemala	408	0.0%	99	4,940	114	2.0	0.0%	100
Guinea	78	0.0%	149	1,020	179	0.1	0.0%	164
Guinea-Bissau	9	0.0%	191	760	186	0.0	0.0%	199
Guyana	75	0.0%	150	9,410	82	0.7	0.0%	127
Haiti	69	0.0%	153	1,430	168	0.1	0.0%	162
Honduras	245	0.0%	110	2,490	148	0.6	0.0%	128
Hong Kong	1,484	0.1%	69	54,460	15	80.8	0.2%	37
Hungary	2,732	0.2%	48	17,740	56	48.5	0.1%	49
Iceland	118	0.0%	133	63,460	10	7.5	0.0%	78
India	50,912	4.3%	4	2,150	154	109.5	0.3%	31
Indonesia	13,431	1.1%	20	4,180	125	56.1	0.2%	46
Iran	16,713	1.4%	14	3,530	138	59.0	0.2%	44
Iraq	4,142	0.4%	38	4,760	118	19.7	0.1%	59
Ireland	1,589	0.1%	67	76,110	6	121.0	0.3%	28
Israel	2,109	0.2%	54	49,290	20	103.9	0.3%	34
Italy	17,771	1.5%	11	35,990	29	639.6	1.8%	10
Jamaica	354	0.0%	102	5,190	110	1.8	0.0%	102
Japan	49,330	4.2%	5	42,650	27	2,103.9	6.0%	3
Jordan	688	0.1%	84	4,170	126	2.9	0.0%	92
Kazakhstan	9,941	0.8%	23	8,880	85	88.3	0.3%	36
Kenya	407	0.0%	100	2,080	155	0.8	0.0%	116
Kiribati	2	0.0%	214	2,750	145	0.0	0.0%	200
Kosovo	111	0.0%	136	5,130	112	0.6	0.0%	130
Kuwait	3,046	0.3%	45	34,290	32	104.5	0.3%	33
Kyrgyzstan	481	0.0%	94	1,180	172	0.6	0.0%	131
Laos	169	0.0%	125	2,500	147	0.4	0.0%	134
Latvia	530	0.0%	90	19,790	51	10.5	0.0%	72
Lebanon	653	0.1%	87	5,110	113	3.3	0.0%	90
Lesotho	66	0.0%	154	1,210	171	0.1	0.0%	163
Liberia	34	0.0%	167	630	192	0.0	0.0%	188
Libya	1,962	0.2%	58	8,700	87	17.1	0.0%	65
Liechtenstein	6	0.0%	200	116,600	2	0.7	0.0%	125
Lithuania	908	0.1%	77	21,740	46	19.7	0.1%	58
Luxembourg	432	0.0%	97	88,190	4	38.1	0.1%	51
Macao	54	0.0%	158	46,450	23	2.5	0.0%	99
Madagascar	82	0.0%	144	490	198	0.0	0.0%	178

TABLE A2.1. (Continued)

All Countries	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
Malawi	40	0.0%	162	620	193	0.0	0.0%	183
Malaysia	5,932	0.5%	29	10,710	75	63.5	0.2%	42
Maldives	27	0.0%	172	9,600	79	0.3	0.0%	145
Mali	64	0.0%	155	820	185	0.1	0.0%	175
Malta	91	0.0%	142	30,760	34	2.8	0.0%	96
Marshall Islands	4	0.0%	209	6,780	98	0.0	0.0%	184
Martinique	80	0.0%	146					
Mauritania	75	0.0%	151	1,950	159	0.1	0.0%	155
Mauritius	110	0.0%	138	9,920	77	1.1	0.0%	111
Mayotte	7	0.0%	195					
Mexico	16,745	1.4%	13	9,590	80	160.6	0.5%	20
Micronesia (country)	4	0.0%	204	3,980	129	0.0	0.0%	190
Moldova	674	0.1%	85	5,370	109	3.6	0.0%	89
Mongolia	692	0.1%	83	3,730	131	2.6	0.0%	97
Montenegro	80	0.0%	145	9,340	83	0.7	0.0%	123
Montserrat	1	0.0%	215					
Morocco	1,630	0.1%	66	3,620	134	5.9	0.0%	82
Mozambique	119	0.0%	132	480	199	0.1	0.0%	174
Myanmar	509	0.0%	93	1,170	173	0.6	0.0%	129
Namibia	79	0.0%	148	4,650	120	0.4	0.0%	138
Nauru	4	0.0%	207	16,920	58	0.1	0.0%	168
Nepal	170	0.0%	124	1,220	170	0.2	0.0%	149
Netherlands	7,076	0.6%	26	55,200	14	390.6	1.1%	12
New Caledonia	117	0.0%	134	13,210	68	1.5	0.0%	106
New Zealand	1,290	0.1%	72	45,230	24	58.4	0.2%	45
Nicaragua	151	0.0%	128	1,950	159	0.3	0.0%	141
Niger	48	0.0%	160	590	195	0.0	0.0%	181
Nigeria	3,463	0.3%	42	2,080	155	7.2	0.0%	79
Niue	0	0.0%	219					
North Korea	3,617	0.3%	40					
North Macedonia	456	0.0%	95	6,190	103	2.8	0.0%	95
Norway	1,715	0.1%	64	83,880	5	143.8	0.4%	24
Oman	1,363	0.1%	71	17,950	55	24.5	0.1%	55
Pakistan	4,833	0.4%	34	1,470	167	7.1	0.0%	80
Palau	9	0.0%	192	12,790	70	0.1	0.0%	160
Palestine	63	0.0%	157	4,220	124	0.3	0.0%	143
Panama	275	0.0%	106	13,920	67	3.8	0.0%	88
Papua New Guinea	167	0.0%	126	2,460	149	0.4	0.0%	135
Paraguay	172	0.0%	123	5,740	108	1.0	0.0%	114
Peru	1,443	0.1%	70	6,460	100	9.3	0.0%	73



TABLE A2.1. (Continued)

All Countries	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
Philippines	3,050	0.3%	44	3,550	136	10.8	0.0%	70
Poland	15,552	1.3%	17	16,850	60	262.1	0.8%	16
Portugal	2,096	0.2%	55	23,890	44	50.1	0.1%	48
Qatar	2,013	0.2%	57	62,310	11	125.4	0.4%	27
Reunion	122	0.0%	131					
Romania	5,430	0.5%	32	14,160	66	76.9	0.2%	38
Russia	78,194	6.7%	3	11,610	73	907.8	2.6%	7
Rwanda	30	0.0%	168	840	182	0.0	0.0%	182
Saint Helena	0	0.0%	217					
Saint Kitts and Nevis	7	0.0%	197	18,820	52	0.1	0.0%	159
Saint Lucia	14	0.0%	185	9,520	81	0.1	0.0%	158
Saint Pierre and Miquelon	3	0.0%	212					
Saint Vincent and the Grenadines	7	0.0%	196	8,720	86	0.1	0.0%	173
Samoa	6	0.0%	199	3,810	130	0.0	0.0%	185
Sao Tome and Principe	3	0.0%	211	2,260	153	0.0	0.0%	198
Saudi Arabia	15,654	1.3%	16	21,540	47	337.2	1.0%	13
Senegal	234	0.0%	113	1,570	165	0.4	0.0%	137
Serbia	2,063	0.2%	56	8,460	89	17.5	0.1%	63
Seychelles	14	0.0%	187	14,540	65	0.2	0.0%	150
Sierra Leone	27	0.0%	173	500	197	0.0	0.0%	191
Singapore	1,830	0.2%	61	64,010	9	117.2	0.3%	29
Sint Maarten (Dutch part)	28	0.0%	170	27,510	40	0.8	0.0%	121
Slovakia	1,955	0.2%	60	20,640	49	40.4	0.1%	50
Slovenia	655	0.1%	86	28,280	39	18.5	0.1%	62
Solomon Islands	10	0.0%	189	2,320	151	0.0	0.0%	186
Somalia	28	0.0%	169	430	201	0.0	0.0%	193
South Africa	16,416	1.4%	15	6,530	99	107.2	0.3%	32
South Korea	17,882	1.5%	10	35,110	30	627.8	1.8%	11
South Sudan	34	0.0%	165	1,040	177	0.0	0.0%	179
Spain	11,339	1.0%	21	29,690	36	336.6	1.0%	14
Sri Lanka	446	0.0%	96	4,030	128	1.8	0.0%	103
Sudan	406	0.0%	101	650	190	0.3	0.0%	144
Suriname	88	0.0%	143	4,410	122	0.4	0.0%	136
Sweden	2,353	0.2%	50	59,540	12	140.1	0.4%	25
Switzerland	1,794	0.2%	62	90,600	3	162.5	0.5%	19
Syria	1,736	0.1%	63	760	186	1.3	0.0%	108
Taiwan	8,506	0.7%	24	32,312	33	274.8	0.8%	15
Tajikistan	277	0.0%	105	1,150	174	0.3	0.0%	140
Tanzania	220	0.0%	118	1,100	176	0.2	0.0%	146

TABLE A2.1. (Continued)

All Countries	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
Thailand	7,451	0.6%	25	7,090	94	52.8	0.2%	47
Togo	63	0.0%	156	960	180	0.1	0.0%	169
Tonga	4	0.0%	205	4,930	115	0.0	0.0%	189
Trinidad and Tobago	1,247	0.1%	73	15,000	63	18.7	0.1%	61
Tunisia	848	0.1%	79	3,540	137	3.0	0.0%	91
Turkey	10,200	0.9%	22	9,900	78	101.0	0.3%	35
Turkmenistan	1,959	0.2%	59	6,970	95	13.7	0.0%	69
Turks and Caicos Islands	6	0.0%	198	21,410	48	0.1	0.0%	156
Tuvalu	0	0.0%	218	7,200	93	0.0	0.0%	203
Uganda	93	0.0%	141	760	186	0.1	0.0%	166
Ukraine	18,314	1.6%	9	4,120	127	75.5	0.2%	39
United Arab Emirates	4,803	0.4%	35	41,770	28	200.6	0.6%	18
United Kingdom	22,665	1.9%	7	44,480	25	1,008.1	2.9%	6
United States	230,181	19.6%	1	70,930	7	16,326.7	46.9%	1
Uruguay	241	0.0%	112	16,080	61	3.9	0.0%	87
Uzbekistan	4,694	0.4%	36	1,960	158	9.2	0.0%	74
Vanuatu	4	0.0%	206	3,240	141	0.0	0.0%	192
Venezuela	5,796	0.5%	31	13,010	69	75.4	0.2%	40
Vietnam	4,117	0.4%	39	3,590	135	14.8	0.0%	68
Wallis and Futuna	1	0.0%	216					
Yemen	569	0.0%	89	840	182	0.5	0.0%	133
Zambia	146	0.0%	129	1,030	178	0.2	0.0%	154
Zimbabwe	519	0.0%	91	1,530	166	0.8	0.0%	119

Notes: Percentage of world total emissions accounted for by individual countries (ie excl international transport) – 97.1%; countries with income data – 96.8%; countries without income data – 0.3%. <sup>^</sup> highlight if >= 0.5%. <sup>^</sup> group exclusions: none, collectively accounting for: 0.0%.

## Annex 3: Sensitivity analysis—summary results for alternative model specifications

TABLE A3.1. Scenario 2. Fair shares results with ‘all GHGs’ measure of emissions

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	GHGs (MtCO <sub>2</sub> e)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	271,578	14.6%	2	70,930	7	19,263	43.1%	1
China	308,591	16.6%	1	11,880	72	3,666	8.2%	2
Germany	44,426	2.4%	8	51,660	18	2,295	5.1%	3
Japan	51,454	2.8%	7	42,650	27	2,195	4.9%	4
Canada	33,961	1.8%	9	48,310	21	1,641	3.7%	5
Australia	27,113	1.5%	12	57,170	13	1,550	3.5%	6
United Kingdom	28,720	1.5%	11	44,480	25	1,277	2.9%	7
Russia	101,133	5.4%	3	11,610	73	1,174	2.6%	8
France	21,740	1.2%	15	44,160	26	960	2.1%	9
Brazil	93,319	5.0%	5	7,740	92	722	1.6%	10
Italy	20,001	1.1%	17	35,990	29	720	1.6%	11
South Korea	19,465	1.0%	20	35,110	30	683	1.5%	12
Netherlands	9,290	0.5%	36	55,200	14	513	1.1%	13
Saudi Arabia	19,569	1.1%	19	21,540	47	422	0.9%	14
Spain	13,680	0.7%	27	29,690	36	406	0.9%	15
Poland	19,579	1.1%	18	16,850	60	330	0.7%	16
Belgium	6,239	0.3%	47	50,490	19	315	0.7%	17
Taiwan	9,449	0.5%	33	32,312	33	305	0.7%	18
Mexico	29,578	1.6%	10	9,590	80	284	0.6%	19
Indonesia	67,263	3.6%	6	4,180	125	281	0.6%	20
Top 20 total	1,196,150	64.3%					87.2%	
<b>By income group</b>								
HIC	686,751	36.9%	2			36,348	81.3%	1
UMIC	697,727	37.5%	1			7,136	16.0%	2
LMIC	365,342	19.6%	3			1,044	2.3%	3
LIC	65,775	3.5%	4			42	0.1%	4
Total categorised*	1,815,595	97.6%				44,569	99.7%	
<b>By devt group</b>								
LDC	96,918	5.2%	1			103	0.2%	3
LLDC	75,632	4.1%	2			282	0.6%	1
SIDS	12,685	0.7%	3			216	0.5%	2

**TABLE A3.1. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	GHGs (MtCO <sub>2</sub> e)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By institutional group</b>								
OECD	675,758	36.3%	2			34,935	78.1%	2
EU	215,215	11.6%	6			8,507	19.0%	5
BRICS	620,063	33.3%	3			5,908	13.2%	6
G7	471,881	25.4%	5			28,351	63.4%	4
G20	1,286,410	69.1%	1			37,791	84.5%	1
Annex II	559,866	30.1%	4			32,881	73.5%	3
<b>By region</b>								
ECA	400,947	21.5%	2			10,635	23.8%	2
N.Am	305,540	16.4%	3			20,904	46.8%	1
LAC	199,813	10.7%	4			1,676	3.7%	4
EAP	563,305	30.3%	1			9,422	21.1%	3
SA	119,987	6.4%	6			252	0.6%	7
MENA	105,070	5.6%	7			1,527	3.4%	5
SSA	131,808	7.1%	5			295	0.7%	6
Total categorised*	1,826,470	98.2%				44,710	100.0%	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.2. Scenario 3. Fair shares results with PPP\$ measure of per capita income**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (PPP\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	230,181	19.6%	1	70,480	11	16,223	37.2%	1
China	229,325	19.5%	2	19,160	77	4,394	10.1%	2
Russia	78,194	6.7%	3	32,170	51	2,516	5.8%	3
Germany	39,040	3.3%	6	60,050	17	2,344	5.4%	4
Japan	49,330	4.2%	5	43,850	34	2,163	5.0%	5
Canada	22,145	1.9%	8	52,310	24	1,158	2.7%	6
United Kingdom	22,665	1.9%	7	50,600	26	1,147	2.6%	7
France	16,779	1.4%	12	52,140	25	875	2.0%	8
South Korea	17,882	1.5%	10	47,400	27	848	1.9%	9
Italy	17,771	1.5%	11	46,940	28	834	1.9%	10
Australia	14,333	1.2%	18	55,330	23	793	1.8%	11
Saudi Arabia	15,654	1.3%	16	46,130	31	722	1.7%	12
Poland	15,552	1.3%	17	36,340	42	565	1.3%	13
Taiwan	8,506	0.7%	24	64,044	14	545	1.3%	14
Spain	11,339	1.0%	21	40,810	40	463	1.1%	15

TABLE A3.2. (Continued)

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (PPP\$/hd)	Rank	Score	Share	Rank
Netherlands	7,076	0.6%	26	63,360	15	448	1.0%	16
India	50,912	4.3%	4	7,130	135	363	0.8%	17
United Arab Emirates	4,803	0.4%	35	71,280	9	342	0.8%	18
Mexico	16,745	1.4%	13	19,060	78	319	0.7%	19
Turkey	10,200	0.9%	22	30,000	54	306	0.7%	20
<b>Top 20 total</b>	<b>878,431</b>	<b>74.8%</b>					<b>85.8%</b>	
<b>By income group</b>								
HIC	558,342	47.6%	1			32,821	75.4%	1
UMIC	425,371	36.2%	2			9,191	21.1%	2
LMIC	142,355	12.1%	3			1,441	3.3%	3
LIC	7,941	0.7%	4			7	0.0%	4
<b>Total categorised*</b>	<b>1,134,009</b>	<b>96.6%</b>				<b>43,459</b>	<b>99.8%</b>	
<b>By devt group</b>								
LDC	6,623	0.6%	3			29	0.1%	3
LLDC	23,948	2.0%	1			395	0.9%	1
SIDS	6,673	0.6%	2			258	0.6%	2
<b>By institutional group</b>								
OECD	539,310	45.9%	2			30,816	70.7%	2
EU	175,368	14.9%	6			8,762	20.1%	5
BRICS	389,143	33.1%	5			7,731	17.7%	6
G7	397,911	33.9%	4			24,745	56.8%	4
G20	881,570	75.1%	1			35,779	82.1%	1
Annex II	457,850	39.0%	3			28,027	64.3%	3
<b>By region</b>								
ECA	312,881	26.7%	2			12,627	29.0%	2
N.Am	252,349	21.5%	3			17,384	39.9%	1
LAC	57,457	4.9%	6			1,024	2.4%	5
EAP	363,846	31.0%	1			9,675	22.2%	3
SA	58,160	5.0%	5			409	0.9%	6
MENA	69,397	5.9%	4			2,154	4.9%	4
SSA	25,713	2.2%	7			284	0.7%	7
<b>Total categorised*</b>	<b>1,139,804</b>	<b>97.1%</b>				<b>43,557</b>	<b>100.0%</b>	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. ^group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.3. Scenario 4. Fair shares results using per capita CO<sub>2</sub> emissions and aggregate GNI (US\$)**

	Cumulative Emissions			Income		Overall Fair Share <sup>A</sup>		
	CO <sub>2</sub> /hd (t)	% Share	Rank	GNI (US\$m)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	830	1.8%	9	23,539,918	1	19,530	48.1%	1
China	175	0.4%	90	16,785,119	2	2,942	7.2%	2
Japan	394	0.8%	36	5,360,684	3	2,112	5.2%	3
Germany	486	1.0%	22	4,298,325	4	2,088	5.1%	4
Canada	720	1.6%	12	1,847,687	9	1,331	3.3%	5
United Kingdom	381	0.8%	40	2,994,732	6	1,140	2.8%	6
Australia	729	1.6%	11	1,468,490	13	1,070	2.6%	7
Russia	541	1.2%	19	1,693,604	11	916	2.3%	8
France	286	0.6%	56	2,991,553	7	856	2.1%	9
South Korea	375	0.8%	41	1,816,733	10	682	1.7%	10
Italy	307	0.7%	54	2,127,119	8	654	1.6%	11
Saudi Arabia	675	1.5%	14	775,463	20	523	1.3%	12
United Arab Emirates	1,175	2.5%	4	387,961	36	456	1.1%	13
Netherlands	449	1.0%	27	967,837	17	435	1.1%	14
Spain	269	0.6%	58	1,407,936	14	378	0.9%	15
Qatar	1,958	4.2%	1	167,494	58	328	0.8%	16
Taiwan	382	0.8%	39	758,318	21	289	0.7%	17
Belgium	474	1.0%	24	585,375	24	277	0.7%	18
Poland	410	0.9%	32	636,064	22	261	0.6%	19
Kuwait	1,382	3.0%	3	152,276	60	211	0.5%	20
Top 20 total	12,396	26.7%					89.8%	
<b>By income group</b>								
HIC	32,114	69.3%	1			35,010	86.1%	1
UMIC	8,389	18.1%	2			5,031	12.4%	2
LMIC	2,814	6.1%	3			500	1.2%	3
LIC	460	1.0%	4			5	0.0%	4
Total categorised*	43,776	94.5%				40,547	99.8%	
<b>By devt group</b>								
LDC	541	1.2%	3			13	0.0%	3
LLDC	2,722	5.9%	2			163	0.4%	2
SIDS	9,849	21.3%	1			226	0.6%	1
<b>By institutional group</b>								
OECD	14,487	31.3%	1			33,080	81.4%	2
EU	10,405	22.5%	2			7,462	18.4%	5
BRICS	1,202	2.6%	6			4,265	10.5%	6
G7	3,404	7.3%	5			27,710	68.2%	4
G20	6,935	15.0%	4			34,729	85.4%	1
Annex II	10,068	21.7%	3			31,277	77.0%	3

**TABLE A3.3. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> /hd (t)	% Share	Rank	GNI (US\$m)	Rank	Score	Share	Rank
<b>By region</b>								
ECA	16,836	36.3%	1			9,137	22.5%	2
N.Am	1,935	4.2%	5			20,863	51.3%	1
LAC	7,784	16.8%	3			677	1.7%	5
EAP	6,846	14.8%	4			7,691	18.9%	3
SA	224	0.5%	7			151	0.4%	7
MENA	8,819	19.0%	2			1,953	4.8%	4
SSA	1,578	3.4%	6			171	0.4%	6
Total categorised*	44,021	95.0%				40,643	100.0%	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.4. Scenario 5. Fair shares results with 1990 cut-off date**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	177,814	18.7%	2	70,930	7	12,612	46.3%	1
China	208,433	21.9%	1	11,880	72	2,476	9.1%	2
Japan	39,055	4.1%	5	42,650	27	1,666	6.1%	3
Germany	27,551	2.9%	6	51,660	18	1,423	5.2%	4
Canada	17,407	1.8%	7	48,310	21	841	3.1%	5
United Kingdom	16,406	1.7%	8	44,480	25	730	2.7%	6
Australia	11,707	1.2%	18	57,170	13	669	2.5%	7
Russia	53,567	5.6%	3	11,610	73	622	2.3%	8
South Korea	16,059	1.7%	9	35,110	30	564	2.1%	9
France	12,032	1.3%	17	44,160	26	531	1.9%	10
Italy	13,632	1.4%	12	35,990	29	491	1.8%	11
Netherlands	5,384	0.6%	27	55,200	14	297	1.1%	12
Saudi Arabia	13,725	1.4%	11	21,540	47	296	1.1%	13
Spain	9,105	1.0%	21	29,690	36	270	1.0%	14
Taiwan	7,515	0.8%	23	32,312	33	243	0.9%	15
Belgium	3,688	0.4%	36	50,490	19	186	0.7%	16
Poland	10,738	1.1%	19	16,850	60	181	0.7%	17
United Arab Emirates	4,328	0.5%	32	41,770	28	181	0.7%	18
Mexico	13,579	1.4%	13	9,590	80	130	0.5%	19
Switzerland	1,357	0.1%	64	90,600	3	123	0.5%	20
Top 20 total	663,081	69.7%					90.0%	

TABLE A3.4. (Continued)

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By income group</b>								
HIC	432,063	45.4%	1			22,961	84.2%	1
UMIC	358,137	37.6%	2			3,881	14.2%	2
LMIC	121,635	12.8%	3			352	1.3%	3
LIC	5,646	0.6%	4			3	0.0%	4
Total categorised*	917,482	96.4%				27,196	99.8%	
<b>By devt group</b>								
LDC	5,920	0.6%	2			9	0.0%	3
LLDC	17,891	1.9%	1			101	0.4%	2
SIDS	5,341	0.6%	3			136	0.5%	1
<b>By institutional group</b>								
OECD	415,821	43.7%	2			21,956	80.6%	2
EU	126,698	13.3%	6			5,040	18.5%	5
BRICS	334,085	35.1%	4			3,379	12.4%	6
G7	303,897	31.9%	5			18,294	67.1%	4
G20	719,403	75.6%	1			23,524	86.3%	1
Annex II	351,161	36.9%	3			20,654	75.8%	3
<b>By region</b>								
ECA	222,198	23.4%	2			6,164	22.6%	2
N.Am	195,239	20.5%	3			13,455	49.4%	1
LAC	47,557	5.0%	6			447	1.6%	5
EAP	321,771	33.8%	1			6,025	22.1%	3
SA	53,257	5.6%	5			113	0.4%	6
MENA	61,267	6.4%	4			951	3.5%	4
SSA	20,904	2.2%	7			102	0.4%	7
Total categorised*	922,194	96.9%				27,257	100.0%	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.



**TABLE A3.5. Scenario 6. Fair shares results with 1900 cut-off date**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	411,905	24.3%	1	70,930	7	29,216	50.6%	1
Germany	87,226	5.1%	4	51,660	18	4,506	7.8%	2
China	249,353	14.7%	2	11,880	72	2,962	5.1%	3
Japan	66,550	3.9%	5	42,650	27	2,838	4.9%	4
United Kingdom	62,185	3.7%	6	44,480	25	2,766	4.8%	5
Canada	33,855	2.0%	9	48,310	21	1,636	2.8%	6
France	35,525	2.1%	8	44,160	26	1,569	2.7%	7
Russia	117,117	6.9%	3	11,610	73	1,360	2.4%	8
Australia	18,882	1.1%	17	57,170	13	1,080	1.9%	9
Italy	24,821	1.5%	12	35,990	29	893	1.5%	10
South Korea	18,928	1.1%	16	35,110	30	665	1.2%	11
Netherlands	11,512	0.7%	23	55,200	14	635	1.1%	12
Belgium	11,186	0.7%	26	50,490	19	565	1.0%	13
Poland	26,924	1.6%	11	16,850	60	454	0.8%	14
Spain	14,887	0.9%	21	29,690	36	442	0.8%	15
Saudi Arabia	16,706	1.0%	18	21,540	47	360	0.6%	16
Taiwan	9,319	0.6%	27	32,312	33	301	0.5%	17
Sweden	4,894	0.3%	41	59,540	12	291	0.5%	18
Czechia	11,473	0.7%	24	24,430	43	280	0.5%	19
Denmark	4,025	0.2%	46	68,300	8	275	0.5%	20
Top 20 total	1,237,272	73.0%					92.0%	
<b>By income group</b>								
HIC	946,642	55.9%	1			51,599	89.4%	1
UMIC	513,950	30.3%	2			5,517	9.6%	2
LMIC	171,929	10.1%	3			516	0.9%	3
LIC	10,246	0.6%	4			4	0.0%	4
Total categorised*	1,642,767	97.0%				57,636	99.8%	
<b>By devt group</b>								
LDC	7,606	0.4%	3			11	0.0%	3
LLDC	33,405	2.0%	1			192	0.3%	2
SIDS	8,619	0.5%	2			210	0.4%	1
<b>By institutional group</b>								
OECD	925,212	54.6%	2			50,301	87.1%	2
EU	340,383	20.1%	6			13,981	24.2%	5
BRICS	461,580	27.2%	5			4,714	8.2%	6
G7	722,067	42.6%	4			43,424	75.2%	4
G20	1,293,617	76.4%	1			50,700	87.8%	1
Annex II	813,121	48.0%	3			48,120	83.3%	3

**TABLE A3.5. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By region</b>								
ECA	544,347	32.1%	1			16,332	28.3%	2
N.Am	445,789	26.3%	2			30,856	53.4%	1
LAC	72,142	4.3%	5			692	1.2%	5
EAP	413,682	24.4%	3			8,392	14.5%	3
SA	64,887	3.8%	6			137	0.2%	7
MENA	77,289	4.6%	4			1,168	2.0%	4
SSA	32,450	1.9%	7			162	0.3%	6
<b>Total categorised*</b>	<b>1,650,587</b>	<b>97.4%</b>				<b>57,738</b>	<b>100.0%</b>	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.6. Scenario 7. Fair shares results with 1.4 percent discount rate**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	175,577	19.0%	2	70,930	7	12,454	46.5%	1
China	192,091	20.8%	1	11,880	72	2,282	8.5%	2
Japan	37,831	4.1%	5	42,650	27	1,613	6.0%	3
Germany	28,969	3.1%	6	51,660	18	1,497	5.6%	4
Canada	17,082	1.8%	7	48,310	21	825	3.1%	5
United Kingdom	16,819	1.8%	8	44,480	25	748	2.8%	6
Russia	58,088	6.3%	3	11,610	73	674	2.5%	7
Australia	11,230	1.2%	19	57,170	13	642	2.4%	8
France	12,502	1.4%	16	44,160	26	552	2.1%	9
South Korea	14,534	1.6%	9	35,110	30	510	1.9%	10
Italy	13,424	1.5%	11	35,990	29	483	1.8%	11
Netherlands	5,365	0.6%	26	55,200	14	296	1.1%	12
Saudi Arabia	12,809	1.4%	14	21,540	47	276	1.0%	13
Spain	8,725	0.9%	21	29,690	36	259	1.0%	14
Taiwan	6,854	0.7%	24	32,312	33	221	0.8%	15
Poland	11,562	1.3%	17	16,850	60	195	0.7%	16
Belgium	3,698	0.4%	35	50,490	19	187	0.7%	17
United Arab Emirates	3,993	0.4%	32	41,770	28	167	0.6%	18
Mexico	13,085	1.4%	12	9,590	80	125	0.5%	19
Switzerland	1,356	0.1%	62	90,600	3	123	0.5%	20
<b>Top 20 total</b>	<b>645,595</b>	<b>69.9%</b>					<b>90.1%</b>	

TABLE A3.6. (Continued)

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By income group</b>								
HIC	426,992	46.2%	1			22,679	84.7%	1
UMIC	343,277	37.2%	2			3,713	13.9%	2
LMIC	115,723	12.5%	3			338	1.3%	3
LIC	6,004	0.6%	4			3	0.0%	4
Total categorised*	891,995	96.5%				26,733	99.8%	
<b>By devt group</b>								
LDC	5,558	0.6%	2			8	0.0%	3
LLDC	18,492	2.0%	1			105	0.4%	2
SIDS	5,201	0.6%	3			131	0.5%	1
<b>By institutional group</b>								
OECD	411,594	44.5%	2			21,743	81.2%	2
EU	130,866	14.2%	6			5,174	19.3%	5
BRICS	317,226	34.3%	4			3,221	12.0%	6
G7	302,204	32.7%	5			18,172	67.8%	4
G20	695,513	75.3%	1			23,125	86.3%	1
Annex II	348,174	37.7%	3			20,480	76.4%	3
<b>By region</b>								
ECA	233,629	25.3%	2			6,359	23.7%	2
N.Am	192,677	20.9%	3			13,281	49.6%	1
LAC	45,401	4.9%	6			427	1.6%	5
EAP	298,911	32.4%	1			5,647	21.1%	3
SA	48,787	5.3%	5			103	0.4%	6
MENA	56,721	6.1%	4			875	3.3%	4
SSA	20,342	2.2%	7			99	0.4%	7
Total categorised*	896,468	97.0%				26,791	100.0%	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.7. Scenario 8. Fair shares results with 3 percent discount rate**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	133,698	18.3%	2	70,930	7	9,483	46.0%	1
China	161,092	22.1%	1	11,880	72	1,914	9.3%	2
Japan	28,960	4.0%	5	42,650	27	1,235	6.0%	3
Germany	21,438	2.9%	6	51,660	18	1,107	5.4%	4
Canada	13,174	1.8%	7	48,310	21	636	3.1%	5
United Kingdom	12,420	1.7%	8	44,480	25	552	2.7%	6
Australia	8,801	1.2%	19	57,170	13	503	2.4%	7
Russia	43,151	5.9%	3	11,610	73	501	2.4%	8
South Korea	11,802	1.6%	9	35,110	30	414	2.0%	9
France	9,292	1.3%	15	44,160	26	410	2.0%	10
Italy	10,100	1.4%	13	35,990	29	364	1.8%	11
Saudi Arabia	10,511	1.4%	11	21,540	47	226	1.1%	12
Netherlands	4,061	0.6%	28	55,200	14	224	1.1%	13
Spain	6,694	0.9%	22	29,690	36	199	1.0%	14
Taiwan	5,515	0.8%	24	32,312	33	178	0.9%	15
Poland	8,589	1.2%	20	16,850	60	145	0.7%	16
Belgium	2,770	0.4%	37	50,490	19	140	0.7%	17
United Arab Emirates	3,324	0.5%	31	41,770	28	139	0.7%	18
Mexico	10,223	1.4%	12	9,590	80	98	0.5%	19
Switzerland	1,022	0.1%	64	90,600	3	93	0.4%	20
<b>Top 20 total</b>	<b>506,637</b>	<b>69.5%</b>					<b>90.0%</b>	
<b>By income group</b>								
HIC	326,214	44.8%	1			17,299	83.8%	1
UMIC	277,935	38.1%	2			3,014	14.6%	2
LMIC	94,426	13.0%	3			274	1.3%	3
LIC	4,543	0.6%	4			2	0.0%	4
<b>Total categorised*</b>	<b>703,118</b>	<b>96.5%</b>				<b>20,589</b>	<b>99.8%</b>	
<b>By devt group</b>								
LDC	4,681	0.6%	2			7	0.0%	3
LLDC	14,350	2.0%	1			81	0.4%	2
SIDS	4,056	0.6%	3			101	0.5%	1
<b>By institutional group</b>								
OECD	313,709	43.1%	2			16,542	80.2%	2
EU	97,373	13.4%	6			3,854	18.7%	5
BRICS	259,433	35.6%	4			2,629	12.7%	6
G7	229,083	31.4%	5			13,789	66.8%	4
G20	549,835	75.5%	1			17,804	86.3%	1
Annex II	264,271	36.3%	3			15,554	75.4%	3

**TABLE A3.7. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By region</b>								
ECA	174,229	23.9%	2			4,746	23.0%	2
N.Am	146,886	20.2%	3			10,121	49.1%	1
LAC	35,898	4.9%	6			337	1.6%	5
EAP	245,986	33.8%	1			4,547	22.0%	3
SA	40,989	5.6%	5			87	0.4%	6
MENA	46,437	6.4%	4			718	3.5%	4
SSA	16,128	2.2%	7			78	0.4%	7
<b>Total categorised*</b>	<b>706,553</b>	<b>97.0%</b>				<b>20,633</b>	<b>100.0%</b>	

Notes: \* Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.8. Scenario 9. Fair shares results excluding all LICs, LMICs, LDCs and SIDS**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	230,181	19.6%	1	70,930	7	16,327	47.8%	1
China	229,325	19.5%	2	11,880	72	2,724	8.0%	2
Japan	49,330	4.2%	5	42,650	27	2,104	6.2%	3
Germany	39,040	3.3%	6	51,660	18	2,017	5.9%	4
Canada	22,145	1.9%	8	48,310	21	1,070	3.1%	5
United Kingdom	22,665	1.9%	7	44,480	25	1,008	2.9%	6
Russia	78,194	6.7%	3	11,610	73	908	2.7%	7
Australia	14,333	1.2%	18	57,170	13	819	2.4%	8
France	16,779	1.4%	12	44,160	26	741	2.2%	9
Italy	17,771	1.5%	11	35,990	29	640	1.9%	10
South Korea	17,882	1.5%	10	35,110	30	628	1.8%	11
Netherlands	7,076	0.6%	26	55,200	14	391	1.1%	12
Saudi Arabia	15,654	1.3%	16	21,540	47	337	1.0%	13
Spain	11,339	1.0%	21	29,690	36	337	1.0%	14
Taiwan	8,506	0.7%	24	32,312	33	275	0.8%	15
Poland	15,552	1.3%	17	16,850	60	262	0.8%	16
Belgium	4,925	0.4%	33	50,490	19	249	0.7%	17
United Arab Emirates	4,803	0.4%	35	41,770	28	201	0.6%	18
Switzerland	1,794	0.2%	62	90,600	3	163	0.5%	19
Mexico	16,745	1.4%	13	9,590	80	161	0.5%	20
<b>Top 20 total</b>	<b>824,038</b>	<b>70.2%</b>					<b>91.7%</b>	

TABLE A3.8. (Continued)

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By income group</b>								
HIC	558,342	47.6%	1			29,546	86.4%	1
UMIC	425,371	36.2%	2			4,569	13.4%	2
LMIC	142,355	12.1%	3			0	0.0%	3
LIC	7,941	0.7%	4			0	0.0%	3
Total categorised*	1,134,009	96.6%				34,114	99.8%	
<b>By devt group</b>								
LDC	6,623	0.6%	3			0	0.0%	2
LLDC	23,948	2.0%	1			120	0.4%	1
SIDS	6,673	0.6%	2			0	0.0%	2
<b>By institutional group</b>								
OECD	539,310	45.9%	2			28,535	83.5%	2
EU	175,368	14.9%	6			6,926	20.3%	5
BRICS	389,143	33.1%	5			3,850	11.3%	6
G7	397,911	33.9%	4			23,906	69.9%	4
G20	881,570	75.1%	1			29,864	87.3%	1
Annex II	457,850	39.0%	3			26,917	78.7%	3
<b>By region</b>								
ECA	312,881	26.7%	2			8,415	24.6%	2
N.Am	252,349	21.5%	3			17,399	50.9%	1
LAC	57,457	4.9%	6			490	1.4%	5
EAP	363,846	31.0%	1			6,816	19.9%	3
SA	58,160	5.0%	5			0	0.0%	7
MENA	69,397	5.9%	4			958	2.8%	4
SSA	25,713	2.2%	7			111	0.3%	6
Total categorised*	1,139,804	97.1%				34,190	100.0%	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: LIC/LMIC/LDC/SIDS; collectively accounting for: 1.7%.

**TABLE A3.9. Scenario 10. Fair shares results with higher income weight (exponent value 2)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	230,181	19.6%	1	70,930	7	1,158,054,288	63.7%	1
Germany	39,040	3.3%	6	51,660	18	104,187,722	5.7%	2
Japan	49,330	4.2%	5	42,650	27	89,732,031	4.9%	3
Canada	22,145	1.9%	8	48,310	21	51,684,111	2.8%	4
Australia	14,333	1.2%	18	57,170	13	46,846,017	2.6%	5
United Kingdom	22,665	1.9%	7	44,480	25	44,841,470	2.5%	6
France	16,779	1.4%	12	44,160	26	32,720,431	1.8%	7
China	229,325	19.5%	2	11,880	72	32,365,634	1.8%	8
Italy	17,771	1.5%	11	35,990	29	23,018,978	1.3%	9
South Korea	17,882	1.5%	10	35,110	30	22,042,942	1.2%	10
Netherlands	7,076	0.6%	26	55,200	14	21,560,768	1.2%	11
Switzerland	1,794	0.2%	62	90,600	3	14,724,653	0.8%	12
Belgium	4,925	0.4%	33	50,490	19	12,554,685	0.7%	13
Norway	1,715	0.1%	64	83,880	5	12,064,043	0.7%	14
Russia	78,194	6.7%	3	11,610	73	10,539,967	0.6%	15
Denmark	2,225	0.2%	53	68,300	8	10,379,361	0.6%	16
Spain	11,339	1.0%	21	29,690	36	9,994,926	0.5%	17
Ireland	1,589	0.1%	67	76,110	6	9,205,596	0.5%	18
Taiwan	8,506	0.7%	24	32,312	33	8,880,783	0.5%	19
United Arab Emirates	4,803	0.4%	35	41,770	28	8,379,540	0.5%	20
Top 20 total	781,615	66.6%					94.8%	
<b>By income group</b>								
HIC	558,342	47.6%	1			1,764,477,500	97.1%	1
UMIC	425,371	36.2%	2			51,036,634	2.8%	2
LMIC	142,355	12.1%	3			1,356,382	0.1%	3
LIC	7,941	0.7%	4			2,506	0.0%	4
Total categorised*	1,134,009	96.6%				1,816,873,021	99.9%	
<b>By devt group</b>								
LDC	6,623	0.6%	3			18,074	0.0%	3
LLDC	23,948	2.0%	1			1,012,210	0.1%	2
SIDS	6,673	0.6%	2			8,221,806	0.5%	1
<b>By institutional group</b>								
OECD	539,310	45.9%	2			1,715,285,507	94.4%	1
EU	175,368	14.9%	6			310,692,285	17.1%	5
BRICS	389,143	33.1%	5			44,697,401	2.5%	6
G7	397,911	33.9%	4			1,504,239,031	82.7%	4
G20	881,570	75.1%	1			1,628,485,114	89.6%	3
Annex II	457,850	39.0%	3			1,673,454,793	92.1%	2

**TABLE A3.9. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By region</b>								
ECA	312,881	26.7%	2			351,211,007	19.3%	2
N.Am	252,349	21.5%	3			1,210,086,507	66.6%	1
LAC	57,457	4.9%	6			5,558,692	0.3%	5
EAP	363,846	31.0%	1			216,189,604	11.9%	3
SA	58,160	5.0%	5			266,333	0.0%	7
MENA	69,397	5.9%	4			33,779,429	1.9%	4
SSA	25,713	2.2%	7			762,397	0.0%	6
Total categorised*	1,139,804	97.1%				1,817,853,969	100.0%	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.10. Scenario 11. Fair shares results with lower income weight (exponent value 0.5)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	230,181	19.6%	1	70,930	7	61	34.3%	1
China	229,325	19.5%	2	11,880	72	25	14.0%	2
Japan	49,330	4.2%	5	42,650	27	10	5.7%	3
Germany	39,040	3.3%	6	51,660	18	9	5.0%	4
Russia	78,194	6.7%	3	11,610	73	8	4.7%	5
Canada	22,145	1.9%	8	48,310	21	5	2.7%	6
United Kingdom	22,665	1.9%	7	44,480	25	5	2.7%	7
France	16,779	1.4%	12	44,160	26	4	2.0%	8
Australia	14,333	1.2%	18	57,170	13	3	1.9%	9
Italy	17,771	1.5%	11	35,990	29	3	1.9%	10
South Korea	17,882	1.5%	10	35,110	30	3	1.9%	11
India	50,912	4.3%	4	2,150	154	2	1.3%	12
Saudi Arabia	15,654	1.3%	16	21,540	47	2	1.3%	13
Poland	15,552	1.3%	17	16,850	60	2	1.1%	14
Spain	11,339	1.0%	21	29,690	36	2	1.1%	15
Netherlands	7,076	0.6%	26	55,200	14	2	0.9%	16
Mexico	16,745	1.4%	13	9,590	80	2	0.9%	17
Taiwan	8,506	0.7%	24	32,312	33	2	0.9%	18
South Africa	16,416	1.4%	15	6,530	99	1	0.7%	19
Brazil	14,297	1.2%	19	7,740	92	1	0.7%	20
Top 20 total	894,141	76.2%					85.6%	



**TABLE A3.10. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By income group</b>								
HIC	558,342	47.6%	1			126	70.7%	1
UMIC	425,371	36.2%	2			44	24.6%	2
LMIC	142,355	12.1%	3			8	4.3%	3
LIC	7,941	0.7%	4			0	0.1%	4
Total categorised*	1,134,009	96.6%				178	99.6%	
<b>By devt group</b>								
LDC	6,623	0.6%	3			0	0.1%	3
LLDC	23,948	2.0%	1			2	1.0%	1
SIDS	6,673	0.6%	2			1	0.5%	2
<b>By institutional group</b>								
OECD	539,310	45.9%	2			121	67.8%	2
EU	175,368	14.9%	6			34	19.1%	6
BRICS	389,143	33.1%	5			38	21.4%	5
G7	397,911	33.9%	4			97	54.2%	4
G20	881,570	75.1%	1			148	83.0%	1
Annex II	457,850	39.0%	3			110	61.6%	3
<b>By region</b>								
ECA	312,881	26.7%	2			48	26.8%	2
N.Am	252,349	21.5%	3			66	37.0%	1
LAC	57,457	4.9%	6			6	3.1%	5
EAP	363,846	31.0%	1			47	26.4%	3
SA	58,160	5.0%	5			3	1.5%	6
MENA	69,397	5.9%	4			8	4.2%	4
SSA	25,713	2.2%	7			2	1.0%	7
Total categorised*	1,139,804	97.1%				179	100.0%	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.

**TABLE A3.11. Scenario 12. Fair shares results with zero income weight (exponent value 0)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>Top 20</b>								
United States	230,181	19.6%	1	70,930	7	0	20.3%	1
China	229,325	19.5%	2	11,880	72	0	20.2%	2
Russia	78,194	6.7%	3	11,610	73	0	6.9%	3
India	50,912	4.3%	4	2,150	154	0	4.5%	4
Japan	49,330	4.2%	5	42,650	27	0	4.3%	5
Germany	39,040	3.3%	6	51,660	18	0	3.4%	6
United Kingdom	22,665	1.9%	7	44,480	25	0	2.0%	7
Canada	22,145	1.9%	8	48,310	21	0	1.9%	8
Ukraine	18,314	1.6%	9	4,120	127	0	1.6%	9
South Korea	17,882	1.5%	10	35,110	30	0	1.6%	10
Italy	17,771	1.5%	11	35,990	29	0	1.6%	11
France	16,779	1.4%	12	44,160	26	0	1.5%	12
Mexico	16,745	1.4%	13	9,590	80	0	1.5%	13
Iran	16,713	1.4%	14	3,530	138	0	1.5%	14
South Africa	16,416	1.4%	15	6,530	99	0	1.4%	15
Saudi Arabia	15,654	1.3%	16	21,540	47	0	1.4%	16
Poland	15,552	1.3%	17	16,850	60	0	1.4%	17
Australia	14,333	1.2%	18	57,170	13	0	1.3%	18
Brazil	14,297	1.2%	19	7,740	92	0	1.3%	19
Indonesia	13,431	1.1%	20	4,180	125	0	1.2%	20
Top 20 total	915,678	78.0%					80.6%	
<b>By income group</b>								
HIC	558,342	47.6%	1			1	49.1%	1
UMIC	425,371	36.2%	2			0	37.4%	2
LMIC	142,355	12.1%	3			0	12.5%	3
LIC	7,941	0.7%	4			0	0.4%	4
Total categorised*	1,134,009	96.6%				1	99.5%	
<b>By devt group</b>								
LDC	6,623	0.6%	3			0	0.6%	3
LLDC	23,948	2.0%	1			0	2.1%	1
SIDS	6,673	0.6%	2			0	0.6%	2
<b>By institutional group</b>								
OECD	539,310	45.9%	2			1	47.5%	2
EU	175,368	14.9%	6			0	15.4%	6
BRICS	389,143	33.1%	5			0	34.3%	5
G7	397,911	33.9%	4			0	35.0%	4
G20	881,570	75.1%	1			1	77.6%	1
Annex II	457,850	39.0%	3			0	40.3%	3

**TABLE A3.11. (Continued)**

	Cumulative Emissions			Income		Overall Fair Share <sup>^</sup>		
	CO <sub>2</sub> (Mt)	% Share	Rank	GNI/hd (US\$/hd)	Rank	Score	Share	Rank
<b>By region</b>								
ECA	312,881	26.7%	2			0	27.5%	2
N.Am	252,349	21.5%	3			0	22.2%	3
LAC	57,457	4.9%	6			0	5.1%	6
EAP	363,846	31.0%	1			0	31.7%	1
SA	58,160	5.0%	5			0	5.1%	5
MENA	69,397	5.9%	4			0	6.1%	4
SSA	25,713	2.2%	7			0	2.3%	7
<b>Total categorised*</b>	<b>1,139,804</b>	<b>97.1%</b>				<b>1</b>	<b>100.0%</b>	

Notes: \*Emissions total may not = 100% because some countries (and CO<sub>2</sub> emissions from international transport) are not included in WB income/regional categories, and/or minor aggregation errors. <sup>^</sup>group exclusions: none; collectively accounting for: 0.0%.