

## How close are INDCs to 2°C and 1.5° pathways?

### Climate Action Tracker Update

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### Summary

#### Aggregate INDC emissions are far above levels consistent with below 2°C, with around 65% of global emissions covered

INDCs announced by 1 September 2015 lead to global emissions far above the levels needed by 2025 and 2030 to put the world on track to hold warming below 2°C, or to below 1.5°C, in 2100.

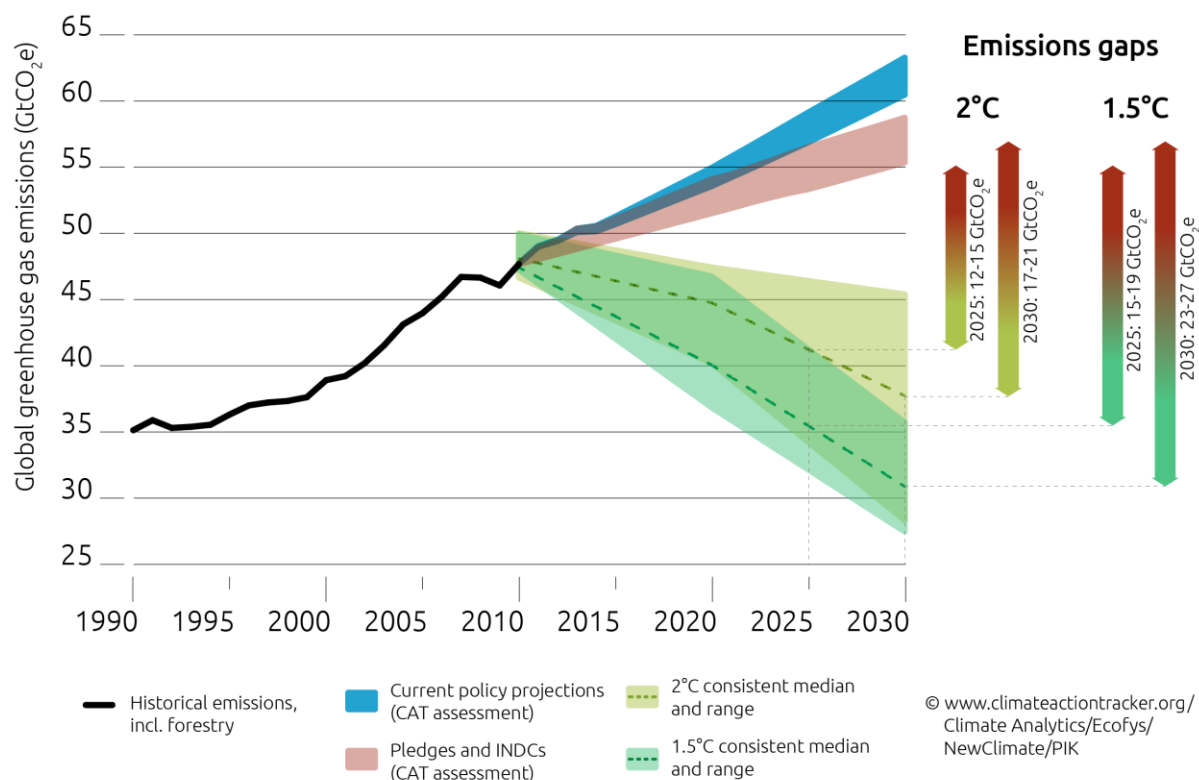
As of 1<sup>st</sup> September, 29 governments have submitted INDCs, covering around 65% of global emissions in 2010 (excluding LULUCF) and 43% of global population. The CAT has directly assessed 16 of these INDCs covering 64.5% of global emissions in 2010 (excluding LULUCF) and 41% of global population.

With the INDCs submitted to date, the CAT projects total global emissions are on track to be 53-57 GtCO<sub>2</sub>e in 2025 and 55-59 GtCO<sub>2</sub>e in 2030, far above the least-cost global pathways consistent with limiting warming below 2°C. Additional reductions in the order of 12-15 GtCO<sub>2</sub>e by 2025 and of 17-21 GtCO<sub>2</sub>e by 2030 are needed for global emissions to be consistent with a 2°C pathway.

INDCs are yet to come from 140 countries. The ten highest emitters yet to submit INDCs are India, Brazil, Iran, Indonesia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, and Pakistan, together accounting for 18% of global emissions not yet covered by INDCs (excluding LULUCF).

Aside from the insufficient ambition of the aggregate INDCs, there is a significant gap between current policies and the INDCs: global emissions under currently implemented policies are projected to be higher than the already inadequate INDC levels. Some countries propose INDCs close to the current trajectory giving confidence that they are met (e.g. EU and China). Others have put forward a target that would be a significant change in trend, but these are not yet supported by any significant existing legislation, e.g. [Australia](#) and [Canada](#), raising questions about the likely implementation. Yet others are show progress in policy implementation, continuously moving their future trajectories downwards, but not yet sufficient to meet their (still inadequate) INDCs (e.g. USA).

The gap between pledges and policies increases through time, highlighting the need for long-term policy action. This is not to underplay the significance and importance of governments s are putting in place policies that will actually reduce their emissions, but for many governments this is not yet the case.



**Figure 1: Emissions levels until 2030 under current policy projections and submitted INDCs compared with least-cost 1.5° and 2°C consistent pathways. The emissions gap ranges only reflect the uncertainty in the pledges and INDCs scenario. 2°C consistent median and range: Greater than 66% chance of staying within 2°C in 2100. 1.5°C consistent median and range: Greater than or equal to 50% chance of being below 1.5°C in 2100. Both temperature paths show the median and 10th to 90th percentile range. Pathway ranges exclude delayed action scenarios and any that deviate more than 5% from historic emissions in 2010.**

## Ambition of INDCs vary, with most not in line with a fair contribution to 2°C

The Climate Action Tracker has rated the INDCs assessed as follows<sup>1</sup> (Tables 3 and 4 for detailed numbers):

- **Seven submitted INDCs are inadequate;** Australia, Canada, Japan, New Zealand, Singapore, South Korea and Russia's INDCs are not considered to be a fair contribution to limiting warming to 2°C - from almost any perspective
- **Six submitted INDCs are medium,** which is within the upper and least ambitious end of what could be considered as fair and if all countries put forward a similar level of ambition, warming would exceed 2°C. China, EU, Mexico, Norway, Switzerland and the US INDCs are consistent with 2°C according to some perspectives on their fair-share contribution, but they still rely on others to have more ambitious targets in order for the world to hold warming to 2°C.
- **Two submitted INDCs are sufficient;** only two of the countries assessed by the CAT - Ethiopia and Morocco - have so far put forward an INDC that is in line with 2°C.
- **No submitted INDCs ranked in the Role Model category.**

If all countries that fall short of the CAT "sufficient" rating were to raise their ambition to meet the criteria for a "sufficient" rating this would close the emissions gap in 2025.

<sup>1</sup> The CAT has assessed but not rated Gabon (further details in our [Gabon country page](#))

## Is it possible to get to 1.5°C and 2°C from the 2025 and 2030 INDC levels?

Given the situation, it is logical to ask whether limiting warming below 2°C, and/or reducing to 1.5°C by 2100 remains possible, or even plausible, from the INDC levels projected for 2025 and 2030. Comparison of the projected global emissions resulting from the combined efforts of all countries with published global emission pathways for limiting warming below 2°C indicates a very different situation between 2025 and 2030, although they are only separated by five years.

While the projected emission levels for 2025 resulting from INDCs are above the published least-cost pathways, limiting warming below 2°C is still likely to be feasible. Much less certain is meeting the 1.5°C goal, as reducing emissions fast enough from 2025 INDC emission levels would be on the border of technological feasibility. Rates of emission reductions after 2025 that would be sufficient to meet the 2° and 1.5° goals would be much more costly than necessary.

For 2030 the picture changes significantly. Limiting warming below 2°C becomes, at the very least, much more expensive, with five more years of very high emissions and five more years of a growing emissions gap, and approaches the boundary of technological feasibility. Indeed, while the 2030 emission levels derived from INDCs result in a further increase of emissions from 2025 to 2030, emission pathways consistent limiting warming below 2°C are, and need to be, firmly on a downward trajectory by that time.

On present evidence, it is no longer plausible from 2030 INDC emission levels to limit emissions to below 1.5°C by 2100. Carbon dioxide emission reduction rates between 2030 and 2050 would need to exceed 5%/year to limit warming below 2°C. In contrast, CO<sub>2</sub> emission reduction rates would be 20% lower if starting from 2025 INDC emission levels and would achieve a more ambitious level in 2030 than implied by the current level of emissions under the INDCs.

## Policy implications

Three major policy conclusions are clear from this analysis of the aggregate effect of the INDCs submitted, and of the projected effects of current policies at the global level.

- 1) Most governments that have already submitted an INDC need to review their targets in light of the global goal and, in most cases, will need to increase the level of ambition. Those that are yet to submit need to work to ensure the highest level of ambition.
- 2) If the present 2030 INDC ambition levels are locked in, there is a high probability that limiting warming below 2°C becomes extremely difficult or infeasible and that the possibility of limiting warming to below 1.5°C by 2100 is foreclosed. The Paris Agreement under negotiation needs to ensure that 2030 levels are not locked in, and that a new cycle of targets for the 2025-2030 period can be developed.
- 3) With current policies being insufficient to limit emissions to the INDC levels by 2025, it is clear that efforts to encourage greater policy action need to be ramped up as part of the Paris Agreement.

## Detailed assessment

### Impact of announced INDCs

At COP20 in Lima, the Climate Action Tracker assessed the global level of ambition as in-line with 2.9-3.1°C of warming by the end of this century. This assessment included the announced 2025 and 2030 targets of the USA, China, and the EU, which were found to make a significant impact on the global emissions trajectory.

Since then, the reduction targets of these three countries have been formalised in INDCs submitted to the UNFCCC and an additional 26 countries have submitted their INDCs. The CAT estimates that the INDCs will result in total emissions of 53-57 GtCO<sub>2</sub>e in 2025, and 55-59 GtCO<sub>2</sub>e in 2030 (Table 1). This compares to CAT's estimate of global emission levels from currently implemented policies of 57-59 GtCO<sub>2</sub>e in 2025 and 60-63 GtCO<sub>2</sub>e in 2030 (see Table 2).

The aggregate emissions levels under the pledge scenarios haven't improved since Lima. There are a few reasons why the additional INDCs have not enhanced the global ambition level significantly.

Country or region	Projected emissions under current policies (GtCO <sub>2</sub> e)		Projected emissions under INDCs (GtCO <sub>2</sub> e)	
	2025	2030	2025	2030
CAT countries with an INDC	30.6 – 32.2	31.3 – 33.6	28.2 – 30.4	27.7 – 30.0
CAT countries with no INDC	11.4 – 11.8	13.0 – 13.6	10.3 – 11.2	11.8 – 12.8
Other countries not directly assessed by the CAT	10.3	11.5	10.3	11.5
International Bunkers (aviation and marine)	1.9 – 2.0	2.2 – 2.3	1.8 – 2.0	2.1
Land Sector	2.7	2.3	2.7	2.3
<b>Total</b>	<b>57 - 59</b>	<b>60 - 63</b>	<b>53 - 57</b>	<b>55 - 59</b>

**Table 1: Contribution of sectors and groups to projected, global aggregate emissions in 2025 and 2030**

Firstly, China, the EU, and USA, whose draft INDC announcements we included in our Lima update, cover 24%, 11%, and 16% of 2010 global emissions respectively, or a total of 51% of 2010 global emissions. The additional INDCs therefore only cover an additional 15% (6.4 GtCO<sub>2</sub>e) of global country emissions and have a limited capacity to close the gap.

Another reason is that a few countries, such as Russia, Canada and New Zealand, have put forward an INDC that is inconsistent with their pre-existing 2050 targets, resulting in a higher contribution from these countries to the 2030 total than our previous estimates (650-850, 75-100, and 5-10 MtCO<sub>2</sub>e for Russia, Canada and New Zealand respectively, assuming a linear interpolation between 2020 and 2050 levels). Although New Zealand's contribution is small, with respect to that countries' total emissions, the percentage increase is comparable between the three countries. Together, this apparent reduction in ambition counteracts the improvements made by others by 0.75-0.9 GtCO<sub>2</sub>e.

### Emissions under current INDCs fall short of 1.5°C and 2°C

Emissions levels compatible with limiting warming below 2°C with likely probability are 39-43 GtCO<sub>2</sub>e in 2025 and 36-45 GtCO<sub>2</sub>e in 2030 (see table 2 below). For limiting warming to 1.5°C (with >50% probability) the CAT's benchmark limits are 38 GtCO<sub>2</sub>e in 2025 and 32 GtCO<sub>2</sub>e in 2030.

Emissions levels under both current policies and pledges including INDCs fall far short of these benchmark limits for both 2025 and 2030. The current INDCs lead to emissions levels that exceed the benchmark 2°C limit by 12-15 GtCO<sub>2</sub>e in 2025, and 17-21 GtCO<sub>2</sub>e in 2030.<sup>2</sup> Benchmark limits to reach 1.5°C are currently exceeded even more, 15-19 GtCO<sub>2</sub>e in 2025 and 23-27 GtCO<sub>2</sub>e in 2030.

Energy-economic models used for deriving 1.5 and 2°C benchmark emission pathways, generally have 10-year time steps, hence provide data for 2020 and 2030, but 2025 benchmark levels need to be inferred by interpolation. While emission levels implied by INDCs lead to levels above what is inferred for 2025 from 2°C benchmark pathways, it is conceivable that “real-world” policy and market forces that act over periods much shorter than 10-year time steps are able to achieve post-2025 emission reductions that put the world back on track for 2°C following a 2020-2025 INDC period.

If one assumes the 2020 emissions gap is not closed, a different category of ‘delayed-action’ emission pathways suggests somewhat higher emission benchmarks for 2025 and 2030 consistent with 2°C, followed by a sharper reduction after 2025 and 2030. Even for such pathways, however, the absolute maximum level is never more than around 50 GtCO<sub>2</sub>e by 2025 and 44 GtCO<sub>2</sub>e by 2030, again both considerably below the levels implied by INDCs, and again much more extremely so for 2030.

Irrespective of the assumption on closing the 2020 gap, or not, benchmark scenarios are firmly on a downward trajectory by 2030, in contrast to the INDC pathways, which show a further increase from 2025 to 2030. Hence, INDCs should be considerably strengthened for the period 2020-2025 to enhance feasibility of 1.5 and 2°C, but at current, largely inadequate levels, the INDCs will very likely render 1.5 and 2°C infeasible if extended to the period 2025-2030.

Emissions in Policy Case (GtCO <sub>2</sub> e)	2025	2030
<b>Current Policy Projections<sup>3</sup></b>	57–59	60–63
<b>Pledges including INDCs<sup>4</sup></b>	53-57	55-59
<b>Below 2°C compatible pathway<sup>5</sup></b>	39–43 <sup>6</sup> (37–45) <sup>7</sup>	36–40 <sup>6</sup> (32–44) <sup>7</sup>
<b>Below 1.5°C by 2100 compatible pathway<sup>8</sup></b>	38 (35–40) <sup>9</sup>	32 (29–36) <sup>9</sup>

**Table 2: Current policy projections and pledges (incl. INDCs) compared with global emission benchmark ranges consistent with limiting warming to 1.5 and 2°C above pre-industrial.**

## Current policies give confidence in pledges but additional policies needed

Many governments have put forward an INDC that is consistent with policies that they have already implemented, or an INDC that requires minimal additional policies to meet the target, e.g., the EU and China. This gives confidence that the INDC target will be met but

<sup>2</sup> Range given only reflects the uncertainty in the pledge scenario. Emissions exceedance is given relative to the mean of the 2°C benchmark range.

<sup>3</sup> Range results from different projection scenarios, uncertainties in policy effectiveness, and assumptions regarding the completeness of policy implementation in the underlying country analyses.

<sup>4</sup> Includes INDCs submitted by 31 August 2015

<sup>5</sup> 2020 “Pledge Gap” closed - least cost-action from 2010 that leads to 2°C compatible emissions in 2020.

<sup>6</sup> Low end represents median of scenarios that assume negative emission technology is not available in the 21st century and high end represents median of scenarios that assume it is.

<sup>7</sup> 20th to 80th percentile range of scenarios. Low end represents low end of scenarios that assume negative emission technology is not available in the 21st century and high end represents high end of scenarios that assume it is.

<sup>8</sup> 2020 “Pledge Gap” closed - least cost-action from 2010 that leads to 1.5°C compatible emissions in 2020 - limits warming below 2°C in the 21st century and has at least a 50% chance of returning warming to below 1.5°C by 2100. Assumes negative emissions technology is available.

<sup>9</sup> 20th to 80th percentile range of scenarios. As higher emissions in the near term have to be compensated by deeper reductions later, following 80th percentile benchmarks over the near term would need to be followed by 20th percentile benchmarks in the second half of the century.

also means that, with development of new technology and the inclusion of additional or more stringent policies, the target could be overachieved and/or strengthened.

Other governments have put forward a target they have assessed as feasible, but is not yet supported by significant existing legislation, e.g. [Australia](#) and [Canada](#). These governments will need to develop the policies necessary to ensure their INDC targets are fulfilled and give others confidence they are on track to meeting their commitment.

Some countries in between show progress in policy implementation, continuously moving their future trajectories downwards, but not yet sufficient to meet their INDCs (e.g. USA).

## Fairness and ambition

Of the 16 CAT countries with INDCs assessed so far, the CAT has only evaluated two to have submitted an INDC compatible with limiting warming to 2°C when a range of effort-sharing perspectives are considered – Morocco and Ethiopia.

Six governments have submitted INDCs that are assessed as ‘medium’, that is, the resulting emissions level is considered fair from the perspective of some effort-sharing perspectives, but if all governments were to adopt a similar level of ambition, warming would be between 2 and 3°C. These countries are therefore relying on others to be more ambitious in order to make up the shortfall and limit warming below 2°C.

Finally, seven countries have INDCs that are rated as inadequate, that is they lie outside the range of all but one perspective of their fair-share contribution. These countries would have to increase their ambition levels significantly to be consistent with a fair-share contribution to limiting warming to 2°C.

Of nine developed countries with an INDC, only four achieved a “medium” rating (Table 3). Compared with a 1990 base year, 2025 INDC targets are weaker than a 25% reduction for all but Switzerland, Norway, and the EU. Of the six developing countries INDCs assessed by the CAT, ratings range from Sufficient to Inadequate (Table 4).

	INDC emissions levels (excl. LULUCF) (MtCO <sub>2e</sub> )		INDC emissions levels (excl. LULUCF) relative to base year (%)						CAT rating
	2025	2030*	1990	2025		1990	2030		
				2005	2010		2005	2010	
<b>Australia</b>	452-526	395-437	9% to 27%	-14% to 1%	-16% to -3%	-5% to 5%	-25% to -16%	-27% to -19%	Inadequate
<b>Canada</b>	604	578	2%	-18%	-14%	-2%	-21%	-17%	Inadequate
<b>EU</b>	3700	3376	-34%	-28%	-21%	-40%	-34%	-28%	Medium
<b>Japan</b>	1218	1079	-1%	-10%	-3%	-13%	-20%	-14%	Inadequate
<b>New Zealand</b>	82-93	59-68	35% to 54%	5% to 19%	12% to 27%	-3% to 13%	-25% to -13%	-20% to -7%	Inadequate
<b>Norway</b>	25-30	20-30	-50% to -40%	-54% to -44%	-54% to -44%	-61% to -40%	-64% to -44%	-64% to -44%	Medium
<b>Russia</b>	2756-3227	2986-3163	-18% to -4%	29% to 51%	24% to 45%	-11% to -6%	40% to 48%	34% to 42%	Inadequate
<b>Switzerland</b>	34	26	-35%	-37%	-37%	-50%	-51%	-51%	Medium
<b>USA</b>	5014-5482	4263-4638	-12% to -19%	-24% to -31%	-20% to -27%	-31% to -25%	-40% to -35%	-37% to -32%	Medium

**Table 3: GHG Emissions levels (excl. LULUCF) in 2025 and 2030 resulting from the INDC from industrialised countries in absolute terms and expressed as reductions below 1990, 2005 and 2010 base years. Note that for the USA, 2030 levels result from the linear interpolation between the 2025 emissions levels implied by the INDC and the long-term target in 2050.**

	INDC emissions levels (excl. LULUCF) (MtCO <sub>2</sub> e)		INDC emissions levels (excl. LULUCF) relative to base year (%)		CAT rating
	2025	2030	2010		
			2025	2030	
<b>China</b>	13089-14038	13588-14960	34% to 40%	36% to 48%	Medium
<b>Ethiopia</b>	162	185	72%	96%	Sufficient
<b>Mexico</b>	603-671	580-716	-14% to -4%	-17% to 2%	Medium
<b>Morocco</b>	131	149	39%	58%	Sufficient
<b>Singapore</b>	68	70	45%	50%	Inadequate
<b>South Korea</b>	540-588	536-632	-14% to -3%	-11% to 10%	Inadequate
<b>Chile (draft)</b>	127-146	127-150	38% to 60%	39% to 64%	Inadequate
<b>Peru (draft)</b>	110	124	37%	54%	Medium

**Table 4: GHG Emissions levels (excl. LULUCF) in 2025 and 2030 resulting from the INDC of developing countries in absolute terms and expressed as reductions below 1990, 2005 and 2010 base years.**

## Closing the Gap

If all countries that fall short of the CAT “sufficient” rating were to raise their ambition to meet the criteria for a “sufficient” rating, the global gap for 2025 would be reduced by 13-15.6 GtCO<sub>2</sub>e, and 15-17.5 GtCO<sub>2</sub>e for 2030). This would be sufficient to fully close the gap in 2025, but not in 2030. It’s possible for the gap to be closed by only some countries because other countries are currently on track to have emissions that are lower than their fair-share.

The world is still waiting for up to 140 INDCs from other countries, representing ~35% of global emissions in 2010, and responsible for 19-20 GtCO<sub>2</sub>e of projected emissions in 2025 (22-23 GtCO<sub>2</sub>e in 2030). Ambitious targets from these countries could also contribute to reducing the gap. Ten countries are responsible for 18% of 2010 global emissions not yet covered by INDCs - India, Brazil, Iran, Indonesia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, and Pakistan.

In addition, emissions from international aviation and marine activities constituted 3% of global emissions in 2010 and are expected to rapidly increase over the coming decades from 1.3 GtCO<sub>2</sub>e in 2010 to 2 GtCO<sub>2</sub>e in 2030, and up to 3-5 GtCO<sub>2</sub>e in 2050. Substantial action to limit emissions from these activities is needed as part of a global initiative to close the gap between current trajectories and those necessary to limit warming to 1.5°C or 2°C.

The current levels of ambition for 2025 and 2030 must not be locked in as part of the Paris Agreement. Mechanisms and opportunities to further close the gaps and reduce projected aggregate emissions, particularly for 2030, need to be put in place.

## Data and Assumptions

The global aggregation presented here builds on the CAT global aggregation methodology described in full on the [CAT website](#). Here we highlight a few key aspects that affect the global aggregation.

Global total emissions are evaluated as a sum of (1) country emissions, excl. the LULUCF sector, (2) emissions from international aviation and shipping, and (3) global land-sector emissions.

For current policy and pledge scenarios, emissions projections for CAT countries (32 countries covering 80% of global emissions) are calculated for each country directly. Full details of the assumptions made and data used can be found on the [CAT website](#).

For [China](#), the CAT finds that the different elements in its INDC lead to different emission levels. We interpret the INDC in the way that reaching all elements (intensity + peaking + 20% fossils) is required for its achievement. This means that the most ambitious of these should be considered for the global pathway. We find that the non-fossil fuel share leads to lowest emission levels, with the remaining sectors following the current policies projections (13.6 GtCO<sub>2</sub>e/a in 2030).

Countries that are not directly assessed by the CAT follow a current policies pathway for both the current policies and pledges and INDCs scenarios. Total emissions of countries that submitted INDCs not assessed by the CAT are projected to be only ~600 MtCO<sub>2</sub>e in 2030. While this introduces some uncertainty into our assessment, it is a small uncertainty because the reduction amount will only be a portion of the 600 MtCO<sub>2</sub>e. Examination of different current trend and business-as-usual scenarios for this group of countries indicates that uncertainty in current trends is in the range of +/- 1 GtCO<sub>2</sub>e by 2030. We currently estimate that the total emissions from countries not directly assessed by the CAT will be ~10 GtCO<sub>2</sub>e in 2025, and ~11 GtCO<sub>2</sub>e in 2030.

Emission projections from international shipping activities are taken from the 3<sup>rd</sup> IMO GHG report (2015). In the gap calculations we include a range of scenarios that were generated from modelling based on the RCP85 and RCP6 global emissions growth scenarios with a range of different technology and energy efficiency assumptions. The range of scenarios we use therefore represents a range from the maximum emissions trajectory modelled to a scenario in which global action to address climate change is reflected in a lower growth scenario for the industry plus some additional energy efficiency measures. The globally aggregated emissions include 1068 – 1185 MtCO<sub>2</sub>e in 2025 and 1218 – 1305 MtCO<sub>2</sub>e in 2030 from international shipping.

Emissions from aviation are included and based on data from Owen et al. (2010)<sup>10</sup>. For the pledge pathways a small global reduction is applied to aviation data relative to current policy projections.

Global land-use and land-use change emissions are included in the aggregation according to the RCP8.5 scenario adjusted for additional policies from Indonesia and Brazil. The contribution of the land sector to global emissions in 2025 and 2030 is 2.7 and 2.3 GtCO<sub>2</sub>e respectively.

The global aggregation values are given as ranges to account for (1) uncertainties derived from challenges in calculating likely emissions under pledge scenarios, e.g. from LULUCF accounting, (2) both conditional and unconditional pledges (3) uncertainty ranges in current trend projections, e.g. emissions from international shipping and aviation

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<sup>10</sup> Owen B, Lee D. S. and Lim L. (2010) Flying into the future: aviation emissions scenarios to 2050 Environ. Sci. Technol. 44 2255–60



The Climate Action Tracker is an independent science-based assessment that tracks the emission commitments and actions of countries. It is a joint project of the following organisations:

### **Climate Analytics**

Climate Analytics is a non-profit organisation based in Berlin, Germany. It has been established to synthesize climate science and policy research that is relevant for international climate policy negotiations. It aims to provide scientific, policy and analytical support for Small Island States (SIDS) and the least developed country group (LDCs) negotiators, as well as non-governmental organisations and other stakeholders in the 'post-2012' negotiations. Furthermore, it assists in building in-house capacity within SIDS and LDCs. Contact: Dr. h.c. Bill Hare, +49 160 908 62463

[www.climateanalytics.org](http://www.climateanalytics.org)

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### **Potsdam Institute for Climate Impact Research (PIK)**

The PIK conducts research into global climate change and issues of sustainable development. Set up in 1992, the Institute is regarded as a pioneer in interdisciplinary research and as one of the world's leading establishments in this field. Scientists, economists and social scientists work together, investigating how the earth is changing as a system, studying the ecological, economic and social consequences of climate change, and assessing which strategies are appropriate for sustainable development. Contact: Dr. Louise Jeffery, [louise.jeffery@pik-potsdam.de](mailto:louise.jeffery@pik-potsdam.de)

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### **NewClimate Institute**

NewClimate Institute is a non-profit institute established in 2014. NewClimate Institute supports research and implementation of action against climate change around the globe, covering the topics international climate negotiations, tracking climate action, climate and development, climate finance and carbon market mechanisms. NewClimate Institute aims at connecting up-to-date research with the real world decision making processes. Contact: Dr. Niklas Höhne, +49 173 715 2279

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