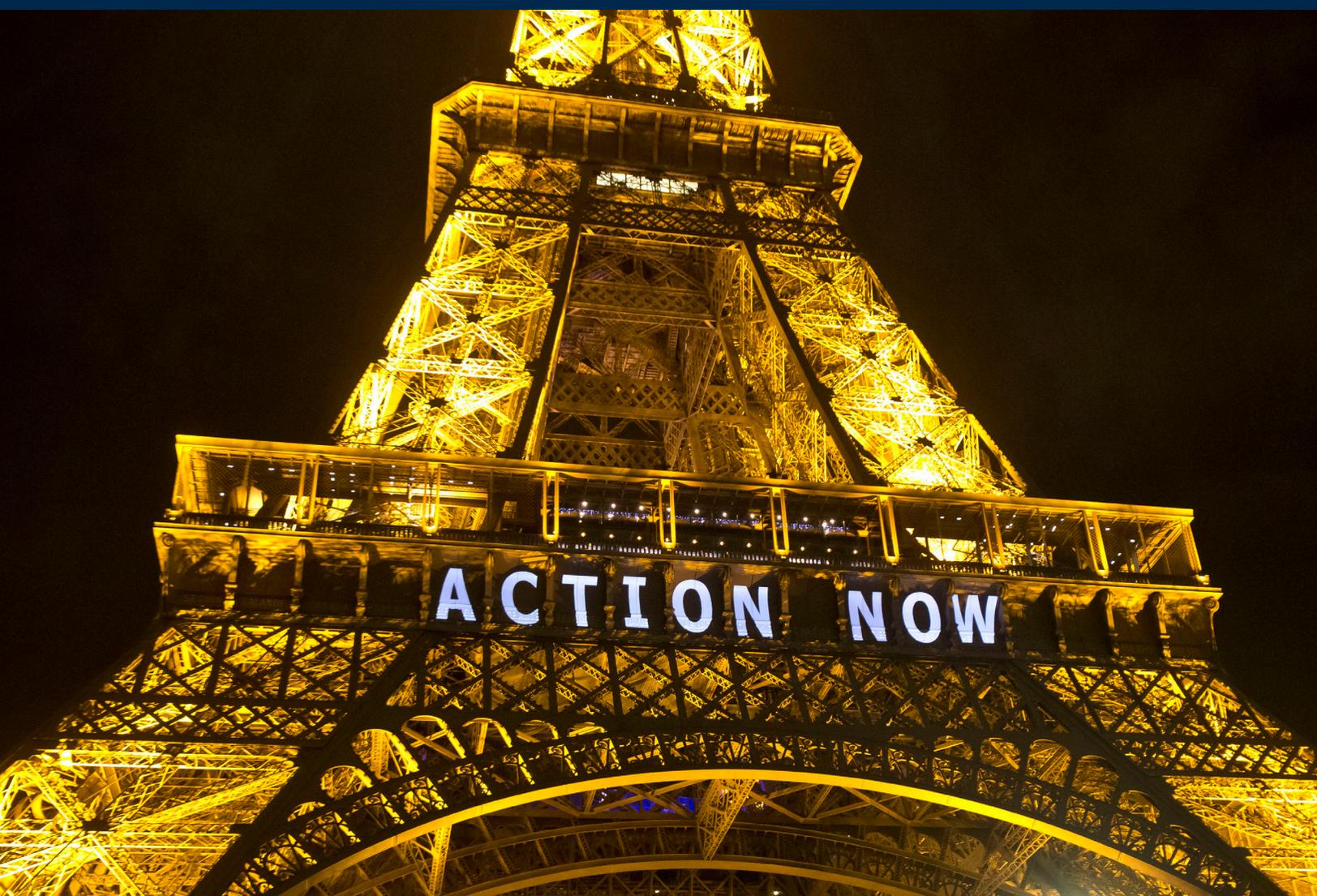




# REALIZING THE PROMISE OF PARIS: ROADMAP TO A SAFER CLIMATE



## Authors and Acknowledgements

*NRDC Authors:* Brendan Guy, Jake Schmidt

*NewClimateInstitute Authors:* Maria Jose de Villafranca Casas, Takeshi Kuramochi, Niklas Höhne

*External reviewers:* Michel den Elzen (PBL Netherlands Environmental Assessment Agency), Kelly Levin (World Resources Institute)

*Copyedit:* Alex Schniewind (independent consultant)

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## About NRDC

The Natural Resources Defense Council is an international nonprofit environmental organization with more than 3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. Visit us at [nrdc.org](http://nrdc.org).

*NRDC Chief Communications Officer:* Michelle Egan

*NRDC Managing Directors of Communications:* Lisa Goffredi and Jenny Powers

*NRDC Publications Director:* Mary Annaïse Heglar

*NRDC Policy Publications Editor:* Leah Stecher

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# REALIZING THE PROMISE OF PARIS: ROADMAP TO A SAFER CLIMATE



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The evidence is clear: climate change is here, and it's getting worse quickly. The world's leading body of climate scientists, the Intergovernmental Panel on Climate Change (IPCC), provides a dire warning: countries' collective commitments to reduce emissions under the Paris Agreement are not sufficient to significantly protect us from the dangers of climate disruption that are occurring earlier and more severely than previously expected.<sup>1</sup> To stave off the serious climate impacts of which the IPCC warns, leaders need to take bold and decisive action to cut emissions now and significantly by 2030. To get us there, policymakers and concerned citizens need a roadmap for action. In this policy brief, the Natural Resources Defense Council (NRDC) and NewClimate Institute assess 24 practical and realistic actions to implement between now and 2030 as key elements of that roadmap. They include such actions as deploying more renewable energy, transitioning away from coal, boosting building and energy efficiency, accelerating electric vehicle deployment, and ending deforestation.

By implementing just 19 of these actions, we can put the world on track for an emissions pathway needed in 2030 to hold global warming to below 2 degrees Celsius. These actions are classified as "On Track" and "Scale Up." If we also implement five additional actions, classified as "Need Focus," we can put the world more squarely on an emissions pathway needed in 2030 to limit temperature increase to below 2 degrees Celsius, and closer to an emissions pathway needed to limit temperature rise to 1.5 degrees Celsius.<sup>2</sup> And additional actions not included in this study provide further opportunities to put the world further along the path to a safer climate future. But delivering the emissions reduction potential of the suite of 24 actions assessed in this roadmap can put the world on track to avert many of the bleak impacts on people, economies, and natural systems forewarned by leading scientists. Realizing the full promise of the Paris Agreement, through these actions and others, should be the defining global climate change undertaking of the next twelve years, and of our time.



## THE PARIS AGREEMENT SETS THE FLOOR FOR CLIMATE ACTION—NOT THE CEILING

In 2015, the international community came together in Paris to forge an historic global framework to tackle climate change. Through the Paris Agreement, countries committed to taking collective action to limit the increase in global warming to “well below 2 degrees Celsius (3.6 degrees Fahrenheit) above pre-industrial levels” and “pursuing efforts” to limit warming to 1.5 degrees Celsius (2.7 degrees Fahrenheit).<sup>3</sup>

The architects of the Paris Agreement recognized that the initial contributions put forward by countries through 2030 would not be ambitious enough to keep temperature increase well below 2 degrees Celsius, much less hold it to 1.5 degrees Celsius. Therefore, the Paris Agreement provides a dynamic mechanism to revisit and continuously strengthen countries’ commitments every five years. This mechanism will iterate until countries can close the emissions gap<sup>4</sup> between the ambition of their collective pledges and policies and the reductions demanded by science.

Creating such a virtuous cycle ensures that countries’ current targets are the floor—not the ceiling—for more aggressive action in the years to come. The first real test of this ambition mechanism will occur in the lead up to 2020 when countries must significantly improve their contributions to better align with the goals of the Paris Agreement and the demands of science.

## THE EMISSIONS GAP MUST BE CLOSED BY 2030

Numerous studies have compared projected global emissions in 2030 with full implementation of countries’ Paris Agreement commitments against the emissions reduction pathways needed to limit global warming to 2 degrees Celsius or 1.5 degrees Celsius.<sup>5,6</sup> The consensus from these studies is that the world is on course to fall far below an emissions reductions pathway needed between now and 2030 to avoid significant climate change impacts.

In October 2018, the world received a clarion call to take swift action to avert the impacts of climate change that will occur sooner and stronger than previously anticipated. Leading scientists from the IPCC issued a sobering report concluding that limiting global warming to a 1.5 degree Celsius increase will require “rapid and far-reaching” action to respond to the growing and grave threats from climate change.<sup>7</sup>

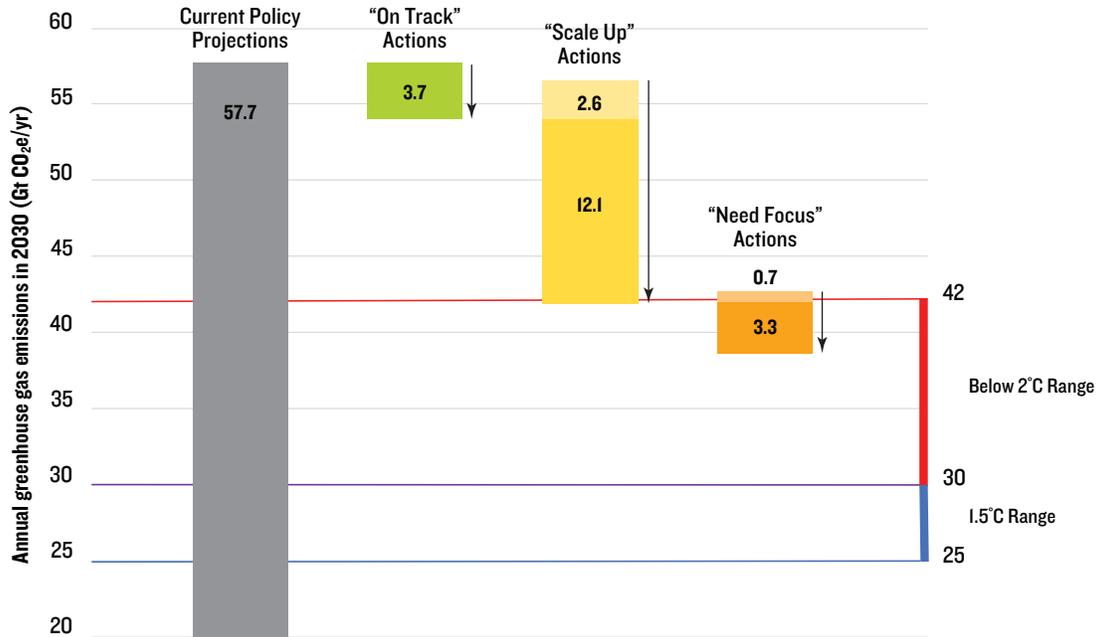
The IPCC report also starkly highlighted that impacts to human and planetary wellbeing at 1.5 degrees Celsius of temperature increase will be severe. For example, hundreds of millions of people will be at risk from disease outbreak, monster storms, flooded coasts, massive wildfires, killer heat waves, and climate-forced migration. Crucially, the report warned, the world must take decisive action to significantly cut emissions—which are still rising—by 2030 or we may lose the possibility to stay on track to limit temperature increase to 1.5 degrees Celsius. In fact, the IPCC warns that global warming could reach 1.5 degrees Celsius as soon as 2030—the same year that most countries’ Paris targets are due to be achieved—or in the subsequent two decades if warming continues at its current pace.<sup>8</sup>

Our analysis projects emissions from current policies will be 57.7 gigatonnes<sup>9</sup> per year in 2030.<sup>10</sup> Compared to these projected emissions in 2030 from current policies, there is an emissions gap of approximately 16 to 28 gigatonnes of greenhouse gas emissions per year that must be bridged in order to be on a pathway consistent with limiting global warming to below 2 degrees Celsius.<sup>11</sup> Using the same projected 2030 emissions from current policies, there is an emissions gap of approximately 28 to 33 gigatonnes of greenhouse gas emissions per year in 2030 that must be bridged in order to be on a pathway consistent with limiting temperature increase to 1.5 degrees Celsius.<sup>12,13</sup> For reference, current estimated global annual greenhouse gas emissions were, including emissions from land use, land use change, and forestry, 51.9 gigatonnes in 2016.<sup>14</sup>

## A PRACTICAL ROADMAP TO A SAFER CLIMATE

This policy brief offers a clear, achievable roadmap to significantly narrow the global emissions gap by 2030. NRDC and NewClimate Institute examined a realistic set of 24 actions to reduce climate pollution from key countries and sectors.<sup>15</sup> We selected specific actions based on their scale of expected emissions reduction potential and political significance. We then calculated somewhat conservative central estimates as well as minimum and maximum ranges of emissions reduction potential for each of the 24 actions based on recent literature.<sup>16</sup> In order to avoid double-counting, we calculated and accounted for the overlap between the emissions reduction potential of actions.<sup>17</sup> We then grouped the 24 actions into three broad categories based on current level of commitment and progress, projected trends, and existing institutional structures and stakeholders to deliver the potential emission reductions (See Figure 1).<sup>18</sup>

**FIGURE I: ANNUAL EMISSIONS REDUCTION POTENTIAL IN 2030 BY CATEGORY**



Annual emissions reduction potential (dark shading) in 2030 from “On Track,” “Scale Up,” and “Need Focus” categories of actions accounting for overlap (light shading)<sup>a</sup> relative to estimated global annual greenhouse gas emissions in 2030 based on current policy projections<sup>b</sup> and ranges of 2030 annual emissions consistent with emissions pathways with a high likelihood of limiting warming to below 2 degrees Celsius<sup>c</sup> or 1.5 degrees Celsius.<sup>d</sup>

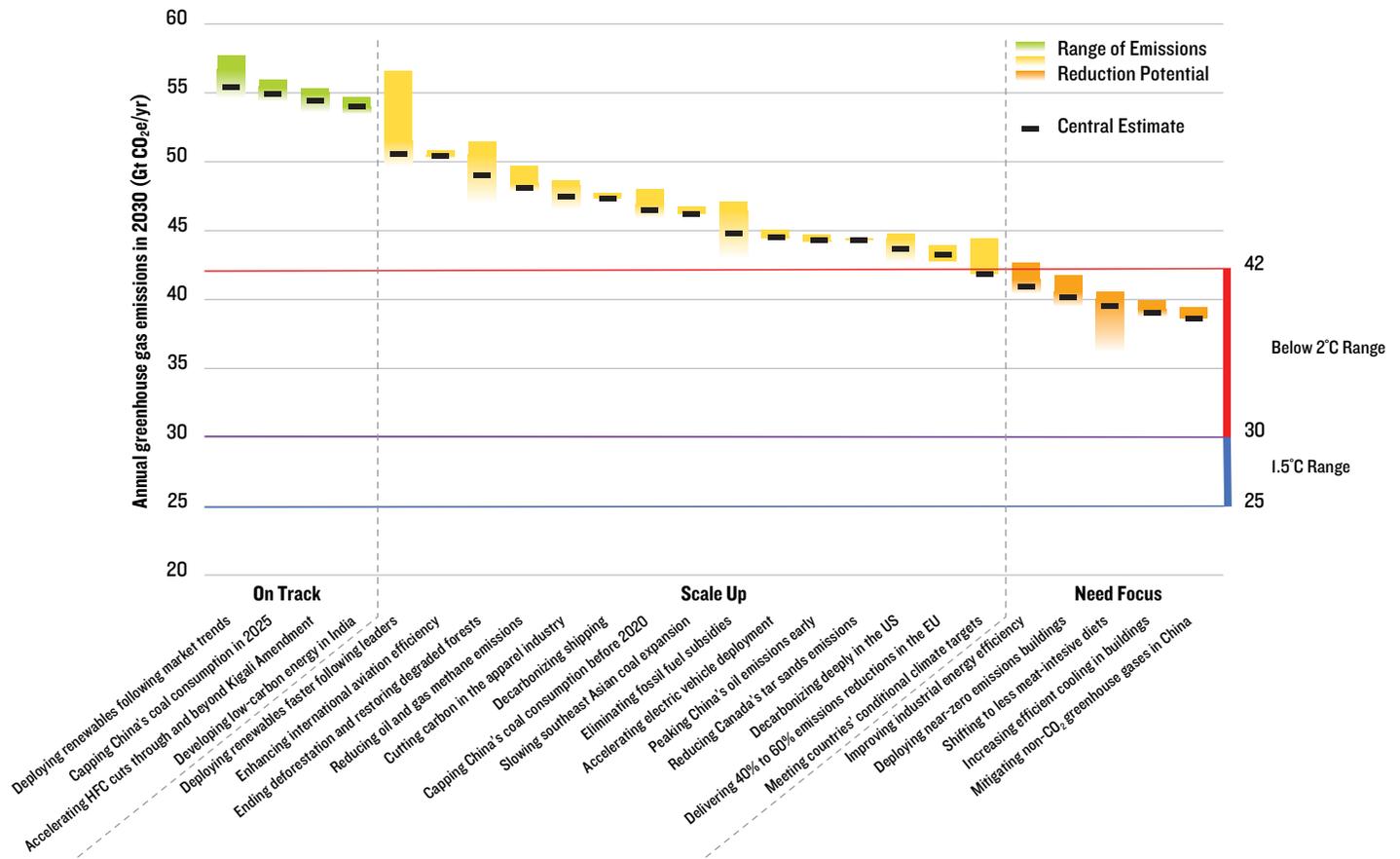
- a See technical appendix for detailed methodology of determining the 2030 annual emissions reduction potential for each category of actions and overlap across actions: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- b Climate Action Tracker. 2017. CAT Emissions Gaps. Available at: <https://climateactiontracker.org/global/cat-emissions-gaps>.
- c Bertoldi, P., M.G.J. den Elzen, J. Ford, R. Klein, D. Ley, T. Roberts, and J. Rogelj. 2018. Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C Scenarios, in G. Flato, J. Fuglested, R. Mrabet, and R. Schaeffer, eds., Global Warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (based on the lower 2°C scenario representing pathways for limiting peak warming to below 2°C during the entire 21st century with greater than 66 percent likelihood; upper and lower ranges equate to the estimated 25th and 75th percentile range of annual emissions consistent with this scenario).
- d *Ibid.* (based on the 1.5°C low overshoot scenario representing pathways limiting median warming to below 1.5°C in 2100 and with a 50 percent to 67 percent probability of temporarily overshooting that level earlier; upper and lower ranges equate to the estimated 25th and 75th percentile range of annual emissions consistent with this scenario).

- “On Track”: actions that are within reach and have a high likelihood of achieving their potential emission reductions based on current trends (four actions)
- “Scale Up”: actions where there is a focused effort and some regionally confined progress already, but efforts need to be stepped-up to roll out these actions more widely (15 actions)
- “Need Focus”: actions where there is an emerging focus or early steps, though the scale is small and will require much more concerted efforts than currently exist to achieve their potential (five actions)

### THE WORLD CAN SIGNIFICANTLY NARROW THE EMISSIONS GAP IN THE NEXT 12 YEARS

Our analysis shows that implementing all 24 actions analyzed in this study could cut annual global greenhouse gas emissions by 19 gigatonnes per year in 2030 (See Figure 2). For comparison, 19 gigatonnes is approximately three times the 2016 greenhouse gas emissions of the United States, the world’s second largest climate polluter and largest historical polluter.<sup>19</sup> That magnitude of emissions reductions would put the world on course to emit approximately 39 gigatonnes of greenhouse gases in 2030, and squarely onto an emissions pathway consistent with limiting global warming to below 2 degrees Celsius.<sup>20</sup>

**FIGURE 2: ANNUAL EMISSIONS REDUCTION POTENTIAL IN 2030 FOR ALL 24 ACTIONS**



Annual emissions reduction potential (showing the minimum emissions reduction potential for each action in solid shading, and the minimum to maximum emissions reduction potential range for each action with dark to light gradient shading) and central estimate in 2030 for all 24 actions across “On Track,” “Scale Up,” and “Need Focus” categories relative to the ranges of annual emissions in 2030 consistent with emissions pathways with a high likelihood of limiting warming to below 2 degrees Celsius<sup>a</sup> or 1.5 degrees Celsius.<sup>b</sup> The first action represents emissions reduction potential relative to 2030 current policy projections.<sup>c</sup> Each subsequent action shows the step down in annual emissions reduction potential relative to the central estimate of the previous action accounting for overlap across actions.<sup>d</sup>

- a Bertoldi, P., M.G.J. den Elzen, J. Ford, R. Klein, D. Ley, T. Roberts, and J. Rogelj. 2018. Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C Scenarios, in G. Flato, J. Fuglestedt, R. Mrabet, and R. Schaeffer, eds., *Global Warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* (based on the lower 2°C scenario representing pathways for limiting peak warming to below 2°C during the entire 21st century with greater than 66 percent likelihood; upper and lower ranges equate to the estimated 25th and 75th percentile range of annual emissions consistent with this scenario).
- b *Ibid.* (based on the 1.5°C low overshoot scenario representing pathways limiting median warming to below 1.5°C in 2100 and with a 50 percent to 67 percent probability of temporarily overshooting that level earlier; upper and lower ranges equate to the estimated 25th and 75th percentile range of annual emissions consistent with this scenario).
- c Climate Action Tracker. 2017. CAT Emissions Gaps. Available at: <https://climateactiontracker.org/global/cat-emissions-gaps>.
- d See technical appendix for detailed methodology of calculating the annual emissions reduction potential minimum and maximum range and central estimate for each action and overlap across actions: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).

To put the world closer to an emissions pathway consistent with limiting global warming to 1.5 degrees Celsius, we need faster, broader, and more aggressive action, in line with the deepest possible emissions reductions potential for each action as well as action in additional areas.

This policy brief evaluates politically important actions with the potential to achieve significant emissions reductions by 2030; however, other actions not analyzed may have the potential to reduce emissions significantly beyond 2030 (i.e., 2050). It is critical that, when prioritizing actions for 2030, decision-makers avoid locking in trajectories that make it more difficult to transition to deeper long-term targets.

## THE WORLD CAN GET ON A 2 DEGREES CELSIUS PATHWAY BY 2030 WITH “ON TRACK” AND “SCALE UP” ACTIONS

Delivering all 19 “On Track” and “Scale Up” actions by 2030 would put the world within the range of an emissions pathway consistent with limiting global warming to below 2 degrees Celsius. Taken together, the potential emissions reductions from “On Track” and “Scale Up” actions are approximately 16 gigatonnes per year in 2030—on the edge of the 16 to 28 gigatonne emissions gap range that needs to be bridged by 2030 to stay on a pathway to limit global warming to below 2 degrees Celsius (See Figure 1).<sup>21</sup> Although those reductions would be a major achievement, they alone are not enough to put the world on an emissions pathway to hold global temperature rise to 1.5 degrees Celsius.

### ON TRACK: these actions are already within reach, and can significantly reduce emissions.

The combined implementation of these four actions (listed below in descending order of potential emissions reductions<sup>22</sup>) could cut global emissions by 3.7 gigatonnes per year in 2030.<sup>23</sup>

- **Deploying more renewable energy, in line with the recent market trends:** *2.2 gigatonnes per year* (range of 1.0 to 3.0 gigatonnes per year). This global potential reflects renewables uptake continuing to accelerate somewhat conservatively following recent market trends.<sup>24</sup>
- **Capping coal consumption in China in 2025:** *1.0 gigatonnes per year* (range of 0.5 to 1.5 gigatonnes per year).<sup>25</sup>
- **Accelerating hydrofluorocarbon (HFC) cuts through and beyond the Kigali Amendment:** *1.0 gigatonnes per year* (range of 0.3 to 1.7 gigatonnes per year). This potential reflects full implementation of the Kigali Amendment to the Montreal Protocol and additional accelerated action.
- **Developing low-carbon energy in India:** *0.6 gigatonnes per year* (range of 0.6 to 1.0 gigatonnes per year). This potential reflects accelerated renewable energy deployment up to 1.35 percent per year and shifts away from coal build-out, as well as strengthened energy efficiency measures in the building and industrial sectors.

### SCALE UP: with accelerated implementation, these actions that have achieved some progress to date can achieve tremendous emission reductions by 2030.

These 15 actions could together cut global emissions by an additional 12 gigatonnes annually in 2030.<sup>26</sup>

- **Deploying more renewable energy faster, following leaders:** *6.0 gigatonnes per year* (range of 5.0 to 7.0 gigatonnes per year). This global potential reflects more rapid acceleration of renewables deployment following leading global jurisdictions.

- **Ending deforestation and restoring degraded forests:** *2.5 gigatonnes per year* (range of 1.0 to 4.5 gigatonnes per year). This potential reflects substantial progress on efforts to stop natural forest loss by 2030 and restoration of considerable amounts of natural ecosystem functions on degraded forest land.
- **Meeting countries' conditional climate targets:** *2.5 gigatonnes per year* (no range estimated). This potential reflects countries having access to the resources needed to achieve their conditional nationally determined contributions to the Paris Agreement.
- **Eliminating fossil fuel subsidies:** *2.3 gigatonnes per year* (range of 0.5 to 4.1 gigatonnes per year). This potential reflects efforts to phase out global fossil fuel subsidies from both consumption and production.
- **Capping coal consumption in China before 2020:** *1.5 gigatonnes per year* (range of 1.0 to 2.0 gigatonnes per year).
- **Reducing methane emissions from oil and gas development:** *1.5 gigatonnes per year* (range of 1.1 to 1.8 gigatonnes per year). This potential reflects progress on a mix of technological improvements, good practice government policies, and private sector action to reduce methane venting in oil and gas extraction.
- **Cutting carbon in the apparel industry:** *1.2 gigatonnes per year* (range of 0.3 to 2.0 gigatonnes per year). This potential reflects progress on energy efficiency, renewable energy, and recycling measures in the apparel industry value chain.
- **Decarbonizing deeply in the United States by mid-century:** *1.2 gigatonnes per year* (range of 0.3 to 2.0 gigatonnes per year). This potential reflects the United States being on track to cut greenhouse gas emissions by at least 80 percent by 2050 from 1990 levels through deploying energy efficiency across the economy; significantly expanding renewable energy; and using this clean power to electrify transportation, buildings, and industrial processes.
- **Accelerating global electric vehicle deployment:** *0.6 gigatonnes per year* (range of 0.5 to 0.7 gigatonnes per year). This potential reflects electric vehicles being on the steep portion of the technology diffusion “S-curve” in light duty global vehicle markets by 2030.
- **Slowing southeast Asian coal plant expansion:** *0.6 gigatonnes per year* (no range estimated). This potential reflects governments and financial institutions across the region revoking approvals of planned coal projects, shifting investments toward renewable energy, and retiring existing plants early, particularly in Vietnam and Indonesia where a significant number of coal plants are currently in the pipeline.
- **Delivering 40 to 60 percent emissions reductions in the European Union:** *0.6 gigatonnes per year* (range 0.0 to 1.1 gigatonnes per year). This potential reflects continued progress in the European Union to reduce emissions approximately 50 percent by 2030 from 1990 levels.

- **Decarbonizing shipping:** *0.4 gigatonnes per year* (no range estimated). This potential reflects full implementation of the recently adopted International Maritime Organization (IMO) target to cut shipping emissions by at least 50 percent by 2050 compared to 2008 levels.
- **Enhancing international aviation efficiency:** *0.4 gigatonnes per year* (range of 0.3 to 0.4 gigatonnes per year). This potential reflects achieving the International Civil Aviation Organization (ICAO) target of capping aviation emissions at 2020 levels through aviation efficiency measures and without the use of offsets.
- **Peaking oil emissions in China early:** *0.4 gigatonnes per year* (range of 0.2 to 0.5 gigatonnes per year). This potential reflects China peaking its oil consumption by 2030 at levels not significantly greater than current annual consumption.
- **Reducing tar sands emissions in Canada:** *0.08 gigatonnes per year* (range of 0.07 to 0.09 gigatonnes per year). This potential reflects the average of two scenarios where tar sands emissions decrease 30 percent by 2030 relative to 2005 or 2015 levels.

## WE NEED MUCH STRONGER ACTION TO PUT THE WORLD ON TRACK TO A 1.5 DEGREES CELSIUS PATHWAY

Based on the latest findings from the IPCC, it is abundantly clear the world needs to do more, faster and more systematically to protect humanity from untold climate hardships. This includes more rapidly deploying energy efficiency, scaling-up renewable energy deployment, shifting to low-carbon mobility systems, and reducing forest loss and planting forests.<sup>27</sup> These are the most significant and cost-effective climate actions that can and should be strengthened through 2030.

Putting the world on an emissions pathway by 2030 to limit global warming to 1.5 degrees Celsius will require additional efforts beyond “On Track” and “Scale Up” actions. This brings us to our next category of actions, which we designated as “Need Focus” (see below). Actions in this area have significant potential, though will require a concerted and coordinated effort that has not yet developed.

Furthermore, key countries, critical sectors, and the international community can help reduce emissions at the upper-end of the emissions reduction potential range for all 24 actions. For our analysis, we used somewhat conservative middle-of-the-road central estimates for the emissions reduction potential for each action, but delivering the maximum potential emissions reductions from each action can put the world closer to a pathway to limit global warming to 1.5 degrees Celsius. Finally, it bears mentioning that these actions are not exhaustive. Indeed, numerous additional actions not included in this analysis could also contribute significantly to reducing additional emissions by 2030.

## NEED FOCUS: these actions are still in the early phases of a more concerted effort, but could make a large dent in global emissions.

Together, the following five actions could cut global emissions by an additional 3.3 gigatonnes per year in 2030:<sup>28</sup>

- **Improving industrial energy efficiency:** *1.6 gigatonnes per year* (range 1.0 to 2.2 gigatonnes per year). This potential reflects emissions reductions (not including indirect emissions) from improving good practice policies in industrial energy efficiency and greater than 1 percent annual energy savings improvement above current efforts.
- **Deploying near-zero emissions buildings:** *1.6 gigatonnes per year* (range 1.0 to 2.1 gigatonnes per year). This potential reflects more rapid adoption of near-zero emissions buildings for new construction, enhanced retrofitting, gradual efficiency improvements, and some fuel switching in existing buildings.
- **Shifting to less meat-intensive diets:** *1.0 gigatonnes per year* (range 0.4 to 4.4 gigatonnes per year). This potential reflects solely demand-side reductions from shifting toward healthier diets with less red meat.
- **Increasing efficient cooling in buildings:** *0.8 gigatonnes per year* (range 0.5 to 1.2 gigatonnes per year). This potential reflects transitioning to more energy efficient air conditioners at efficiencies already available in buildings globally.
- **Mitigating non-carbon dioxide greenhouse gases in China:** *0.8 gigatonnes per year* (no range estimated). This potential reflects the creation of strong policies and concrete targets specific to these emissions using technically feasible measures.

## TO BRIDGE THE EMISSIONS GAP BY 2030, THE WORLD NEEDS TO STEP UP NOW

The Paris Agreement recognized the emissions gap and set the expectation and the mechanism for countries to iteratively strengthen their targets before 2030. Some countries, states, provinces, cities, and sectors have shown the type of leadership that will be needed by all players to effectively bridge the emissions gap. But key decision-makers need to take even more assertive action—in some cases, much more—to put the world on a safer climate trajectory by 2030. To underscore this point, the IPCC specifically states that the chances of “failing to reach 1.5 degrees Celsius are significantly increased if near-term ambition is not strengthened beyond the level implied by current nationally determined contributions (NDCs).”<sup>29</sup>

The next major milestone on the road to closing the emissions gap is for countries to prepare to revise their national climate targets immediately—and by 2020 at the latest—and implement the corresponding policies and actions to achieve those targets. In addition, states, provinces, cities, businesses, investors, and other key decision-makers need to push even harder to accelerate the clean energy and low-carbon transition, and enable national governments to meet and surpass their targets.

Closing the emissions gap quickly, effectively, and fairly will be the defining global climate undertaking of the next twelve years. With aggressive and sustained implementation across the suite of actions this roadmap identifies, as well as others, we can put the world on track to avoid climate catastrophe and leave our children and grandchildren a legacy of a safer, healthier, and more stable climate. Now is the time for true leaders to step up.

#### ENDNOTES

- 1 Intergovernmental Panel on Climate Change. 2018. Special Report on Global Warming of 1.5°C. Available at: <http://www.ipcc.ch/report/sr15>.
- 2 This analysis was not designed to present a set of actions that would put the world on a pathway to limit global warming to 2°C or 1.5°C. Rather, it analyzed a suite of real-world, politically significant actions to determine their emissions reduction potential relative to the pathways needed to limit global warming to below 2°C or 1.5°C. Greater alignment with a 2030 pathway consistent with limiting global warming to 1.5°C would require full implementation at the maximum range of emissions reduction potential estimated for all 24 actions (not only implementation of the more conservative central estimate for each action quantified in this study) and likely implementation of additional actions not evaluated in this study.
- 3 United Nations Framework Convention on Climate Change. 2015. The Paris Agreement. Available at: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- 4 The term “emissions gap” referenced in this study refers to the difference between the “current policy projections” benchmark emissions referenced in endnote 10 and the benchmark emissions from pathways consistent with limiting global warming to below 2°C and 1.5°C with low overshoot as referenced in endnotes 11 and 12.
- 5 Climate Action Tracker. 2017. CAT Emissions Gaps. Available at: <https://climateactiontracker.org/global/cat-emissions-gaps>.
- 6 United Nations Environment Programme. 2018. The Emissions Gap Report 2018. Available at: <https://www.unenvironment.org/resources/emissions-gap-report-2018>.
- 7 Intergovernmental Panel on Climate Change. 2018. Special Report on Global Warming of 1.5°C. Available at: <http://www.ipcc.ch/report/sr15>.
- 8 *Ibid.*
- 9 In this policy brief the term “gigatonnes” is used as a shorthand to refer to metric gigatonnes of carbon-dioxide equivalent emissions (GtCO<sub>2</sub>e).
- 10 The baseline greenhouse gas emissions scenario used in this study is the median of the “current policy projections” range from the Climate Action Tracker (CAT). The CAT current policy projections are based on implemented policies as of November 2017 and account for additional factors such as expected economic growth and expected trends in activity levels and energy consumption. Under the CAT current policy projections, global greenhouse gas emissions including land use, land use-change and forestry are projected to increase from 49.0 GtCO<sub>2</sub>e/yr in 2014 to 56.2–59.3 GtCO<sub>2</sub>e/yr in 2030. This study used the median of the CAT range to establish the current policy projections baseline emissions in 2030 at 57.7 GtCO<sub>2</sub>e/yr. Therefore, all emissions reduction potentials specified in this policy brief are additional to the emissions reductions already included in the baseline scenario. Other gap analyses may use different baseline scenarios, and therefore may arrive at different ranges for the emissions gaps. If a baseline scenario with a higher 2030 emissions level is used, then the emissions reduction potential from the actions included in this study would also be correspondingly greater.
- 11 Bertoldi, P., M.G.J. den Elzen, J. Ford, R. Klein, D. Ley, T. Roberts, and J. Rogelj. 2018. Cross-Chapter Box 11: Consistency Between Nationally Determined Contributions and 1.5°C Scenarios, in G. Flato, J. Fuglestvedt, R. Mrabet, and R. Schaeffer, eds., Global Warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. (Based on the lower 2°C scenario representing pathways for limiting peak warming to below 2°C during the entire 21st century with greater than 66 percent likelihood)
- 12 *Ibid.* (Based on the 1.5°C low overshoot scenario representing pathways limiting median warming to below 1.5°C in 2100 and with a 50 percent to 67 percent probability of temporarily overshooting that level earlier)
- 13 Given this analysis uses the Climate Action Tracker 2030 “current policy projections” as the baseline, the emissions gap is greater than using a baseline where countries meet their unconditional and/or conditional nationally determined contributions to the Paris Agreement. Meeting and exceeding countries’ Paris targets is therefore captured by delivering the relevant actions, including the additional emissions reductions from the “Meeting countries’ conditional climate targets” action.
- 14 United Nations Environment Programme. 2017. The Emissions Gap Report 2017. Available at: <https://www.unenvironment.org/resources/emissions-gap-report-2017>.
- 15 Two overarching observations about the 24 actions analyzed in this policy brief are worth bearing mention. First, the synergistic effect of implementing multiple actions in parallel is likely to be higher than implementing individual actions in isolation such that the whole is greater than the sum of its parts (*i.e.* near-zero emissions buildings and accelerated renewable energy further reduces the need for fossil fuels and their subsidies). And second, many actions also have complementarity effects on other actions, in that delivering one action will make it easier to deliver another action (*i.e.* efficient cooling in buildings makes it easier to achieve near-zero emissions buildings).

- 16 See technical appendix for detailed methodology used to quantify the minimum and maximum range of emissions reduction potential and central estimates for actions: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 17 The emissions reduction potential of one action could affect the potential magnitude of emissions reductions of another action and lead to double counting of emissions reduction potentials if overlaps are not properly accounted for. Overlaps in this study are defined as emissions reduction potentials that are covered by more than one action due to the overlapping geographical and/or sectoral scope of these actions. See technical appendix for detailed methodology used to estimate overlaps across actions: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 18 Grouping actions by category was conducted based on an analysis of the level of institutionalization around an action. This included evaluation of where there is an existing international commitment, agreement, or focused conversation; national policies, measures, or focused conversations; concerted efforts from multiple stakeholders; or simply potential for impact. Other “gap analyses” have previously assessed technology-based actions, so we chose to focus on an approach based on the current commitment and level of institutionalization around an action. This approach is aimed at providing a clear roadmap for decision-makers to focus on the key venues and stakeholders needed to deliver this magnitude of emission reductions. Over time, actions could move from one category to another given changes in the level of institutionalization around them and stakeholders’ commitment to them. See technical appendix for further details on the categorization of actions: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 19 United States Environmental Protection Agency. 2018. Inventory of U.S. Greenhouse Gas Emissions and Sinks. Available at: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>.
- 20 Bertoldi, P., M.G.J. den Elzen, J. Ford, R. Klein, D. Ley, T. Roberts, and J. Rogelj. 2018. Cross-Chapter Box II: Consistency Between Nationally Determined Contributions and 1.5°C Scenarios, in G. Flato, J. Fuglestedt, R. Mrabet, and R. Schaeffer, eds., *Global Warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*.
- 21 See technical appendix for the methodology used to determine net additional emissions reduction potentials per category: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 22 Actions in Figure 2 are listed in the same order as they appear in the overlap matrix in the technical appendix and whereby initial overlap calculations with preceding actions in the overlap matrix were conducted. However, they are listed in descending order of emissions reduction potential in the text for ease of reference. Action names in the policy brief may differ slightly from those in the technical appendix.
- 23 The 3.7 gigatonnes per year is the net emissions reduction potential for the combined four actions in the “On Track” category after accounting for overlap. The emission reduction potentials listed alongside each individual action are the central estimate and range without accounting for overlap. See technical appendix for additional details: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 24 “Deploying more renewable energy” is broken into two distinct actions to show the approximate magnitude of emissions reductions in both the “On Track” and “Scale Up” categories given the large overall magnitude of emissions reduction potential from the measure. See technical appendix for further details: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 25 “Capping coal consumption in China” is broken into two distinct actions to show the approximate magnitude of emissions reduction potential in both the “On Track” and “Scale Up” categories given the large overall magnitude of emissions reduction potential from the measure. See technical appendix for further details: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 26 The 12 gigatonnes per year is the net emissions reduction potential for the combined 15 actions in the “Scale Up” category after accounting for overlap. The emission reduction potentials listed alongside each individual action are the central estimate and range without accounting for overlap. See technical appendix for additional details: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 27 Energy efficiency, renewable energy, low-carbon mobility, and natural carbon sequestration (*i.e.* afforestation and land use) play a primary role in any scenario that quickly and cost-effectively puts the world on a safer climate trajectory. In this policy brief, these four crucial measures are embedded in three primary ways. First, the four measures are included in the baseline current policy scenario of our analysis for countries that already have considerable renewable energy deployment, energy efficiency penetration, shifts to low-carbon transit, and deforestation and reforestation measures through 2030 in their current policies on the books and anticipated through market forces. Second, a central component of the national measures in specific actions (*i.e.*, China’s coal consumption, India’s renewable energy growth, meeting countries’ conditional climate targets, achieving deeper emissions cuts in the European Union, and deep decarbonization in the United States) include measures from energy efficiency, renewable energy, low-carbon mobility, and natural carbon sequestration to achieve their emissions reduction potential. Finally, the policy brief includes several stand-alone actions focused on delivering specific strategies that address energy efficiency, renewable energy, low-carbon mobility, and natural sinks that cut across multiple jurisdictions.
- 28 The 3.3 gigatonnes per year is the net emissions reduction potential for the combined five actions in the “Need Focus” category after accounting for overlap. The emission reduction potentials listed alongside each individual action are the central estimate and range without accounting for overlap. See technical appendix for additional details: [https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap\\_Technical-Appendix.pdf](https://newclimate.org/wp-content/uploads/2019/01/Paris-Roadmap_Technical-Appendix.pdf).
- 29 Bertoldi, P., M.G.J. den Elzen, J. Ford, R. Klein, D. Ley, T. Roberts, and J. Rogelj. 2018. Cross-Chapter Box II: Consistency Between Nationally Determined Contributions and 1.5°C Scenarios, in G. Flato, J. Fuglestedt, R. Mrabet, and R. Schaeffer, eds., *Global Warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*.