Deeper, Earlier Emissions Cuts Needed to Reach Paris Goals

To limit warming to well below 2°C, as outlined in the Paris Agreement, countries must strengthen their current pledges in the next few years.

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Overview

The Paris Agreement sets a goal to limit warming to no more than 2°C with the aim to limit warming to no more than 1.5°C. However, full implementation of the current pledges, as of April 20, 2016, would result in expected warming by 2100 of 3.5°C (6.3°F). Deeper, earlier emissions cuts are needed to limit warming to no more than 2°C. The Paris Agreement provides a mechanism for the nations of the world to increase their commitments and submit stronger pledges by 2020. Climate Interactive's analysis shows what this could mean.

If countries strengthen their current nationally determined contributions (NDCs) so global emissions peak by 2020 and then decline, the emissions cuts required to limit warming to no more than 2°C become much easier, with the required rate of emissions reductions for the period 2030-2040 falling from 4.6%/year under the current NDCs to 3.2%/year. With each year that countries wait to strengthen their current pledges the rate at which emissions must decline gets steeper and steeper. If countries only fulfill their current Paris pledges by 2030, our energy infrastructure, agriculture practices, and consumption habits will need to change prohibitively fast after 2030, lowering the chances of achieving the Paris agreement goal of limiting warming to no more than 2°C (and aiming to stay below 1.5°C). Between the impacts of climate change if we don't act and the dramatic shifts in our economies if we delay action, stronger action now is essential for a more secure future.

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Dr. John Sterman of MIT Sloan said, “Paris is a major step. But the current pledges defer the emissions reductions needed to keep warming below 2°C until after 2030. By then, substantial additional fossil fuel infrastructure would be built, only to become stranded assets after 2030 at great cost to the companies that built them and the citizens of the nations who financed them.”

Dr. John Sterman of MIT Sloan said: “The developed nations must cut their emissions faster than their current NDCs specify. But we cannot limit warming to 2°C unless the developing nations also reduce their emissions. The developed nations should cover the cost of emissions reductions in the developing world so these nations can leapfrog the polluting fossil fuel infrastructure through clean, renewable energy and efficient end use, just as Africa jumped straight to mobile telephony, leapfrogging land lines."

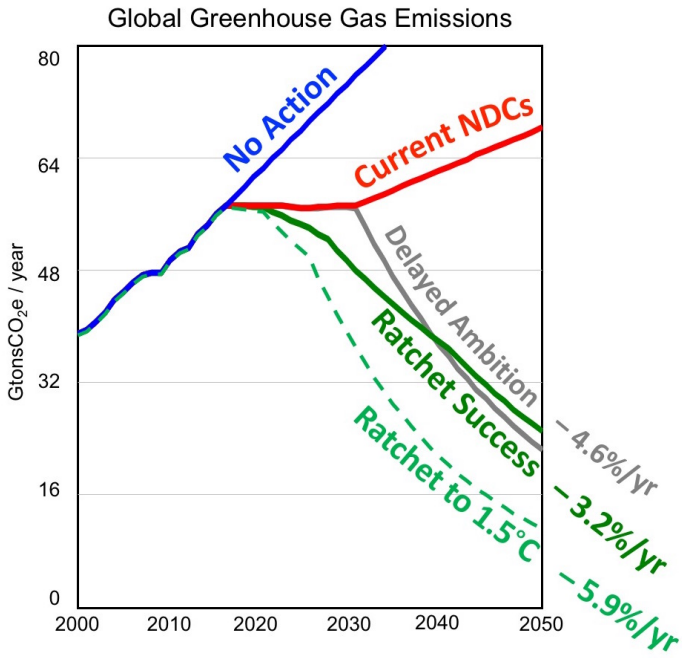

Figure 1: Potential emissions trajectories from 2015-2050, with average annual reduction rates from 2030-2050 included.

We compared two scenarios that limit warming to no more than 2°C (Figure 1). In the first, denoted ***Delayed Ambition***, all current NDCs are fully implemented, with emissions falling after 2030 fast enough to limit warming to no more than 2°C (3.6°F). In the second, denoted the ***Ratchet Success***, countries strengthen their NDCs so emissions fall faster between 2020 and 2030, with continued cuts after 2030. We also included a scenario to 1.5°C, denoted **Ratchet to 1.5°C**.

The Scenarios

This analysis explores several scenarios, with particular emphasis on the two Ratchet scenarios which indicate potential trajectories for countries to follow to meet the Paris Agreement goals of keeping temperatures below 2°C and aiming to stay below 1.5°C. All were modeled using the C-ROADS climate policy simulator:

1. ***No Action*** **-** Nations continue on a business-as-usual trajectory with continued emissions growth leading to 4.5°C (8.1°F) with a range of uncertainty from 2.6 to 5.9°C (4.8 to 10.6°F) of warming. This scenario and aligns with the IPCC’s AR5 RCP 8.5 scenario.

2. ***Current NDCs*** **–** Emissions follow the NDCs offered as of April 20, 2016, specifically, that all current pledges are fully implemented, but excluding actions

that have not been pledged. This would put the world on track, by 2100, for a expected global temperature increase of 3.5°C (6.3°F) above pre-industrial levels, with a range of uncertainty from 2.0 to 4.6°C (3.6 to 8.2°F). More on this scenario: https://www.climateinteractive.org/tools/scoreboard/scoreboard-science-and-data/

3. ***Ratchet Success –*** The current NDCs are improved between 2020-2030 as described in Table 1 below and then reductions continue beyond 2030. The result is expected warming of 1.8°C (3.2°F) by 2100, with a range of uncertainty from 0.9 to 2.4°C (1.7 to 4.4°F). More on this scenario: https://www.climateinteractive.org/tools/scoreboard/ratchet-success-scenario/

4. ***Delayed Ambition –*** Emissions follow the NDCs as per the ***Current NDCs*** scenario and then fall at the rate required to limit warming to no more than 2°C. As in the ***Ratchet Success*** scenario, the ***Delayed Ambition*** scenario limits warming to 1.8°C (3.2°F), with a range of uncertainty from 0.9 to 2.4°C (1.7 to 4.4°F). However, ***Delayed Ambition*** requires significantly steeper reduction rates in the period after 2030 to achieve the same outcome as ***Ratchet Success***.

5. ***Ratchet to 1.5°C*** – The current NDCs are improved between 2020-2030 as described in Table 2 and then reductions continue beyond 2030. The result is expected warming of 1.5°C (2.7°F) by 2100, with a range of uncertainty from 0.8 to 2.1°C (1.4 to 3.7°F). This scenario is similar to ***Ratchet Success*** except it achieves a lower expected temperature result in 2100.

Ratchet Success Implications

Under the ***Ratchet Success*** scenario, emissions for major emitters would fall sooner and farther than their current pledges (Table 1). This means that:

- China would commit to peaking emissions by 2025, not 2030. Other developing countries would commit to a peak by 2027.
- The U.S. would pledge to reduce emissions 45% below 2005 levels by 2030, improving on its Paris pledge of a 26% drop below 2005 levels by 2025. The other developed countries would match the 45% pledge.
- The EU would pledge to reduce emissions 47% below 1990 levels (45% below 2005 levels) by 2030, improving on its Paris pledge of a 40% cut below 1990 levels.

Table 1: Summary of assumptions for the "Ratchet Success" scenario

	Current NDC for 2025/2030	Improved NDC for 2030
EU	40% below 1990 levels by 2030	47% below 1990 levels by 2030 (45% below 2005)
U.S.	26% below 2005 levels by 2025	45% below 2005 levels by 2030
Other Developed	2% decrease below 2005 emissions by 2030*	45% below 2005 levels by 2030 (51% below 1990)
China	Peak CO_2 by 2030, at 60% below 2005 intensity	Peak by 2025
Other Developing	14% below BAU by 2030*	Peak by 2027

*Level of ambition of the aggregate of individual NDCs within this group.

Full implementation of the ***Ratchet Success*** scenario by countries would enable global emissions to peak in 2020 and begin to decline to give the world about a two-thirds chance of keeping warming below 2°C (Figure 2).

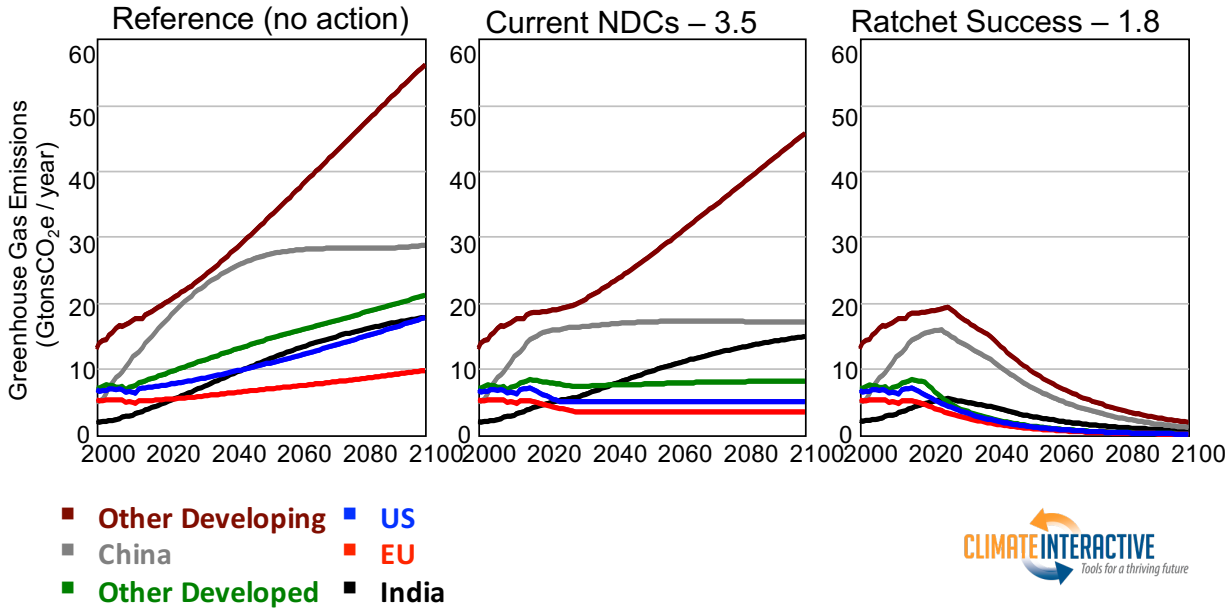

Figure 2: Greenhouse gas emissions from 2000-2100 for six regions of the world, under three scenarios.

Ratchet to 1.5°C Implications

The ***Ratchet to 1.5°C*** scenario would require the steepest rate of reductions of the scenarios, but would ensure greater planetary stability and security as significant climate impacts would be avoided. Current pledges from all major emitters are not in line with limiting warming to 1.5°C. In Table 2 we explore what the NDCs of countries would need to be to have a significant chance limiting warming to 1.5°C.

Table 2: Summary of assumptions for the "Ratchet to 1.5°C" scenario.

	Current NDC for 2025/2030	Improved NDC for 2030
EU	40% below 1990 levels by 2030	62% below 1990 levels by 2030 (or 60% below 2005)
U.S.	26% below 2005 levels by 2025	60% below 2005 levels by 2030
Other Developed	2% decrease below 2005 emissions by 2030*	60% below 2005 levels by 2030 (or 64% below 1990)
China	Peak CO_2 by 2030, at 60% below 2005 intensity	Peak no later than 2025
Other Developing	14% below BAU by 2030*	Peak no later than 2025

*Level of ambition of the aggregate of individual NDCs within this group.

Summary Tables

Table 3: Global Annual Reduction Rates

Rates of CO2 equivalent emissions					
		2000-2015	2015-2030	2030-2050	2050-2100
Global	Ref	2.4%	2.0%	1.4%	0.8%
	NDC Strict	2.4%	0.2%	0.9%	0.6%
	Ratchet Success Pathway	2.4%	-1.0%	-3.2%	-3.9%
	Ratchet to 1.5	2.4%	-2.7%	-5.9%	-6.3%
	Delayed Ambition	2.4%	0.1%	-4.6%	-4.6%

Table 4: Developed Country and Region Annual Reduction Rates

		2000-2015	2015-2030	2030-2050	2050-2100
US	Ref	0.3%	1.1%	1.2%	1.1%
	NDC Strict	0.3%	-2.2%	0.0%	0.0%
	Ratchet Success Pathway	0.3%	-4.2%	-5.1%	-5.1%
	Delayed Ambition	0.3%	-2.2%	-6.5%	-6.5%
EU	Ref	-0.1%	0.7%	0.9%	0.7%
	NDC Strict	-0.1%	-2.6%	0.0%	0.0%
	Ratchet Success Pathway	-0.1%	-3.8%	-5.1%	-5.1%
	Delayed Ambition	-0.1%	-2.6%	-5.5%	-5.5%
Russia	Ref	0.8%	2.0%	1.3%	0.8%
	NDC Strict	0.8%	-0.8%	0.0%	0.0%
	Ratchet Success Pathway	0.8%	-5.0%	-5.1%	-5.1%
	Delayed Ambition	0.8%	-0.8%	-6.6%	-6.6%
Canada	Ref	-0.8%	1.9%	1.2%	1.0%
	NDC Strict	-0.8%	0.6%	0.0%	0.0%
	Ratchet Success Pathway	-0.8%	-1.0%	-5.1%	-5.1%
	Delayed Ambition	-0.8%	0.6%	-6.3%	-6.3%
Japan	Ref	0.9%	0.4%	0.5%	0.4%
	NDC Strict	0.9%	-2.1%	0.0%	0.0%
	Ratchet Success Pathway	0.9%	-4.9%	-5.1%	-5.1%
	Delayed Ambition	0.9%	-2.1%	-6.5%	-6.6%
Australia	Ref	0.2%	2.3%	1.8%	1.4%
	NDC Strict	0.2%	-1.8%	0.0%	0.0%
	Ratchet Success Pathway	0.2%	-3.8%	-5.1%	-5.1%
	Delayed Ambition	0.2%	-1.8%	-6.5%	-6.6%
South Korea	Ref	2.0%	2.2%	1.2%	0.3%
	NDC Strict	2.0%	-1.6%	1.2%	0.4%
	Ratchet Success Pathway	2.0%	-5.7%	-5.1%	-5.2%
	Delayed Ambition	2.0%	-1.6%	-8.2%	-8.2%
Developed nonMEF	Ref	2.5%	2.5%	1.9%	0.8%
	NDC Strict	2.5%	0.3%	0.6%	0.3%
	Ratchet Success Pathway	2.5%	-5.7%	-5.1%	-5.2%
	Delayed Ambition	2.5%	0.3%	-7.1%	-7.1%

Table 5: Developing Country and Region Annual Reduction Rates

		2000-2015	2015-2030	2030-2050	2050-2100
China	Ref	6.9%	3.0%	1.1%	0.1%
	NDC Strict	6.9%	1.1%	0.2%	0.0%
	Ratchet Success Pathway	6.9%	0.2%	-3.0%	-4.0%
	Delayed Ambition	6.9%	0.9%	-4.3%	-5.0%
India	Ref	4.0%	3.8%	2.4%	1.0%
	NDC Strict	4.0%	2.6%	2.4%	1.0%
	Ratchet Success Pathway	4.0%	1.9%	-2.7%	-3.5%
	Delayed Ambition	4.0%	2.6%	-4.0%	-4.0%
Indonesia	Ref	3.3%	0.3%	1.8%	1.2%
	NDC Strict	3.3%	-0.8%	1.8%	1.2%
	Ratchet Success Pathway	3.3%	-1.0%	-2.7%	-3.5%
	Delayed Ambition	3.3%	-0.8%	-4.0%	-4.0%
Mexico	Ref	1.6%	1.8%	1.6%	1.0%
	NDC Strict	1.6%	-0.1%	-4.6%	0.0%
	Ratchet Success Pathway	1.6%	-0.4%	-2.7%	-3.5%
	Delayed Ambition	1.6%	-0.1%	-4.6%	-4.0%
Brazil	Ref	0.3%	1.2%	0.9%	0.5%
	NDC Strict	0.3%	-3.1%	0.0%	0.0%
	Ratchet Success Pathway	0.3%	-3.7%	-2.6%	-3.5%
	Delayed Ambition	0.3%	-3.1%	-4.0%	-4.0%
South Africa	Ref	1.6%	1.7%	1.8%	1.3%
	NDC Strict	1.6%	0.3%	-1.1%	-1.0%
	Ratchet Success Pathway	1.6%	0.0%	-3.2%	-3.5%
	Delayed Ambition	1.6%	0.3%	-3.4%	-4.0%
Developing nonMEF	Ref	2.4%	1.8%	1.7%	1.2%
	NDC Strict	2.4%	1.3%	1.7%	1.2%
	Ratchet Success Pathway	2.4%	0.6%	-2.7%	-3.5%
	Delayed Ambition	2.4%	1.3%	-4.0%	-4.0%