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Institute for Governance & Sustainable Development

New Reports Detail Essential Climate Policies Needed to Limit Warming Below 2°Celsius

CO_2 Mitigation Is Crucial First Step but Alone Cannot Prevent Dangerous and Possibly Catastrophic Temperature Increases, Finds Study Authored by 33 Leading Experts

Cutting Short-Lived Super Climate Pollutants Critical;
Atmospheric Carbon Extraction Also Needed;
Only Fast Action Can Avoid Tipping Points and Possible Existential Risks

14 September 2017, New York – Two new studies released today find that global temperature increases can be limited to less than 2 degrees Celsius above pre-industrial levels, as global leaders have pledged through the Paris Agreement, but only if the world quickly pursues three cooling approaches: decarbonizing the global energy system by mid-century; drastically reducing emissions of short-lived super climate pollutants like HFCs, methane, and black carbon by 2020; and undertaking atmospheric carbon extraction, which will be needed over time if CO_2 emissions do not peak by 2020.

These are the conclusion of a matched pair of reports released today during the United Nation's Climate Week. The *Well Under 2 Degrees Celsius: Fast Action Policies to Protect People and the Planet from Extreme Climate Change*, authored by a team of 33 prominent scientists and policy experts, and the peer-reviewed *Well Below 2 ℃: Mitigation strategies for avoiding dangerous to catastrophic climate changes* by Xu & Ramanathan published in the *Proceedings of the National Academy of Science (PNAS)* outline specific science-based policy pathways that serve as the building blocks for a three-lever strategy that could limit warming to well under 2°C. This is likely the first-time scientific reports written by climate scientists are concluding that unchecked climate changes pose existential threats to the entire population including many species.

"The world has cumulatively emitted about 2.2 trillion tons of CO_2 to date, and policymakers have previously assumed that we could emit up to 3.7 trillion tons and remain below dangerous levels. We show in our paper, however, that there is a 1 in 20 chance that emission beyond the current 2.2 trillion tons presents catastrophic and perhaps even an existential risk. This could include exposing about 7 billion people to deadly heat stress; 2.5 billion people to viruses such as Zika and chikengunya; and expose close to 20% of species to dangers of extinction," said Professor V. Ramanathan who is the lead co-chair of the report and one of the two lead coauthors of the PNAS study. "To put in perspective, how many of us would choose to buckle our grandchildren to an airplane seat if we knew there was as much as a 1 in 20 chance of the plane crashing? With climate change that can pose existential threats, we have already put them in that plane. The good news from our two studies is that there is still time to avoid catastrophic changes."
"Climate change is an urgent problem requiring urgent solutions," said Dr. Mario Molina, Nobel Laureate and lead co-chair of the report. "We have less than a decade to put these solutions in

place around the world to preserve nature and our quality of life for generations to come. The time is now."

Pulling the first lever, drastically reducing emissions of short-lived super pollutants beginning now, would avoid warming in 2100 by up to 1.2°C. The short-lived super pollutant lever is essential for slowing near-term warming and can be implemented today with existing technologies and often with existing laws and institutions such as the HFC phasedown under the Montreal Protocol as a result of the landmark Kigali Amendment in 2016.

The second lever, carbon neutrality, calls for decarbonizing the global energy system by 2050 through the use of renewables and improvements in energy intensity. The maximum warming reductions feasible would be between 2.8°C by 2100. If, in addition to bending the SLCPs emissions curve, the CO_2 emissions peak in 2020 and reach zero by 2050, the authors suggest there is less than a 20% probability of exceeding 2°C.

The third lever, atmospheric carbon extraction, is added as an insurance against surprises due to policy lapses, mitigation delays, and non-linear climate changes. If emissions of CO_2 and short-lived super pollutants start to decrease by 2020 and carbon neutrality is achieved by 2050, the amount of carbon that must be removed will be nearly negligible. However, if CO_2 emissions continue until 2030, a staggering one trillion tons of carbon extraction would be needed.

Figure 1. Adapted from Supporting Information Table S1: *The contribution of individual mitigation measures to the warming in the 21st century (*Xu & Ramanathan, 2017).

Mitigation Measure	2050 avoided warming	2100 avoided warming
Energy intensity	–0.2	–0.9
Bending CO_2 emissions by 2030	–0.1	–1.6
Bending CO_2 emissions by 2020	–0.3	–1.9
Extraction of one trillion tons of CO_2	0	–0.3
Drastic reductions in emissions of SLCPs (Methane, Black Carbon, HFCs)	–0.6	–1.2
Aerosol unmasking (Mostly from fossil fuels)	+0.3	+0.6

However, the building blocks' successful implementation requires the global mobilization of financial and technical resources. The *Well Under 2C Report* goes on to describe ten scalable solutions for the global economy and society to achieve such rapid reduction in short-lived super pollutants by 2030, and carbon neutrality and climate stability by 2050. The solutions are adapted

and modified from the report *Bending the Curve* written by fifteen researchers from the University of California system.

"The climate has already warmed by 1°C. The problem is running ahead of us, and under current trends we will likely reach 1.5°C in the next fifteen years and surpass the 2°C guardrail by mid-century with a 50% probability of reaching 4°C by end of century," said Durwood Zaelke, one of the three co-chairs of the *Well Under 2°C Report* and President of IGSD. "We need to act now to accelerate our solutions to reach global scale as fast as possible."

A 50% probability of existential risks without aggressive actions beyond the committed actions under the Paris agreement, the authors urge, should inspire humanity to act with unprecedented urgency. In the absence of fast and aggressive mitigation, we face non-linear climate tipping points that can lead to self-reinforcing and cascading climate change impacts. These include the ice/snow albedo feedback of retreating Arctic sea ice; melting of Tibetan-Himalayan glaciers by greenhouse gases and black carbon soot; retreating of extra tropical cloud systems which protect the planet from warming by reflecting enormous sunlight back to space; release of methane and CO_2 from wetlands; and reduced uptake of carbon by the warmer oceans, among others. These abrupt shifts, or 'climate wild cards', are irreversible on a human time scale (<100 years) and would create a notable disruption to the climate system, condemning the world to warming beyond that which we have previously projected.

The 4 blocks-3 levers mitigation strategy implemented through the 10 solutions may appear ambitious and formidable, but there are numerous living laboratories ranging from cities such as Stockholm to a large state like California, the sixth largest economy in the world, already embarked on mitigation actions such as 40% reductions in CO_2 emissions by 2030 and 50 to 80% reductions in short-lived super pollutants. CO_2 emissions curves in the U.S. and E.U. have already started to bend since 2005. The multitude of many examples in our recent past—further expanded upon in the report— provide hopeful examples of humanity's ability to mobilize to achieve our collective environmental objectives.

The good news is urgent and practical solutions exist and are ready for implementation now that will deliver benefits in the next few critical decades, placing the world on a path to achieving the long-term targets of the Paris Agreement and near-term sustainable development goals. Time is short and climate mitigation efforts must be taken aggressively and immediately to avoid the looming devastating consequences.

The *Well Under 2 Degrees Celsius: Fast Action Policies to Protect People and the Planet from Extreme Climate Change* is available here.

The *Well Below 2℃: Mitigation strategies for avoiding dangerous to catastrophic climate changes* is available here.