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Hearing on "Examining Global Climate Trends and Progress in addressing Climate Change"
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Thank you, Senators Manchin and Barrasso, and members of the Committee on Energy and Natural Resources, for inviting me here to testify today on global climate trends and the progress we've made in addressing climate change. I am a contributing and lead author to several global climate assessments, including the Intergovernmental Panel on Climate Change's Sixth Assessment Report and the United Nations Environment Programme's Emissions Gap Report. I also direct a research group, the Data-Driven Environmental Policy Lab or Data-Driven Lab for short, based at the University of North Carolina-Chapel Hill. Much of my research has focused on China and its contributions to global climate change and energy policy. It is an honor to be here today to share with the committee my knowledge of global trends and progress in addressing climate change.

The global climate's status is dire, and the world has a small window remaining to make the drastic cuts necessary to avoid the most dangerous impacts of climate change. Current national government policies are inadequate to produce the drastic reductions that science dictates are needed to secure a safe and prosperous climate future. We can see, however, that many countries have begun to acknowledge their role in contributing to global climate change. More than 120 governments have made pledges to decarbonize around the middle of this century or sooner.[1] There is also a large, understudied potential for bottom-up climate actions from cities, state and regional governments, and businesses to build on national efforts and create additional greenhouse gas emission reductions.

Maintaining primarily a global perspective, my comments are divided in four parts:

- A stock-taking of the global climate - what are current greenhouse gas emissions levels and trends and what global climate change impacts can we already observe? I will address global trends from the perspective of energy and industrial-related emissions, while acknowledging that

[1] ECIU. (2021). *Net Zero Tracker*. Energy & Climate Intelligence Unit. https://eciu.net/netzerotracker

land-use based emissions from agriculture and forestry comprise 23 percent of global greenhouse gas emissions.[2]

- Second, reviewing current policies and initiatives and their implications for meeting the global goals of containing temperature rise within 2 degrees Celsius or the 2015 Paris Agreement's 1.5 degree target, the threshold that scientists have established as a global tipping point beyond which the world will experience the most catastrophic climate change impacts.[3]
- I will focus in particular on China's efforts to combat climate change and the country's latest pledge to decarbonize by 2060 or earlier. In the last two decades, China has implemented a growing suite of climate and energy policies and recently unveiled plans to decarbonize its economy - the world's second largest - showing what is possible even in the world's largest emitter of greenhouse gases, and also suggesting opportunities for trans-Pacific collaborations and productive competition.
- Lastly, recognizing insufficient progress towards decarbonization, subnational governments and business actors have in recent years stepped up to fill in the climate initiative shortfalls. Whether the contributions from these actors will be sufficient to make up for limited progress elsewhere remains an unanswered question.

1. What is the global climate's current status?

The latest climate science literature describes in stark detail a narrowing window for meaningful climate action. The Intergovernmental Panel on Climate Change (IPCC) reported in September 2018 on the importance of restricting global temperature rise to 1.5 degrees Celsius above pre-industrial levels, and yet, as of 2020, temperatures have already risen by about 1.2 degrees Celsius.[4] The IPCC reports that exceeding this 1.5 degrees Celsius benchmark would result in increasingly dire environmental impacts: sea level rise, extreme heat, ecosystems and species loss, and reductions to crop and fishery yields.[5]

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[2] IPCC, 2018: Summary for Policymakers. In: 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 [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

[3] *ibid.*

[4] World Meteorological Institute (WMO; 2020). Press release: 2020 was one of the three warmest years on record. Available: https://public.wmo.int/en/media/press-release/2020-was-one-of-three-warmest-years-record

[5] Levin, K. (2018, October 7,). Half a degree and a world apart: The difference in climate impacts between 1.5˚C and 2˚C of warming. Retrieved from https://www.wri.org/blog/2018/10/half-degree-and-world-apart-

Climbing temperatures have caused the loss of more than 28 trillion tonnes of ice between 1994 and 2017[6], triggered oceanic thermal expansion and accelerated sea level rise.[7] Changing precipitation patterns have exacerbated flooding and drought, destroyed agricultural livelihoods and have made some areas of the globe completely uninhabitable.[8]

Despite the glaring importance of aggressive emissions reduction, efforts to combat global climate change have had mixed results. Tracking global greenhouse gas emissions trends, between 2010 and 2019, carbon dioxide (CO_2) emissions increased at an average yearly rate of 0.9 percent,[9] despite a relative flattening of global CO_2 emissions from 2014-2016[10] and 2018-2019. The year 2019, however, saw record high greenhouse emissions levels of 52.4 gigatonnes CO_2e, with 65% of all GHG emissions (including land use change) coming from fossil carbon sources. The global energy system is the primary driver of these greenhouse gas emissions trends. The world's energy mix is today composed primarily of fossil carbon sources, with coal, oil, and natural gas comprising around 64% of global electricity generation in 2018.[11]

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difference-climate-impacts-between-15-c-and-2-c-warming; Schleussner, C., Rogelj, J., Schaeffer, M., Lissner, T., Licker, R., Fischer, E. M., . . . Hare, W. (2016). Science and policy characteristics of the paris agreement temperature goal. Nature Climate Change, 6(9), 827.

[6] Slater, T., Lawrence, I. R., Otosaka, I. N., Shepherd, A., Gourmelen, N., Jakob, L., Tepes, P., Gilbert, L., & Nienow, P. (2021). Review article: Earth's ice imbalance. *The Cryosphere*, *15*(1), 233–246. https://doi.org/10.5194/tc-15-233-2021

[7] Weeman, K., & Lynch, P. (n.d.). *New study finds sea level rise accelerating*. Climate Change: Vital Signs of the Planet. https://climate.nasa.gov/news/2680/new-study-finds-sea-level-rise-accelerating

[8] Schwartz, J. (2018, -12-17T21:53:54.768Z). More floods and more droughts: Climate change delivers both. The New York Times Retrieved from https://www.nytimes.com/2018/12/12/climate/climate-change-floods-droughts.html; BAMS. (2018). Explaining extreme events of 2017 from a climate perspective. Retrieved from https://www.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/explaining-extreme-events-from-a-climate-perspective/; U.S. Global Change Research Program. (2018). Fourth national climate assessment. volume II: Impacts, risks, and adaptation in the United States. Retrieved from https://nca2018.globalchange.gov; Missirian, A., & Schlenker, W. (2017). Asylum applications respond to temperature fluctuations. Science, 358(6370), 1610-1614; Kumari Rigaud, K., de Sherbinin, A., Jones, B., Bergmann, J., Clement, V., Ober, K., . . . Midgley, A. (2018). Groundswell: Preparing for internal climate migration. Retrieved from http://www.worldbank.org/en/news/infographic/2018/03/19/groundswell---preparing-for-internal-climate-migration

[9] See https://www.globalcarbonproject.org/carbonbudget/ and Friedlingstein, P., O'Sullivan, M., Jones, M. W., Andrew, R. M., Hauck, J., Olsen, A., Peters, G. P., Peters, W., Pongratz, J., & Sitch, S. (2020). Global carbon budget 2020. *Earth System Science Data*, *12*(4), 3269–3340.

[10] IEA. (2020). *CO2 Emissions from Fuel Combustion: Overview* [Statistics Report]. IEA. CO2 Emissions from Fuel Combustion: Overview

[11] IEA. (2020). *Electricity statistics*. IEA. https://www.iea.org/subscribe-to-data-services/electricity-statistics

The single largest short-term influencer of greenhouse gas emissions levels in the most recent decade, however, is the COVID-19 pandemic. CO_2 emissions reductions due to COVID-19-related shutdowns are estimated to be between 7 and 9 percent - larger than previous record dips from other global events like World War II or other economic downturns.[12] The largest share of emissions reductions stem from reduced surface and air transport associated with the COVID-19 pandemic, although emissions growth had begun to show signs of slowing prior to the pandemic in 2019.[13] The precipitous drop in global greenhouse gas emissions has provided an opportunity for countries to consider post-COVID 19 recovery plans with climate change and energy policy considerations.

There is a strong economic case for the transition away from fossil fuels to renewable energy. Costs have continuously declined for renewable energy products, such that by 2019, 56 percent of all new utility-scale renewable generation capacity supplied electricity demand at a lower cost than the cheapest new fossil-fuel options available.[14] This includes two-fifths of utility-scale solar PV operating at a more affordable rate than the cheapest fossil fuel option in 2019, despite solar PV being 7.6 times more expensive than fossil fuel options just ten years ago. Renewables demand under COVID-19 has remained robust compared to demand for fossil fuels, and the share of renewables in the electricity mix increased through 2020 for many large economies, including the U.S.[15] In 2020 over 70 percent of utility-scale power that was added to the U.S.'s generation capacity was in the form of renewable energy.[16] Globally, renewable energy sources in the electricity mix have grown aggressively, with over 27 percent of global electricity generation supplied by renewables, up from 19 percent in 2010. The share of global electricity demand filled by solar photovoltaics and wind technologies have grown fivefold since 2009 and together supplied around 8.7 percent of total global generation. These global trends suggest that countries are wizened to the multiple benefits of decarbonization, in terms of economic cost savings, energy security, public health, and climate resiliency.

2. How are current policy efforts addressing global climate change?

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[12] Liu, Z., Ciais, P., Deng, Z., Lei, R., Davis, S. J., Feng, S., ... & Schellnhuber, H. J. (2020). Near-real-time monitoring of global CO 2 emissions reveals the effects of the COVID-19 pandemic. Nature communications, 11(1), 1-12.

[13] See ICOS. (2020). *Data supplement to the Global Carbon Budget 2020*. https://www.icos-cp.eu/science-and-impact/global-carbon-budget/2020

[14] IRENA. (2020). *Renewable Power Generation Costs in 2019*. IRENA. https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019

[15] IEA. (2020). *Global Energy Review 2020*. IEA. https://www.iea.org/reports/global-energy-review-2020

[16] U.S. Energy Information Agency. (2021). Renewables account for most new U.S. electricity generating capacity in 2021. Available: https://www.eia.gov/todayinenergy/detail.php?id=46416

The science is clear - we need to get to zero emissions or net-negative by 2050 for a 66 percent chance of containing global temperature rise within 2 or 1.5 degrees C, respectively. To meet this charge, the IPCC states that global emissions must be halved by 2030 from 2017 levels and then fall to net zero by 2050.[17]

Ideally, global emissions would have already peaked in 2020 to allow for emissions to steadily decline and reach half by 2030 and then to zero by 2050. An analogy that has been used to illustrate the enormity of the climate challenge is equating needed emissions reductions to falling off a cliff. If the world had begun steadily decreasing emissions around 10 years ago, we would only need to have been reducing emissions by 2 percent a year. Since we didn't achieve those reductions, global emissions now need to fall off of a cliff - decreasing more than an average of 7 percent a year until dropping to zero to keep 1.5 degrees C within reach.[18] Because the long-term temperature impacts of climate-warming emissions are cumulative, what this means is that the world now has an even greater challenge to reduce emissions at a faster rate than what was previously estimated. In the words of UN Emissions Gap Report scientists, we now have "four times the work or one-third the time" to contain dangerous global temperature rise.[19]

The reality is that the current pace of reduction and the ambition of national government climate policy efforts are woefully inadequate to stay within our remaining carbon budget, which at the start of 2018 was only 420 gigatonnes of carbon dioxide.[20] At our current rate of emissions, we would deplete this entire remaining budget within the next 10 years.[21] The 2020 UN Emissions Gap Report identifies a 29-32 gigatonne CO_2-equivalent gap between current policies and projected emissions levels in 2030 that would allow us to keep the 1.5 degrees Celsius goal within reach.[22] This "emissions gap" has widened four times since 2010,[23] and has remained virtually stagnant for the last several years, prior to the COVID-19 pandemic. Translated into global temperature rise, scientists estimate that the world is on track to warm more than 3 degrees C by the end of the century.[24] The Climate Action Tracker assesses current national

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[17] IPCC. (2018). *Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments—IPCC*. https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/

[18] Höhne, N., Elzen, M. den, Rogelj, J., Metz, B., Fransen, T., Kuramochi, T., Olhoff, A., Alcamo, J., Winkler, H., Fu, S., Schaeffer, M., Schaeffer, R., Peters, G. P., Maxwell, S., & Dubash, N. K. (2020). Emissions: World has four times the work or one-third of the time. *Nature*, *579*(7797), 25–28. https://doi.org/10.1038/d41586-020-00571-x

[19] *ibid.*

[20] IPCC. (2018).

[21] Hausfather, Z. (2018, April 9). *How much 'carbon budget' is left to limit global warming to 1.5C?* Carbon Brief. https://www.carbonbrief.org/analysis-how-much-carbon-budget-is-left-to-limit-global-warming-to-1-5c

[22] UNEP. (2020). *The emissions gap report 2020*. https://www.unep.org/emissions-gap-report-2020

[23] Höhne, et al. (2020).

[24] UNEP. (2020)

policies are so insufficient that without additional and more ambitious effort, there is a 97 percent probability that the world will exceed 2 degrees C temperature rise.

3. China's plans to decarbonize by 2060

While the data show that countries' track record for addressing climate change has not been adequate, around 127 countries totaling more than 68 percent of the global economy have pledged to decarbonize, including the world's largest emitter of greenhouse gas emissions - China.[25] China's President Xi Jinping announced at the September 2020 United Nations General Assembly meeting that it would commit to become carbon neutral by 2060.[26] Responsible for 28 percent of global greenhouse gas emissions,[27] China joined a number of major economies, including France and the United Kingdom, which have codified their 2050 net-zero targets into legislation, Japan, the Republic of Korea, Canada, South Africa, among others.[28] This carbon neutrality pledge is significant for several reasons. China historically has only made climate-related commitments bilaterally or in multilateral fora, such as the United Nations Framework Convention on Climate Change (UNFCCC). The bilateral climate agreement between the U.S. and China is largely hailed as being critical for securing the Paris Agreement, breaking years of impasse on climate action between the two largest climate emitters.[29] Instead, China unilaterally made its carbon neutral pledge, outside of a specific climate or energy forum, and without any qualifiers or statements of conditionality. If successful, China's achievement of its carbon neutrality goal could cool the planet by 0.2-0.3 degrees Celsius by 2100 on its own.[30]

It will be challenging for China to achieve this goal. The country will need to eliminate coal as part of its energy mix, which in 2018 comprised around 62 percent of its total primary energy supply and generates 65 percent of electricity.[31] The world's largest producer and consumer of coal, China also tops the world

[25] ECIU. (2021). *Net Zero Tracker*. Energy & Climate Intelligence Unit. https://eciu.net/netzerotracker
[26] Ministry of Foreign Affairs, People's Republic of China. (2020). "Statement by H.E. Xi Jinping President of the People's Republic of China at the General Debate of the 75th Session of the United Nations General Assembly." Available: https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1817098.shtml.
[27] Global Carbon Project (2020).
[28] ECIU. (2021). *Net Zero Tracker*. Energy & Climate Intelligence Unit. https://eciu.net/netzerotracker
[29] Stern, T. (2020). "Can the United States and China Reboot their Climate Cooperation?" Brookings, Sept. 14. Available: https://www.brookings.edu/articles/can-the-united-states-and-china-reboot-their-climate-cooperation/.
[30] Climate Action Tracker. (2021). *China Country Summary*. https://climateactiontracker.org/countries/china/
[31] International Energy Agency. (2020). China. Available: https://www.iea.org/countries/china.

in terms of global installed coal-fired electricity power.[32] Oil and natural gas are also prominent in China's energy supply, comprising 27 percent as of 2018.[33] They have a plan to completely phase out coal by 2050 and generate 90 percent of all electricity from non-fossil sources, including renewables and energy.[34] To do this will require a 16-fold increase in solar energy, a nine-fold growth in wind power, and increasing nuclear power by six times and doubling hydroelectricity.[35] Achieving these goals will also require China to push their original timeline for achieving their climate and energy goals earlier and more aggressively. According to Tsinghua University, one of the country's leading academic institutions charged with developing China's 2060 carbon neutrality roadmap, China will need to ramp the ambition of its original 2015 Paris pledge, such as shifting its goal for making renewables 20 percent of its energy mix five years earlier to 2025 as well as potentially increasing this target to 25 percent.[36] In 2020 national governments were called upon to increase the ambition of their 2015 Paris contributions. Although China at the time of writing has not yet submitted its "enhanced ambition" nationally-determined contribution, the top leadership has signaled its intent to do so to align with its new carbon neutrality goals.[37]

To meet these ambitious clean energy targets, China will need to grow their investments in renewable energy to around $15 trillion USD between 2020 and 2050 - a number that is more than China's entire 2018 GDP.[38] Two decades ago, China's clean energy sector was virtually non-existent, but today China top's global clean energy investments with an average total around $100 billion USD each year - double the United States and more than the United States and European Union combined.[39] These investments to develop a national innovation system with clean energy at the center have paid off - China is a leading manufacturer of wind, solar, and electric vehicle technology. China now leads the world in these technologies; five of the 10 largest wind turbine manufacturers and nine of the world's top 10 solar panel manufacturers are Chinese-owned or operated.[40] More than two-thirds of the world's solar panels and half

[32] Global Energy Monitor. (2020). Global Coal Plant Tracker. Available: https://endcoal.org/global-coal-plant-tracker/
[33] International Energy Agency. (2020). China. Available: https://www.iea.org/countries/china.
[34] Myllyvirta, L. (2020). Influential academics reveal how China can achieve its carbon neutrality goal. Carbon Brief. 14 October. Available: https://www.carbonbrief.org/influential-academics-reveal-how-china-can-achieve-its-carbon-neutrality-goal
[35] Mallapaty, S. (2020). How China could be carbon neutral by mid-century. *Nature*.
[36] *ibid.*
[37] Gabbattis, J. (2021). Analysis: Which countries met the UN's 2020 deadline to raise 'climate ambition'? Carbon Brief. Available: https://www.carbonbrief.org/analysis-which-countries-met-the-uns-2020-deadline-to-raise-climate-ambition
[38] Bloomberg News. (2020). China seeks big money's help in reaching its carbon neutral goal. Available: https://www.bloomberg.com/news/articles/2020-10-27/china-seeks-big-money-s-help-reaching-its-carbon-neutral-goal; Myllyvirta (2020).
[39] REN-21. (2020). https://www.ren21.net/gsr-2020/chapters/chapter_05/chapter_05/
[40] *ibid.*

of global wind turbines are produced in China.[41] China is also responsible for around 37 percent of passenger electric vehicles and 99 percent of the e-buses sold globally since 2011.[42] They have installed this technology at home at breakneck speed - doubling wind capacity every year from 2005 and 2009 and now having the highest installed capacity of solar PV in the world - being the first country to surpass a total of 100 GW installed in 2017.[43]

The U.S. and the world can have confidence that China will meet its carbon neutrality target. The country's past record demonstrates that it has met or has come extremely close to meeting every single energy and environmental target made. China is on track to overachieve its 2020 and 2030 carbon intensity reduction targets, with some suggesting that emissions may peak between 2021 to 2025 - much earlier than its "2030 or as soon as possible" Paris pledge.[44] Aside from the economic opportunities for its clean energy industry, China's climate actions have also been driven largely by domestic concerns over air pollution, which is estimated to have caused around 1.8 million deaths or 17 percent of all deaths in 2019 in China. Substantial investments in air pollution control have also paid dividends in climate co-benefits.[45] Independent, satellite analyses of China's air pollution reductions confirm these achievements.[46]

4. A groundswell of subnational and business climate action supports global climate efforts

While national climate policy efforts have stagnated in recent years, a groundswell of city, region, and company actors are stepping up to fill the emissions gap. Climate policy scholars increasingly view city, regional, and business actors' engagement in global climate change governance as critical to meeting national and international climate goals. Scaled-up participation from all levels of government and sectors formed a key "pillar" of the Paris Agreement.[47] Currently, more than 10,000 subnational actors, 4,000

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[41] *ibid.*
[42] Bloomberg New Energy Finance. (2018).Cumulative Global EV Sales Hit 4 Million. Available: https://about.bnef.com/blog/cumulative-global-ev-sales-hit-4-million/
[43] Yan, J. and Myllyvirta, L. (2017). China has already surpassed its 2020 solar target. Greenpeace. Available: https://unearthed.greenpeace.org/2017/08/25/china-raises-solar-power-target/
[44] Climate Action Tracker. (2020). China. Available: https://climateactiontracker.org/countries/china/; Wang, H., Lu, X., Deng, Y., Sun, Y., Nielsen, C. P., Liu, Y., ... & McElroy, M. B. (2019). China's CO 2 peak before 2030 implied from characteristics and growth of cities. Nature Sustainability, 2(8), 748-754.
[45] Institute for Health Metrics and Evaluation. (2021). Global Burden of Disease. Available: https://vizhub.healthdata.org/gbd-compare/.
[46] Ma, Z., Liu, R., Liu, Y., & Bi, J. (2019). Effects of air pollution control policies on PM 2.5 pollution improvement in China from 2005 to 2017: A satellite-based perspective. *Atmospheric Chemistry and Physics*, *19*(10), 6861-6877.
[47] Hale, T. (2016). "All hands on deck": The paris agreement and nonstate climate action. Global Environmental Politics, 16(3), 12-22.

businesses, 1,000 investors, among others have pledged some action on climate change.[48] These entities pledge individual commitments or join voluntary initiatives, like C40 Cities for Climate Change Leadership and the Science-Based Target Initiatives, which often commit actors to specific targets and help connect cities, companies, and other actors to share knowledge, build capacity, disclose carbon emissions information, and pursue other goals. Rather than a simple hub and spoke model of nation-state centric governance, with the UNFCCC at the center, global climate governance is increasingly described as a diverse ecosystem of actors, with multiple nodes interacting simultaneously.

Our research demonstrates that nearly 6,000 cities, states and regions, and over 1,500 companies could lower greenhouse gas emissions by 1.2 to 2.0 gigatons of carbon dioxide equivalent/year ($GtCO_2e$/year) in 2030, compared to what would be achieved merely through national policies that are currently underway.[49] This *additional* reduction amounts to roughly four percent of the world's total annual greenhouse gas emissions, or about as much as carbon Japan and Canada emit in a year. In the United States, city, region, and company commitments could provide at least half of the emissions reductions needed to meet its Paris pledge.[50] But these pledges are just the start - many subnational and corporate actors have also committed to decarbonize. As of October 2020, 826 cities and 103 regional governments, including 24 U.S. states, had made net-zero commitments, whether economy-wide or focused on a specific sector (i.e., electricity or buildings).[51] The population living in these cities and regions equals around 880 million people or around 11 percent of the global population. Around 1,565 companies representing 12.5 trillion USD have also joined in pledging a net-zero target.[52]

Summary

The challenge ahead of the world in terms of the speed and pace required to reduce emissions is pressing. How national governments design post-COVID 19 economic recovery strategies, in addition to individual behavior responses, will largely determine how much global emissions rebound to pre-COVID-19

[48] UNFCCC. (2020). Global Climate Action Portal. Available: https://climateaction.unfccc.int; Hsu, A., Yeo, Z.Y., Rauber, R., Sun, J., Kim, Y., Raghavan, S., Chin, N., Namdeo, V., and Weinfurter, A. (2020). ClimActor, a harmonized dataset of 10,000+ city and region transnational climate network participation. Nature Scientific Data.
[49] Kuramochi, T., M. Roelfsema, A. Hsu, S. Lui, A. Weinfurter, S.Chan, T. Hale, A. Clapper, A. Chang & N. Höhne (2020): Beyond national climate action: the impact of region, city, and business commitments on global greenhouse gas emissions, Climate Policy, DOI: 10.1080/14693062.2020.1740150.
[50] Kuromochi et al. (2020)
[51] NewClimate Institute & Data-Driven EnviroLab (2020). Navigating the nuances of net-zero targets. Research report prepared by the team of: Thomas Day, Silke Mooldijk and Takeshi Kuramochi (NewClimate Institute) and Angel Hsu, Elwin Lim, Zhi Yi Yeo, Amy Weinfurter, Yin Xi Tan, Ian French, Vasu Namdeo, Odele Tan, Sowmya Raghavan, and Ajay Nair (Data-Driven EnviroLab).
[52] *ibid*.

levels.[53] The global pandemic has provided a narrow window for governments to reset their approach to addressing climate change. The realities of precipitously declining prices for renewable energy options and a demand for renewables that has remained relatively unaffected by the global pandemic provides the space for renewable energy expansion to continue to contribute to emissions reductions and energy security in tandem. Friendly competition in the renewable energy sector between major global powers can be an effective vehicle towards decarbonization of the global economy and sustained progress towards emissions reduction targets, and continued progress from subnational and business actors in reducing supply chain emissions and switching to greener energy sources will help to fill in the gaps. The urgency for humanity to get to zero emissions by mid-century remains if we are to stave off climate change's most pernicious effects, and even then the impacts will be felt all across the world.

[53] Le Quéré, C., Jackson, R. B., Jones, M. W., Smith, A. J. P., Abernethy, S., Andrew, R. M., De-Gol, A. J., Willis, D. R., Shan, Y., Canadell, J. G., Friedlingstein, P., Creutzig, F., & Peters, G. P. (2020). Temporary reduction in daily global CO 2 emissions during the COVID-19 forced confinement. *Nature Climate Change*, *10*(7), 647–653. https://doi.org/10.1038/s41558-020-0797-x