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WHITE PAPER SERIES

United States And China
Competitors or Collaborators to Combat Climate Change?

By Anita Tang

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China is the world's largest emitter of greenhouse gases, and the United States, the second.

The two countries had been at the forefront of environmental collaboration as early as the 1980's. Their environmental partnership took a serious toll when the Trump administration began setting tariffs and other trade barriers on China in January 2018, and the conflicts eventually turned into a full-blown U.S.-China trade war.

This White Paper examines what the United States and China are doing vis-à-vis their environmental commitments to the global community. We also bring this question to the foreground: "Will the world's two largest greenhouse-gas emitters work together in some ways to combat climate change?"

Climate Change Shocks – Right Here, Right Now

In 2021, just in the month of July alone, the disastrous wildfire destroyed the entire Lytton village in British Columbia, Canada. Over the border to Oregon and Washington in the U.S., a death toll of nearly 200 people is reported during the record-breaking heatwave. Across the Atlantic, flash floods hit Germany and Belgium with death toll rising to over 200. Down south to Africa, heavy rain flooded Lagos in Nigeria and paralyzed its entire economic activity. Some 5,700 miles away in Russia, flooding affected 99 settlements across its territory and regions and have forced almost 4,000 people to evacuate their homes. South in Inner Mongolia, China, two reservoir dams failed after a period of heavy rainfall and thousands are affected by the resulting floods. Moving southeast to Henan province, flooding turned the streets in Zhengzhou to rivers, killed at least 57 with close to a million people being removed from their homes. Heavy floods in India resulted in landslides which took away lives of some 125 people. Natural disasters also adversely affected people in Costa Rica, Saudi Arabia, Iran, Turkey, France, Italy, Austria, the Philippines, among others.

Climate change is right here impacting our normal life. We can see it and feel it.

Climate change, broadly interpreted, is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It is caused by factors that include oceanic processes, biotic processes, variations in solar radiation received by Earth, plate tectonics and volcanic eruptions, and human-induced alterations of the natural world. The latter effect is currently causing global warming, and "climate change" is often used to describe human-specific impacts.[1]

> ***"Taken as a whole, the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time."***
>
> *Intergovernmental Panel on Climate Change, NASA*

Former U.S. Vice President Al Gore's documentary film and book, "An Inconvenient Truth" (2006), raised awareness of global warming:[2]

[1] "History of Climate Change Science," Wikipedia. Retrieved on July 19, 2021, https://en.wikipedia.org/wiki/History_of_climate_change_science

[2] "Excerpt: 'An Inconvenient Truth'," NPR Special Series, Global Warming, All Things Considered, May 31, 2006. Retrieved on July 19, 2021, https://www.npr.org/templates/story/story.php?storyId=5441976

"Global warming is not just about science and that it is not just a political issue. It is really a moral issue.

"The voluminous evidence now strongly suggests that unless we act boldly and quickly to deal with the underlying causes of global warming, our world will undergo a string of terrible catastrophes, including more and stronger storms like Hurricane Katrina, in both the Atlantic and the Pacific."

Environmental Cooperation Led by U.S.-China Partnership

China is the world's largest emitter of greenhouse gases (GHG), and the United States, the second.

The two countries had been at the forefront of environmental collaboration. Their partnership on environmental protection started as early as the 1980's. They had engaged in a wide range of cooperative activities aimed at increasing energy efficiency, reducing emissions of pollutants, toxics, and greenhouse gases, limiting threats to public health caused by pollution, and creating a foundation for long-term environmental sustainability.[3]

Joanna Lewis, in her "The U.S.-China Climate and Energy Relationship" report[4], pointed out that during the Obama presidency, the United States pursued an aggressive bilateral agenda to scale up cooperation with China on clean energy and climate change. Since 2009, thousands of people from both countries have worked together to do collaborative research, shared experiences and information, and developed commercial ventures to deploy clean-energy technology.

In 2014, the United States and China made a joint announcement on their intent to reduce emissions with their respective climate targets, which helped build international momentum. By December 2015, 180 countries representing nearly 95 percent of global

[3] "U.S.-China Environmental Cooperation," Editorials, October 31, 2010. Retrieved on July 19, 2021, https://editorials.voa.gov/a/us---china-environmental-co-op-106487809/1482128.html

[4] "The U.S.-China Climate and Energy Relationship – Chapter 10, Climate Change and Energy," Joanna Lewis, Center for Strategic and International Studies, September 2017. Retrieved on July 19, 2021, https://www.csis.org/us-china-climate-and-energy-relationship

emissions announced their climate targets. They signed the Paris Climate Accord (Paris Agreement) which replaced the 2005 Kyoto Protocol.

However, the Trump presidency brought a different approach to the issue – one that moved the United States further away from its allies, from its alliances on climate and energy with China, and alienated it from ongoing multilateral climate negotiations.

On November 4, 2020, the Trump administration formally withdrew from the Paris Climate Accord. U.S. emissions have declined more slowly during President Trump's term than when President Obama was in the White House. Other advanced economies like the EU and Japan have reduced emissions faster[5]:

> "In Obama's eight years as president, CO_2 emissions from burning fossil fuels and cement production fell by 11 percent. The amount of coal used for primary energy production decreased by 38 percent while renewable generation went up by 44 percent.
>
> "In Trump's three years in power to 2019, this trend continued but slowed down. CO_2 emissions fell by just 0.5 percent. Coal use for primary energy production went down 3 percent, despite the president's talk of reviving the industry, while renewables rose 11 percent."

Photo by Shane Rounce on Unsplash

Once inaugurated, President Biden signed an executive order (January 20, 2021) to rejoin the Paris Agreement. The country formally rejoined on February 19, 2021.[6]

The United States may see China as an adversary or a competitor on different fronts, but there is a glimmer of hope that the Biden administration may help the two nations again find common ground as collaborators to address climate change.

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[5] "Where are U.S. Emissions After Four Years of President Trump?" Joe Lo, Climate Home News, June 10, 2020. Retrieved on July 19, 2021, https://www.climatechangenews.com/2020/10/06/us-emissions-four-years-president-trump

[6] "United States Withdrawal from the Paris Agreement," Wikipedia. Retrieved on July 19, 2021, https://en.wikipedia.org/wiki/United_States_withdrawal_from_the_Paris_Agreement

Deep Decarbonization is Needed to Tackle Climate Change

In a January 28, 2020 article published by the Yale School of the Environment, David G. Victor asserted the urgency of the need for a realistic blueprint to wean our economies off carbon emissions:[7]

> "Emissions are now rising at about 1 to 2 percent annually, even though a new UN study shows they must tumble nearly 8 percent per year to be consistent with holding warming to 1.5 degrees Celsius.
>
> "No major economy has ever cut emissions of warming gases that quickly; it's not practical to make such cuts globally on the time frame of industrial and agricultural systems that usually don't change quickly.
>
> "The planet will blow through the 1.5 degrees Celsius goal and through 2 degrees Celsius as well. Even with a big effort, we may be on track for 3 degrees Celsius or more – levels of warming that scientists say will have ruinous consequences."

Though close to 200 countries are involved in the encouraging framework of the Paris Climate Accord, Victor pointed out that "Global diplomacy and global agreements will operate too slowly and too cautiously to address the climate crisis. Global agreements have a role to play, but they will largely be followers rather than leaders."

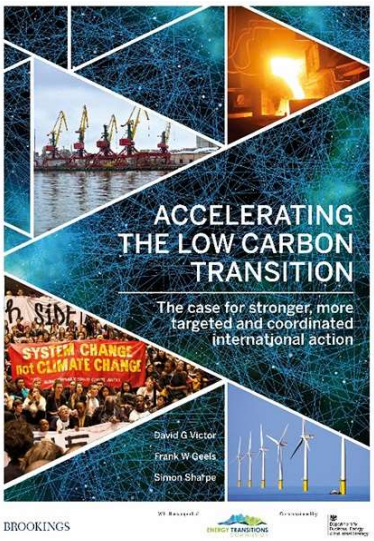
So, where does the world stand now on sustainability?

The 2020 Environment Performance Index (EPI) ranked Denmark on top. Other nations in the top tier included Luxembourg, Switzerland, the U.K., and France, while the U.S. was in the 24th spot, and China, 120th (see Figure 1 for the complete listing).

This is the 22nd year that researchers at Yale and Columbia universities produced this biennial scorecard of national results on a range of sustainability issues. EPI provides a data-driven summary of the state of sustainability around the world. Using 32 performance

[7] "Deep Decarbonization: A Realistic Way Forward on Climate Change," David G. Victor, Yale Environment 360, January 28, 2020. Retrieved on July 20, 2021, https://e360.yale.edu/features/deep-decarbonization-a-realistic-way-forward-on-climate-change

indicators across 11 issue categories, the EPI ranks 180 countries on environmental health and ecosystem vitality.[8]



"Accelerating the Low Carbon Transition," a report published by the Brookings Institution in November 2019[9], argued that getting serious about decarbonization requires a new approach to industrial policy – one that is organized sector-by-sector and coordinated internationally to create progressively larger markets and stronger incentives for decarbonized industries. The report suggested that decarbonization requires a string of technological revolutions in each of the major emitting sectors. The 10 sectors identified accounted for some 80 percent of world emissions:

1. Power
2. Agriculture
3. Cars
4. Trucks
5. Shipping
6. Aviation
7. Buildings
8. Steel
9. Cement
10. Plastics

China Puts its Climate Commitment on The Table

Despite COVID-19 pandemic-related slowdown, global emissions are still on the rise.

On September 23, 2020, Chinese President Xi Jinping told the UN General Assembly that China aims to have CO_2 emission peak before 2030 and achieve carbon neutrality before 2060.

Beijing's commitment prompted neighboring countries to follow suit, with Japan committing to net-zero greenhouse-gas emissions and South Korea to carbon neutrality by 2050. According to Greenpeace, these three Asian economies together accounted for one-third of all global carbon emission in 2018.[10]

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[8] "Decarbonization Propels Countries to Top Sustainability Rankings in 2020 EPI Index," Yale School of the Environment, June 4, 2020. Retrieved on July 20, 2021, https://environment.yale.edu/news/article/decarbonization-propels-countries-to-top-sustainability-rankings-in-2020-epi-index

[9] "Accelerating the low carbon transition," David G. Victor, Frank W. Geels and Simon Sharpe, Energy Transitions Commission, November 2019. Retrieved on July 20, 2021, https://www.energy-transitions.org/publications/accelerating-the-low-carbon-transition

[10] "Is China's Five-year Plan a Decarbonization Blueprint? Stuart Braun, Made for Minds, March 5, 2021. Retrieved on July 20, 2021, https://www.dw.com/en/china-coal-emissions-climate-change/a-56644449

The EU is a big bloc that is fully committed to neutrality and cheered on China's commitment. China has underscored how firmly it aligns with a common agenda with the EU on climate policy.[11]

Figure 1: 2020 EPI Rank, Score, and Regional Rank (REG) for 180 countries

RANK	COUNTRY	SCORE	REG
1	Denmark	82.5	1
2	Luxembourg	82.3	2
3	Switzerland	81.5	3
4	United Kingdom	81.3	4
5	France	80.0	5
6	Austria	79.6	6
7	Finland	78.9	7
8	Sweden	78.7	8
9	Norway	77.7	9
10	Germany	77.2	10
11	Netherlands	75.3	11
12	Japan	75.1	1
13	Australia	74.9	12
14	Spain	74.3	13
15	Belgium	73.3	14
16	Ireland	72.8	15
17	Iceland	72.3	16
18	Slovenia	72.0	1
19	New Zealand	71.3	17
20	Canada	71.0	18
	Czech Republic	71.0	2
	Italy	71.0	18
23	Malta	70.7	20
24	United States of America	69.3	21
25	Greece	69.1	3
26	Slovakia	68.3	4
27	Portugal	67.0	22
28	South Korea	66.5	2
29	Israel	65.8	1
30	Estonia	65.3	5
31	Cyprus	64.8	6
32	Romania	64.7	7
33	Hungary	63.7	8
34	Croatia	63.1	9
35	Lithuania	62.9	10
36	Latvia	61.6	11
37	Poland	60.9	12
38	Seychelles	58.2	1
39	Singapore	58.1	3
40	Taiwan	57.2	4
41	Bulgaria	57.0	13
42	United Arab Emirates	55.6	2
43	North Macedonia	55.4	14
44	Chile	55.3	1
45	Serbia	55.2	15
46	Brunei Darussalam	54.8	5
47	Kuwait	53.6	3
48	Jordan	53.4	4
49	Belarus	53.0	1
50	Colombia	52.9	2
51	Mexico	52.6	3
52	Costa Rica	52.5	4
53	Armenia	52.3	2
54	Argentina	52.2	5
55	Brazil	51.2	6
56	Bahrain	51.0	5
	Ecuador	51.0	7
58	Russia	50.5	3
59	Venezuela	50.3	8
60	Ukraine	49.5	4
61	Uruguay	49.1	9
62	Albania	49.0	16
63	Antigua and Barbuda	48.5	10
64	Cuba	48.4	11
	St. Vincent and Grenadines	48.4	11
66	Jamaica	48.2	13
67	Iran	48.0	6
68	Malaysia	47.9	6
69	Trinidad and Tobago	47.5	14
70	Panama	47.3	15
71	Tunisia	46.7	7
72	Azerbaijan	46.5	5
73	Paraguay	46.4	16
74	Dominican Republic	46.3	17
	Montenegro	46.3	17
76	Gabon	45.8	2
77	Barbados	45.6	18
78	Bosnia and Herzegovina	45.4	18
	Lebanon	45.4	8
	Thailand	45.4	7
81	Suriname	45.2	19
82	Mauritius	45.1	3
	Tonga	45.1	8
84	Algeria	44.8	9
85	Kazakhstan	44.7	6
86	Dominica	44.6	20
87	Moldova	44.4	7
88	Bolivia	44.3	21
	Uzbekistan	44.3	8
90	Peru	44.0	22
	Saudi Arabia	44.0	10
92	Turkmenistan	43.9	9
93	Bahamas	43.5	23
94	Egypt	43.3	11
95	El Salvador	43.1	24
	Grenada	43.1	24
	Saint Lucia	43.1	24
	South Africa	43.1	4
99	Turkey	42.6	19
100	Morocco	42.3	12
101	Belize	41.9	27
102	Georgia	41.3	10
103	Botswana	40.4	5
104	Namibia	40.2	6
105	Kyrgyzstan	39.8	11
106	Iraq	39.5	13
107	Bhutan	39.3	1
108	Nicaragua	39.2	28
109	Sri Lanka	39.0	2
110	Oman	38.5	14
111	Philippines	38.4	9
112	Burkina Faso	38.3	7
	Malawi	38.3	7
114	Tajikistan	38.2	12
115	Equatorial Guinea	38.1	9
116	Honduras	37.8	29
	Indonesia	37.8	10
118	Kiribati	37.7	11
119	São Tomé and Príncipe	37.6	10
120	China	37.3	12
120	Samoa	37.3	12
122	Qatar	37.1	15
123	Zimbabwe	37.0	11
124	Central African Republic	36.9	12
125	Dem. Rep. Congo	36.4	13
126	Guyana	35.9	30
127	Maldives	35.6	3
	Uganda	35.6	14
129	Timor-Leste	35.3	14
130	Laos	34.8	15
	Sudan	34.8	16
132	Kenya	34.7	15
	Zambia	34.7	15
134	Ethiopia	34.4	17
	Fiji	34.4	16
136	Mozambique	33.9	18
137	Eswatini	33.8	19
	Rwanda	33.8	19
139	Cambodia	33.6	17
	Cameroon	33.6	21
141	Viet Nam	33.4	18
142	Pakistan	33.1	4
143	Micronesia	33.0	19
144	Cabo Verde	32.8	22
145	Nepal	32.7	5
146	Papua New Guinea	32.4	20
147	Mongolia	32.2	21
148	Comoros	32.1	23
149	Guatemala	31.8	31
150	Tanzania	31.1	24
151	Nigeria	31.0	25
152	Marshall Islands	30.8	22
	Niger	30.8	26
	Republic of Congo	30.8	26
155	Senegal	30.7	28
156	Eritrea	30.4	29
157	Benin	30.0	30
158	Angola	29.7	31
159	Togo	29.5	32
160	Mali	29.4	33
161	Guinea-Bissau	29.1	34
162	Bangladesh	29.0	6
163	Vanuatu	28.9	23
164	Djibouti	28.1	35
165	Lesotho	28.0	36
166	Gambia	27.9	37
167	Mauritania	27.7	38
168	Ghana	27.6	39
	India	27.6	7
170	Burundi	27.0	40
	Haiti	27.0	32
172	Chad	26.7	41
	Solomon Islands	26.7	24
174	Madagascar	26.5	42
175	Guinea	26.4	43
176	Côte d'Ivoire	25.8	44
177	Sierra Leone	25.7	45
178	Afghanistan	25.5	8
179	Myanmar	25.1	25
180	Liberia	22.6	46

Asia-Pacific
Eastern Europe
Former Soviet States
Global West
Greater Middle East
Latin America & Caribbean
Southern Asia
Sub-Saharan Africa

Source: Environmental Performance Index 2020, XII 2020 epi report. table es-1.
https://epi.yale.edu/downloads/epi2020report20210112.pdf

[11] "Did Xi Just Save the World?" Adam Tooze, Foreign Policy, September 25, 2020. Retrieved on July 21, 2021, https://foreignpolicy.com/2020/09/25/xi-china-climate-change-saved-the-world%e2%80%a8

Beijing is sending a clear and powerful message: it is playing by the rules of the Paris Agreement, which revolve around independent national commitments. It has not asked for a quid pro quo from other countries. It is simply taking the lead, especially when the world cannot depend on the United States to take that position.

China's 14th Five-year Plan, 2021-2025

All eyes were on China's 14th Five-year Plan (FYP), expecting to see an update of China's promise to achieve peak carbon before 2030.

However, the Plan announced on March 5, 2021 only included a GDP target for 2021 instead of the entire five-year period, which, as Greenpeace's Li Shuo puts, "will not allow us to calculate the absolute emission increase over the next five years. As a result, the FYP defers some of the key climate questions to into the future." Nevertheless, Li picked up a positive signal in the Plan – the proportion of non-fossil-fuel sources in China's energy mix rises from 15 percent in the last five-year plan to around 20 percent for 2021-2025.[10]

Though many observers question China's ability to quit its dependency on coal and its ability to quickly transition to renewable energy to meet its emission time-commitment, others are hopeful that China can make it happen, especially when the cost of renewables is coming down fast.

Greenpeace's Li noted that China has the "habit of under-committing and over-delivering five-year plans," suggesting that "these targets will hopefully hedge against a surge in further emission growth."[10]

Christine Loh, chief development strategist at the Institute for the Environment at Hong Kong University of Science and Technology, believes that China's decarbonization target "did not come out of the blue." Given the scale of China's 2060 pledge, Loh believes that China has not only been planning for a decarbonization revolution, but that it also fears the impact of climate change, including severe flooding. "It believes in the science," she said.[10]

The U.S. Plan is about A Clean Energy Revolution

Combatting climate change was a part of the Biden presidential campaign, and he is following through that cause as the 46th president of the country. As soon as he took office in

January 2021, President Biden unveiled his environmental plan, a Green New Deal-like initiative aimed at putting climate change at the center of the country's domestic, national security and foreign policy[12]. The U.S. also formally rejoined the Paris Climate Accord on February 19, 2021.

> ***At this moment of profound crisis, we have the opportunity to build a more resilient, sustainable economy – one that will put the United States on an irreversible path to achieve net-zero emissions, economy-wide, by no later than 2050.***
>
> *Biden-Harris, Battle for the Soul of the Nation*

"Right now we have to act and act fast. We're late in the game here," President Biden said at the White House on June 30, 2021, during a meeting with governors from western states facing a record-breaking heat wave. "The truth is we're playing catch up. This is an area that has been under resourced, but that's going to change if we have anything to do with it."[13]

The infrastructure plan Biden proposed will cost around US$2 trillion. This covers investments in infrastructure, an American-based energy-efficient automobile industry, increased public transportation options, a sustainable power sector, weatherized buildings and housing, scientific innovations, climate-smart agriculture and conservation, and efforts to promote environmental justice.[14]

The U.S. Plan for Climate Change

President Biden took seriously the scientific consensus that the world needs to keep global temperatures from rising more than 1.5 degrees Celsius above preindustrial levels in order to avert irreversible planetary damage. He pledged to cut America's emissions in half

[12] "Biden Pitches Green New Deal-like $2 Trillion Environmental Plan," Steven Nelson and Mark Moore, New York Post, January 27, 2021. Retrieved on July 21, 2021, https://nypost.com/2021/01/27/biden-pitches-green-new-deal-like-2t-environmental-plan

[13] "'We have to Act and Act Fast:' Biden says Climate Change is Driving Wildfires and Historic Heat Wave," Nikki Carvajal and Kate Sullivan, CNN, June 30, 2021. Retrieved on July 21, 2021, https://www.cnn.com/2021/06/30/politics/wildfire-response-western-governors-biden-meeting/index.html

[14] "What Exactly Are Joe Biden's Climate & Environmental Plans?" EarthTalk, Good Men Project, May 18, 2021. Retrieved on July 21, 2021, https://goodmenproject.com/featured-content/what-exactly-are-joe-bidens-climate-environmental-plans

by 2030, eliminate fossil-fuel emissions from power plants by 2035 and zero out all greenhouse-gas emissions by midcentury.[15]

The Biden administration addresses its climate-change plan in the following areas:[16]

1. Ensure the U.S. achieves a 100 percent clean-energy economy and reaches net-zero emissions no later than 2050
2. Build a stronger, more resilient nation
3. Rally the rest of the world to meet the threat of climate change
4. Stand up to the abuse of power by polluters who disproportionately harm communities of color and low-income communities
5. Fulfill the U.S.' obligation to workers and communities who powered the country's industrial revolution and subsequent decades of economic growth

Execution of the Plan, like almost everything else, hinges on funding.

Funding was not looking good as Congress and the White House are still wrangling over the infrastructure bill. In mid-July, however, new hopes surfaced when President Biden and congressional Democrats vowed to push through a US$3.5 trillion budget-blueprint to vastly expand social and environmental programs. The legislation is far from passage, but top Democrats have agreed on working to include several far-reaching details, and clean energy is a part of it, among others.[17]

Competition or Collaboration?

Underlying the confrontations on combatting climate change was the assumption that tackling climate change would be costly, and negotiations were mostly about how these

[15] "Joe Biden's Monumental Environmental Gambit." Editorial, New York Times, July 17, 2021. Retrieved on July 21, 2021, https://www.nytimes.com/2021/07/17/opinion/biden-climate-change.html

[16] "Biden's Plan for Climate Change," Greg Daugherty, Investopedia, April 22, 2021. Retrieved on July 21, 2021, https://www.investopedia.com/biden-s-plan-for-climate-change-5083643

[17] "Democrats Roll Out $3.5 Trillion Budget to Fulfill Biden's Broad Agenda," Jonathan Weisman, Emily Cochrane and Jim Tankersley, New York Times, July 14, 2021. Retrieved on July 21, 2021, https://www.nytimes.com/2021/07/14/us/politics/biden-social-spending-deal.html

costs should be distributed. China and many developing countries argued that industrialized nations bore "historical responsibility" to lead on reducing the carbon emissions that had fueled their prosperity.[18]

Stephen Minas, in his May 2, 2021 article, titled "China's Climate Policy Has Major Implications for Trade,"[18] pointed out that "these arguments persist, but the underlying cost-benefit analysis in many countries has shifted radically." He further noted that "for a growing number of countries, reducing emissions is now about transforming economies in order to prosper in the carbon-constrained future."

For such a transformation, it involves education, regulation, innovation, execution, and transition. While there needs to be some adjustment in personal habits and possibly lifestyle, the bulk of the change would be to incorporate more energy-efficient hardware and software into our daily life, which has a lot to do with business enterprises.

To reach carbon neutrality, countries have to lower their greenhouse-gas emissions (six primary sources of greenhouse gas emissions: transportation, electricity production, industry, commercial and residential, agriculture, and land use and forestry) and find ways to capture carbon, or use carbon credits to get to carbon-neutral status. They cannot do it alone.

Competition

When the world sees that China and the United States – the world's two largest GHG emitters – may work together, there are, however, areas for competition that their government have distinctively announced. I am quoting here a case each in transportation and electricity production.

Transportation

Whether it is movement of people or goods, and whether it is through ground, air, or ocean, we need to bring about energy efficiency in transportation.

Developing electric vehicles (EV) and putting them on the road can be high up on many countries' agenda.

[18] "China's Climate Policy Has Major Implications for Trade," Stephen Minas, The Lowy Interpreter, May 2, 2021. Retrieved on July 21, 2021, https://maritime-executive.com/editorials/china-s-climate-policy-has-major-implications-for-trade

China is ahead of the curve in EV for many reasons. As noted by Jack Perkowski, "China has no other choice." He offered his analysis on the three fundamental paths China may follow: "First, it can choose to live with a rapidly growing number of ICE (internal combustion engine) powered vehicles on its roads, with all that implies as far as air pollution and energy independence. Second, the government can restrict the transportation choices of its citizens in an effort to balance environmental concerns. Or third, the country can embrace EV technologies that enable its citizens to have their cars without jeopardizing air quality in its cities."[19]

Matthew Culley and Daniel Grana explained why China is well positioned to lead EV manufacturing:[20]

- There are many EV start-ups coming out of China because China has the unique capability of being able to leverage their low-cost-manufacturing base and support innovative start-ups to focus on a software architecture from the outset.
- They designed their vehicles with a unified software architecture that is capable of being dynamically updated over-the-air down to the firmware and component level.
- By developing a unified software stack, these innovators can continually improve the vehicle after the initial sale. Consumers now have access to the most modern technology longer and are embracing "smart" electric vehicles much faster than expected.

The United States is not contented to be just another player in the big EV market. On May 18, 2021, President Biden said at Ford Motor's Rouge Electric Vehicle Center in Dearborn, Michigan:[21]

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[19] "China Is Leading The World's Boom In Electric Vehicles – Here's Why," Jack Perkowski, Forbes, June 1, 2017. Retrieved on July 22, 2021, https://www.forbes.com/sites/jackperkowski/2017/06/01/china-is-leading-the-worlds-boom-in-electric-vehicles-heres-why/?sh=1fe8411f2f2e

[20] "Emerging Market Equities: China's 'Smart' Opportunity," Matthew Culley and Daniel J. Grana, Emerging Market Equities April 2021, Janus Henderson Investors. Retrieved on July 22, 2021, https://www.janushenderson.com/en-us/investor/article/emerging-market-equities-chinas-smart-opportunity

[21] "'Car guy' Biden Aims to Overtake China in EV Race," Scott Foster, Asia Times, May 21, 2021. Retrieved on July 22, 2021, https://asiatimes.com/2021/05/car-guy-biden-aims-to-overtake-china-in-ev-race

"Look, the future of the auto industry is electric. There's no turning back.

"The only question is whether we'll lead the race or fall behind.

"Right now, China is leading in this race, make no bones about it; they will not win this race. We can't let them."

The Chinese market by itself is very big. Tesla is already there, though recently hitting a speedbump that it has to recall 285,000 of its EVs in China because of some risk associated with its "autopilot feature" that it can rectify by rolling out an online software update to upgrade it.

Photo by Michael Förtsch on Unsplash

Competition from the U.S. or other countries to produce good or better-value EVs should be welcome by consumers in China, and vice versa. The question is – will the government of the two countries levy too high a tariff to make the import EVs not competitive in the market?

Electricity Production

In 2019, 63.3 percent of global electricity came from fossil fuels[22]. In the U.S., approximately 62 percent of electricity came from burning fossil fuels, mostly coal and natural gas[23], and in China, 66.9 percent in which 62.2 percent was from coal[24].

Michael Standaert voiced his concerns on China's coal spree: "China is building large numbers of coal-fired power plants to drive its post-pandemic economy. The government has promised a CO_2 emissions peak by 2030, but the new coal binge jeopardizes both China's decarbonization plans and global efforts to tackle climate change."[25]

Institute for Energy Research (IER) provided some insights in this area:[26]

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[22] "Energy," Hannah Ritchie and Max Roser, Our World in Data, 2020. Retrieved on July 22, 2021, https://ourworldindata.org/electricity-mix

[23] "Sources of Greenhouse Gas Emissions," Greenhouse Gas Emissions, EPA. Retrieved on July 22, 2021, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

[24] "Electricity Sector in China," Wikipedia. Retrieved on July 22, 2021, https://en.wikipedia.org/wiki/Electricity_sector_in_China

[25] "Despite Pledges to Cut Emissions, China Goes on a Coal Spree," Michael Standaert, Yale Environment 360, March 24, 2021. Retrieved on July 22, 2021, https://e360.yale.edu/features/despite-pledges-to-cut-emissions-china-goes-on-a-coal-spree

[26] "China's Economy Is Based on Fossil Fuels," IER, January 8, 2021. Retrieved on July 22, 2021, https://www.instituteforenergyresearch.org/international-issues/chinas-economy-is-based-on-fossil-fuels

"China is allowing coal power plants to be built until around 2030 when China will be richer and replacement technologies will have advanced and their costs will be lower.

"China's coal industry believes it can coexist with the 2060 pledge. Five years ago, Chinese companies began upgrading their plants to trap more of the small particulates that generate smog, and to produce more electricity from every ton of coal they burn.

"Chinese power companies tout that their best coal power plants are on the same environmental level as some natural-gas-fired units.

"Chinese companies also believe that technology breakthroughs in areas such as carbon capture and sequestration, which traps and stores the greenhouse gases emitted when coal is burned, will help to achieve carbon neutrality."

IER also pointed out that China is investing heavily in oil-refining capacity and is about to unseat the United States as the world leader in petroleum refining, a position the United States has held for over a century. According to the International Energy Agency, China is expected to dethrone the United States as the number one petroleum product producer as early as next year (2022).

Collaboration

Besides lowering greenhouse-gas emissions, finding ways to capture carbon are also important to help our planet reach carbon neutrality.

There are areas that neither the U.S. nor China are clear leaders, and other countries in the world are in the race – which should open up avenues for collaboration and cooperation. Carbon capture and storage, and carbon trading may fit into this area.

Carbon Capture and Storage

Carbon capture and storage (CCS) could potentially capture around 90 percent of the CO_2 emitted when fossil fuels such as coal are used. It would then be transported and stored safely underground so it cannot contribute to climate change. CCS can also be applied to

gas-fired power plants, and on various CO_2 emitting sources such as oil refineries and cement, chemical or steel plants.[27]

CO_2 capture technology has been in used since the 1920's for separating CO_2 sometimes found in natural gas reservoirs from the saleable methane gas. This existing technology started being applied to CCS since the 1970's.[28]

ReportLinker issued a 124-page report in April 2019 profiling the leading companies operating within the carbon-capture-and-storage market. Of these top 20 companies that CCS named, 11 are located in North America with eight in the U.S.A. and three in Canada; six in Europe in which two are located in France and one each in Norway, the Netherlands, the U.K., and Switzerland; two in Asia, namely Japan and Malaysia; and one in the United Arab Emirates in the Middle East:[29]

	Company	Headquarters
1	General Electric	U.S.A.
2	Mitsubishi Heavy Industries Ltd.	Japan
3	Occidental Petroleum	U.S.A.
4	Air Liquide	France
5	Air Products & Chemicals Inc.	U.S.A.
6	Praxair Technology, Inc.	U.S.A.
7	Linde Group	U.K.
8	Dakota Gas	U.S.A.
9	Enhance Energy Inc.	Canada
10	Aker Solutions	Norway
11	Petronas	Malaysia
12	Schlumberger Limited	France
13	Royal Dutch Shell plc	Netherlands
14	NRG Energy	U.S.A.
15	ADNOC	UAE
16	Climeworks	Switzerland
17	Global Thermostat	U.S.A.
18	Carbon Engineering Ltd.	Canada
19	CO_2 Solutions	Canada
20	ExxonMobil	U.S.A.

Table compiled by Royal Roots Global Inc. Data source: https://markets.businessinsider.com/news/stocks/top-20-companies-in-carbon-capture-and-storage-2019-1028258450

[27] "CO_2 Capture, Transport and Storage," Postnote June 2009 Number 335, Parliamentary Office of Science and Technology. Retrieved on July 23, 2021, https://www.parliament.uk/globalassets/documents/post/postpn335.pdf

[28] "A Brief History of CCS and Current Status," CCS Information Sheet 2, IEAGHG. Retrieved on July 23, 2021, https://ieaghg.org/docs/General_Docs/Publications/Information_Sheets_for_CCS_2.pdf

[29] "Top 20 Companies in Carbon Capture and Storage 2019," Press Release PR Newswire, June 6, 2019, Business Insiders. Retrieved on July 23, 2021, https://markets.businessinsider.com/news/stocks/top-20-companies-in-carbon-capture-and-storage-2019-1028258450

In 2020, StartUs Insights analyzed 226 carbon-capture-and-storage startups impacting the energy sector and singled out five of them to showcase. These companies were chosen based on a data-driven startup scouting approach, taking into account factors such as location, founding year, and technology among others:[30]

- See O2 Energy, Canada
- Mirreco, Australia
- Deep Branch Biotech, Britain
- Hexas Biomass, U.S.A.
- Carbonfree Chemicals, U.S.A.


Photo by Michael Parzuchowski on Unsplash

Decades of research has made CCS technically feasible, but it is both incredibly complex and wildly expensive. Petra Nova was the only operational CCS project in the U.S., and the largest one in the world using its specific technology.[31]

Nevertheless, the fossil-fuel industry continues to chase after carbon capture. Just the first week of February 2021, ExxonMobil said that it was investing US$3 billion over the next five years on projects to lower emissions, including 20 carbon-capture projects around the world.[32]

Molly Taft, in her February 2, 2021 *GIZMODO* article, summarized the current situation: "On paper, CCS sounds like the solution to all our problems. If we could just suck the carbon dioxide emitted by burning fossil fuels and put it somewhere else, we could cut warming without shifting away from old methods of generating energy. In practice, though, the results have been less than promising and failed to scale at anywhere near the levels needed to avert catastrophic climate change."[31]

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[30] "5 Top Carbon Capture & Storage Startups Impacting The Energy Sector," StartUs Insights. Retrieved on July 23, 2021, https://www.startus-insights.com/innovators-guide/5-top-carbon-capture-storage-startups-impacting-the-energy-sector

[31] "The Only Carbon Capture Coal Plant in the U.S. Just Closed," Molly Taft, GIZMODO, February 2, 2021. Retrieved on July 23, 2021, https://gizmodo.com/the-only-carbon-capture-plant-in-the-u-s-just-closed-1846177778

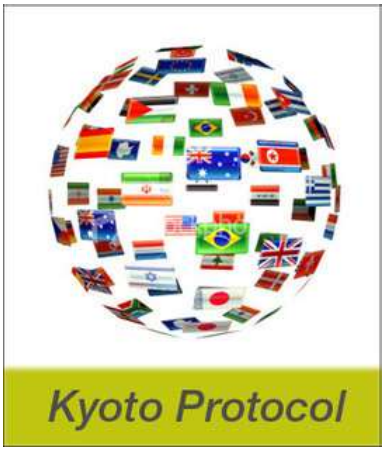
[32] "Exxon Mobil to Invest $3 Billion in Carbon Capture and Other Projects to Lower Emissions," New York Times, February 1, 2021. Retrieved on July 23, 2021, https://www.nytimes.com/2021/02/01/business/energy-environment/exxon-mobil-carbon-capture.html

If the world is determined to use CCS as a way to help solve the climate problem under a definitive timeframe, it is wise and makes sense for the world to pull resources together to collaborate and cooperate on this complex and expensive task.

Carbon Trading

There are two main types of trading systems: "Cap-and-trade systems" and "baseline-and-credit systems." In a cap-and-trade system, an upper limit on emissions is fixed, and emission permits are either auctioned out or distributed for free according to specific criteria. Under a baseline-and-credit system, there is no fixed limit on emissions, but polluters that reduce their emissions more than they otherwise are obliged to can earn "credits" that they sell to others who need them in order to comply with regulations they are subject to[33]. The cap-and-trade systems have been touted as one of the most effective means to reduce commercial emissions of greenhouse gases[34].

A carbon credit is defined as a tradable permit or certificate that provides the holder of the credit the right to emit one ton of carbon dioxide or an equivalent of another greenhouse gas – it's essentially an offset for producers of such gases. The main goal for the creation of carbon credits is the reduction of emissions of carbon dioxide and other greenhouse gases from industrial activities to reduce the effects of global warming.[35]



The notion of carbon credit was conceived and birthed by the United Nations through a Kyoto Protocol treaty in 2005. The document recognizes that it is impossible to exist in a modern world that does not create pollution and sets forth a market-based mechanism called "Cap and Trade" to manage global emissions. Carbon trading in a nutshell:[36]

[33] "Emission Trading Systems," OECD. Retrieved on July 23, 2021, https://www.oecd.org/environment/tools-evaluation/emissiontradingsystems.htm

[34] "Emissions and Efficiency: Cap-and-Trade Systems Around the World," JP Casey, Power Technology, November 2, 2020. Retrieved on July 23, 2021, https://www.power-technology.com/features/emissions-and-efficiency-cap-and-trade-systems-around-the-world

[35] "What is a Carbon Credit?" Corporate Finance Institute. Retrieved on July 23, 2021, https://corporatefinanceinstitute.com/resources/knowledge/other/carbon-credit/#:~:text=What%20is%20a%20Carbon%20Credit%3F%201%20Types%20of,the%20international%20transfer%20of%20credits.%203%20Additional%20Resources

[36] "The Hopeful Future of Carbon Trading," Kirkcoburn, July 22, 2021. Retrieved on July 23, 2021, https://kirkcoburn.com/2021/07/22/hopeful-future-carbon-trading-how-very-rich-get-much-richer

- Companies known to pollute receive [X] number of carbon credits. A government or organization allots those credits.
- In the beginning, the company will operate as usual – and pollute as usual – but no more.
- If they exceed their expected emissions, they face an expensive fine.
- Periodically their credit allowance goes down, so they receive fewer credits.
- To operate using fewer credits or to generate more, a business may need to adjust their business model, find carbon-neutral options within their operations, or shut down for a time.
- Meanwhile, one organization can sell its unused credits to another company that exceeds its credit allotment.

More countries and regions are joining the carbon-trading wave. Currently, there are some 38 national jurisdictions, 24 states, regions or cities that operate carbon-trading markets.[37]

One of the more successful cap-and-trade systems has been the EU's Emissions Trading System (ETS). Implemented in 2005, the program involves 14,000 energy facilities across the continent that are responsible for almost half of the bloc's greenhouse-gas emissions, and has aimed to lower emissions through international collaboration and financial incentives[34]. As of July 14, 2021, EU ETS operates in all EU countries plus Iceland, Liechtenstein, and Norway (EEA-EFTA states)[38]. A report released by the OECD in 2018[39] concluded that

[37] "2021 碳交易市场研究报告" 为学志, July 22, 2021. Retrieved July 23, 2021, https://mp.weixin.qq.com/s/aMUlx9tkuQCzGw9BX2YHDQ

[38] "EU Emissions Trading System (EU ETS)," European Commission. Retrieved on July 24, 2021, https://ec.europa.eu/clima/policies/ets_en

[39] "The Joint Impact of the European Union Emissions Trading System on Carbon Emissions and Economic Performance," Antoine Dechezlepretre, Daniel Nachitgall and Frank Venmans, OECD, December 14, 2018. Retrieved on July 23, 2021, https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ECO/WKP(2018)63&docLanguage=En#:~:text=We%20find%20that%20the%20EU%20ETS%20led%20to%20a%20statistically,15%25%20in%20the%20second%20phase

the system had been so effective as it explicitly targeted some of the larger-scale power facilities in Europe.

In 2014-2017, the European Commission, in close cooperation with China, carried out a three-year project to support the design and the implementation of emissions trading in China. The project provided technical assistance for capacity building and supported the seven, regional, pilot systems already set up in China and the establishment of a national emissions trading system. In 2015, the EU and China agreed to further enhance their bilateral cooperation on carbon markets which lead to a new project for 2017-2020.[40]

After a decade-long preparation, China finally launched its national carbon market – the Shanghai Environment and Energy Exchange, located in Shanghai. It is the world's largest emissions trading system initially covering more than 2,200 companies in China's power sector, which are responsible for 14 percent of the global greenhouse-gas emissions (or 40-50 percent of China's GHG emissions).[41]

The success of the EU ETS shows that greater unity results in greater impacts. The sharing of experience and close cooperation between the EU and China for the past six years was valuable as it led to the introduction of the new cap-and-trade system in China that aims to help curb its vast CO_2 emissions.

We will also see more tools that can help corporates address unavoidable carbon emissions in the near term when Climate Impact X (CIX), a Singapore-based global carbon credit exchange current being organized, goes online at the end of this year. According to CIX, "the initiative is expected to increase transparency over the risks and effectiveness of carbon projects, as well as improve price transparency, which will help to address challenges suppliers face in developing new carbon-reduction projects, including liquidity issues."[42]

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[40] "International Carbon Market," Europa, European Commission. Retrieved on July 23, 2021, https://ec.europa.eu/clima/policies/ets/markets_en

[41] "China Has a Carbon Market Now: What Does It Mean?" Soundaram Ramanathan, DownToEarth, July 16, 2021. Retrieved on July 23, 2021, https://www.downtoearth.org.in/news/energy/china-has-a-carbon-market-now-what-does-it-mean-77989

[42] "Singapore-based Global Carbon Credit Exchange Planned," Regulation Asia, ESG Investor, May 21, 2021. Retrieved on July 23, 2021, https://www.esginvestor.net/singapore-based-global-carbon-credit-exchange-planned

What's Next?

While countries work to reduce emissions to transform their respective economies, will the world's two largest emitters of greenhouse gases work together on this environmental front, or will they keep fighting each other?


Photo by Jeremy Bishop on Unsplash

Now that "America is Back", will other countries be forced to take sides with the United States or China or are they allowed the freedom to choose to work with whoever is/are the best partners for specific initiatives?

For the United States and China, there are many battles. One wins some and loses some. The key is for the world to win the war – the war against climate change.