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INTRODUCTION

Subnational climate action, including states, provinces, and cities, is essential to meet national targets and the Paris Agreement. Subnational governments are leaders in developing innovative climate policies, engaging in collaborative efforts across jurisdictions and are the key to implementation of many national policies. They regulate the primary sources of emissions and are on the front line of addressing increasing climate risks. According to UN Habitat, cities alone produce more than 60 percent of greenhouse gas emissions while consuming 78 percent of the world's energy (Energy Overview | UN-Habitat, n.d.). Recent analysis of United States (U.S.) climate policy shows that the heterogenous action by states to address climate change does not significantly increase the cost of climate action and can actually be a benefit as states with greater will to take action are willing to bear higher costs (Peng et al., 2021).

Subnational climate policies have become common in the United States and China. In the United States, over 600 local governments have climate action plans while climate policies exist in every Chinese province (Markolf et al, 2020). Coalitions of subnational actors in the United States are globally significant, representing almost 70% of U.S. Gross Domestic Product (GDP), 65% of the U.S. population, and over half of U.S. emissions (Hultman et al. 2020). Hultman et al. (2020) found that U.S. states, cities, and businesses' existing commitments can reduce 25% of emissions below 2005 levels by 2030 and reach 37% with increased ambition demonstrating the effectiveness of coordinated subnational actions. In 2030, China's cities are expected to be responsible for more than 80% of national emissions, making their efforts to early peaking crucial to meeting the national target of peaking before 2030 (Ye et al., 2020).

The impact of climate change is first experienced at the local level, particularly with extreme weather events, wildfires, floods, and droughts that are affecting certain subnational and local communities. In China, the summer floods, heat waves, forest fires, and other climate-related natural disasters have already cost more than \$13 billion in 2022 (Pandey, 2022). Similarly, due to the increase

in climate-related disasters, such as the more frequent wildfires, heat waves in the southwestern U.S. with several cities experiencing record-high temperatures this summer, the U.S. has spent a huge amount on climate disaster relief. It is estimated that between 2017 and 2021, severe weather events have caused more than \$121.4 billion in property damage in the U.S. (Davis, 2022).

Subnational governments have jurisdiction over waste management, electricity generation, land use planning, infrastructure, housing, and community development. This gives them an ability to integrate mitigation and adaptation into their existing planning with extensive co-benefits that meet the needs of citizens. Some of these co-benefits include air quality and associated public health benefits, public savings, and improved quality of life. For example, subnational actors in China and the United States have implemented transportation policies that improve air quality and reduce emissions such as transit-oriented development and incentives for electric vehicles (IPCC, 2021). Similar efforts in tightening energy efficiency regulations for buildings and expanded green infrastructure have reduced emissions, consumer costs, and heating and cooling needs to address increasingly frequent extreme weather events such as the heat waves seen in the U.S. and China this summer.

Subnational engagement poses unique opportunities for U.S.-China cooperation, particularly in the areas where subnationals are at the forefront of actions while the national government has limited authority. For example, the largest coal -producing states like Wyoming, West Virginia, Pennsylvania, and Illinois and the top coal-producing Chinese provinces—Shanxi, Inner Mongolia, and Shaanxi, are facing similar challenges of just transition away from coal. This also creates a great opportunity for sharing their experiences and best practices of balancing the social-economic and environmental interests at the subnational levels, and programs to help transform the coal sector workforce to green jobs. Another example is the regional and states' carbon market exchange and potential linkages that could occur in the future. The United States and China announced the US-China Joint Declaration in Glasgow in 2021, identifying several areas for cooperation to address climate change, including areas where subnationals are playing an increasingly important role. This paper reviews the status and challenges of subnational climate policy in the U.S. and China, respectively, and offers recommendations of opportunities for cooperation between U.S. and Chinese subnationals.

U.S. BACKGROUND AND CHALLENGES

Within the U.S. federal system, states have legal authority, administrative capacity, and a degree of autonomy from the federal government. Climate policy falls into traditional states' roles, including electricity regulation, land use planning, and air pollution policy. Constitutional rules, along with lapses in federal leadership, has meant that much of the U.S.'s energy and climate policy has been led by states since the 1990s. This has produced an uneven terrain of state climate action as some states such as California have developed and accelerated climate solutions while others have made limited progress (Dai et al, 2022).

The United States rejoined the Paris Agreement in 2020 and has established an economy-wide target of reducing its net greenhouse gas emissions by 50-52 percent below 2005 levels in 2030 through its Nationally Determined Contribution (NDC) to the Paris Agreement (The United States of America, 2021). Domestically, in the U.S., subnational leadership is part of the Biden administration's "whole of government" climate approach, and several states and cities have demonstrated new momentum on climate action on electrifying the transportation sector and decarbonizing the electricity supply.

To date, the United States has not adopted economy-wide climate targets or policies, but has passed significant investment packages that provide funding for clean energy and low emission technology. The Infrastructure Investment and Jobs Act (IIJA) of 2021 included funding for clean transportation, including electric vehicles, clean fuels, and public transportation (The White House, 2021). The recently passed Inflation Reduction Act (IRA) provides significant funding for investments and incentives in low-carbon and emission reduction technologies and projects.



Source: Rhodium Group.

Analysis by the Rhodium Group estimates that the package will reduce emissions 32-42 percent below 2005 levels by 2030 (Larsen et al., 2022, Figure 1). The same analysis finds that the IRA will result in the largest emission reductions in the electric power sector, followed by reductions through carbon removal, including by nature-based solutions and direct air capture.

Subnational Climate Action in the United States

While the Inflation Reduction Act is the most aggressive action that the United States has taken to date, it is not sufficient to meet the United States' NDC. Meeting this target will require additional action, including significant action at the subnational level. Subnational action has long been an important driver of climate action in the United States. In 2005, then Seattle mayor Greg Nickels launched the Mayors' Climate Protection Agreement with the goal to advance the Kyoto protocol through commitments and actions by mayors (Little, 2005). Later that same year, then California Governor Arnold Schwarzenegger issued an Executive Order establishing the state's first greenhouse gas emission reduction target. Following these actions, additional mayors and governors made commitments to addressing climate change, state legislatures adopted climate change laws, and cities and states developed comprehensive climate action plans. This leadership has continued as leadership at the federal level has waxed and waned, with the low point being the United States' withdrawal from the Paris Agreement in 2017.

When the United States withdrew from the Paris Agreement, the Governors of California, Washington, and New York announced the formation of the U.S. Climate Alliance. Twenty-four states are now members of the Alliance¹ and each has committed to achieve the goals of the Paris Agreement and to collectively reduce greenhouse gas (GHG) emissions at least 26-28% by 2025; 50-52% by 2030 below 2005 levels; and to achieve overall net-zero GHG emissions no later than 2050 (U.S. Climate Alliance, n.d.). The Climate Alliance's collective commitment encourages a collaborative approach to addressing climate change and enables states to benefit from shared emission reduction strategies.

State action has been an important driver of federal climate action in the United States, as demonstrated by California's leadership to develop vehicle emission standards. California has authority under the Clean Air Act to establish its own standards for passenger vehicles, which other states can choose to follow. As a result, California's vehicle emission standards typically are more stringent than federal standards and often serve as a model for the federal government,

¹ California, Colorado, Connecticut, Delaware, Hawaii, Illinois, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Jersey, New Mexico, New York, North Carolina, Oregon, Pennsylvania, Puerto Rico, Rhode Island, Vermont, Virginia, Washington, Wisconsin.

other states, and jurisdictions around the world (Sperling & Eggert, 2014). Using this authority under the Clean Air Act, California established the first-ever greenhouse gas emission standards for passenger vehicles in 2004, which a large number of other states chose to follow. Over time, as more states adopted California's standards, a larger share of the U.S. new passenger vehicle fleet met these standards. The Obama Administration eventually established federal fuel economy standards that were nearly equivalent to California's GHG emission standards.

States Economy-Wide Greenhouse Gas Emission Targets

While many states began with sectoral policies like transportation, an increasing number of U.S. states have adopted economy-wide GHG emission targets. As of October 2021, twenty-eight U.S. states have pledged specific near-term (to 2030) or long-term (post 2030) greenhouse gas emissions reductions targets (Dai et al., 2022). These climate targets provide quantitative goals to guide climate policy-making and an accountability mechanism. Analysis by Jaeger and Saha (2020), demonstrates that between 2005 and 2017, forty-one states decoupled emissions and economic growth, including states with (e.g., Maine, New York, and Nevada) and without (e.g., Alabama, Georgia, Indiana, Ohio, and Alaska) near-term or long-term targets.

Select Sectoral Subnational Policies in the United States

States continue to lead with sectoral policies covering nearly all sources of GHG emissions. The International Energy Agency maintains a comprehensive policy inventory, which includes all state-level climate policies,² as shown in Table 1.

In addition to the above sectoral policies, carbon pricing— as a cross sector approach has been applied at twelve states: California, and the Regional Greenhouse Gas Initiative (RGGI)³ that includes the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Virginia, Vermont, and Washington, DC.⁴ RGGI is the first mandatory cap-and-trade program in the U.S., which limits carbon dioxide emissions from the power sector. California's cap-and-trade program currently covers more than 450 emitters which are responsible for approximately 75 - 85% of California's GHG emissions (California Air Resources Board, 2015). California invests auction proceeds totalling over \$11.4 billion, into programs that reduce GHG emissions, a portion of which are required to be invested in disadvantaged communities (California Climate Investments, n.d.). The California Cap-and-Trade Program and Québec Cap-and-Trade System are linked, making this the first multi-sector cap-and trade linkage in North America (Center for Climate and Energy Solutions, n.d.).⁵

INTEGRATED CLIMATE ACTIONS

As states are taking steps to reduce emissions, they are also taking proactive steps to support impacted communities, to respond and prepare for climate impacts; and to support the economic transition to a low carbon economy.

Equity and Environmental Justice

Some states are taking steps to ensure that communities who have experienced disinvestment and high pollution burden are prioritized in climate actions and investments. Washington enacted the Healthy Environment for All (HEAL) Act, which requires major state departments to comply with several environmental justice-related mandates, including adopting a community engagement plan by

² See <u>https://www.iea.org/policies?country%5B0%5D=United%20States&jurisdiction=State%2FProvincial</u>

³ See Regional Greenhouse Gas Initiative at <u>https://www.rggi.org/</u>

⁴ Virginia officially joined RGGI on January 1, 2021. Washington also passed a cap and trade bill in 2021. Pennsylvania has begun the process to join RGGI.

⁵ Linkage allows for the mutual acceptance of compliance instruments issued by each jurisdiction.

Table 1 Selected sectoral subnational climate policies in the U.S.				
	Policy Focus	Selected State Examples		
Energy	Clean or renewable energy targets, renewable portfolio standards	Rhode Island • 100% state-wide renewable energy by 2030		
Transportation	Zero Emission Vehicle Mandates, Vehicle emission standards, Fiscal Incentives	California:Prohibiting the sale of gasoline-powered passenger vehicles in the state after 2035		
Industry	Limited at the state level, Focus on hydrofluorocarbons, procurement standards	 Colorado: Adopted a "buy clean" policy that sets maximum acceptable global warming potential limits for a variety of materials used in public construction projects 		
Buildings	Energy efficiency codes, green buildings incentives	Washington's Clean Buildings Act (HB 1257), ¹ the first statewide mandatory adoption of an energy performance standard for existing buildings Montana's tax law, which provides an income tax credit for certain investments in energy efficiency ²		
Natural and Working Lands/ Nature-based Climate Solutions	Conservation, Healthy Soils	California, Hawaii, Maine, New Mexico, Louisiana, Michigan, Oregon, and Washington have adopted statewide 30x30 goals, to preserve 30% of the state's land and water		
Methane	Oil and gas sector	All U.S. Climate Alliance states have committed to reducing short-lived climate pollutants by 40-50% below current levels by 2030 Colorado's methane pollution rules required additional emissions control devices and implementation of leak detection and repair programs to address volatile organic compounds (VOCs) and methane emissions		

¹ Washington House Bill 1257, 2019

² Montana Home Energy Efficiency and and Alternative Energy Tax Incentives, 2019

July 2022, integrating environmental justice into their strategic plans by January 2023, and conducting environmental justice assessments when considering "significant agency actions." An early adopter of the HEAL Act concepts, the 2021 State Energy Strategy included a focus on equity and environmental justice developed by the Environmental Justice Task Force. Illinois requires that 40 percent of utilities' spending on transportation electrification be dedicated toward charging equipment in environmental justice and low-income areas while Colorado has committed to spending 25 percent of energy efficiency and demand-side management funding to income-qualified households.

Adaptation and Resilience

States are also taking the lead in responding to and preparing for the impacts of climate change. Massachusetts's State Hazard Mitigation and Climate Adaptation Plan (2018) comprehensively integrates climate change impacts and adaptation strategies with hazard mitigation planning and is linked to funding and capacity building for municipalities to develop action plans that consider

equity and environmental justice. The Connecticut Act Concerning Climate Change Adaptation (2021) expands the ability for municipal flood and erosion control boards to manage floods through combined grey and green infrastructure solutions. It also created an Environmental Infrastructure Fund to invest in climate adaptation and resilience projects in addition to water, waste and recycling, agriculture, land conservation, parks and recreation, and environmental markets.

Just Transition

States are beginning to take a more active role in supporting communities likely to be most impacted by the transition to a low-carbon economy, especially those dependent on the fossil fuel industry. California established the Community Economic Resilience Fund to invest in regional collaboratives to support economic development. Crucially, state leaders recognized the connection between the impacts of the pandemic and the climate crisis on local community resilience, and crafted the program with a specific focus on "long-term economic resilience in the overall transition to a carbon-neutral economy." Minnesota established an Energy Transition Office at the Department of Employment and Economic Development to assist communities and workers in areas with retiring electric generation facilities.

CHINA BACKGROUND AND CHALLENGES

There are major political and economic challenges to achieving energy transition in China. Recently, the Chinese government has included climate goals in key domestic planning documents and international pledges, such as China's 14th Five Year Plan, the Working Guidance for Peaking and Carbon Neutrality (1+N policy), and revised Nationally Determined Contributions (NDC). However, fossil fuels are still the bedrock of China's energy system. Today, China derives nearly 60% of its electricity from coal and has been reluctant to accelerate its coal phase down (Xu & Maguire, 2021). There is also disagreement within the Chinese leadership over substitute fuels, technologies and pathways to carbon neutrality. Thus far, the Chinese government has prioritized ambition in long term goals which do not require significant changes to the energy system in the near term.

Starting in September 2020, the Chinese central government laid out a series of national level climate targets. In a surprise announcement at the United Nations General Assembly in September 2020, President Xi pledged that China will peak its carbon dioxide emissions by 2030 and achieve carbon neutrality by 2060, which the government later clarified includes all greenhouse gas emissions (United Nations, 2020). In December 2020, President Xi updated China's 2030 climate targets at the United Nations Climate Action Summit, including reducing carbon intensity by 65% compared to 2005 levels, increasing the share of non-fossil fuels to 25% of the primary energy mix, and increasing installed wind and solar power to 1,200 gigawatts (GW) (Xinhuanet, 2020). China's NDC laid out these same targets without any new goals (China's Achievements, New Goals and New Measures for Nationally Determined Contributions, 2022)

These announcements were expected to provide momentum going into the planning period for China's 14th Five Year plan, which includes its climate related targets for the next five years around carbon intensity, energy intensity, and share of non-fossil energy consumption. However, the plan fell short in increasing ambition. The official plan released in March 2021 modestly increased China's non-fossil energy consumption goals from 15% in its 13th Five-Year-Plan to 20% over the next five years, carbon intensity reduction targets remained flat at 18%, and the target to reduce energy use per unit of GDP actually dropped from 15% to 13.5% (Xinhuanet, 2021). In the near term, the Chinese government has prioritized ensuring energy security by securing coal supplies, rather than accelerating the shift to renewable energy sources.

There has been some positive movement, although the central government continues to direct provinces to proceed with the energy transition at a gradual pace. During the US Leaders Summit on Climate held in April 2021, China clearly stated that it will peak its coal consumption in 2025 (Xinhuanet, 2021). China's Working Guidance for Peaking and Carbon Neutrality (1+N policy) plan laid out overarching strategic guidelines to implement the 2030 and 2060 goals. It will be linked with action plans for key sectors. Priorities

Table 2 China's Key 13th Five Year Plan and 14th Five Year Plan Targets				
Target Type	13th FYP Target (2016-2020)	Actual Acheivement by 2020	14th FYP Target (2021-2025)	
Carbon Intensity	18% decrease from 2015	-18.8%	18% decrease from 2020	
Energy Intensity	15% decrease from 2015	-14%	13.5% decrease from 2020	
Non-Fossil Share of Primary Energy	15%	-15.9%	20%	
Hydro Power	350 GW	370.16 GW	ТВА	
Wind Power	200 GW	281.53 GW	ТВА	
Solar Power	100 GW (increased to 150 GW)	253.43 GW	ТВА	
Nuclear	58 GW	49.89 GW	70 GW	

Source: *Lewis & Edwards 2021*

include conservation of energy and resources and strengthening ecosystem-based land-use planning, ecosystem conservation and restoration. The Action Plan for Peaking Carbon Emissions before 2030 also includes general goals with a focus on energy and industry, and enhancing carbon sinks. In September 2021, China also made a pivotal commitment to end building coal plants abroad.

Beyond the energy transition, China's Mid-Century Long-Term Low Greenhouse Gas Emission Development Strategy submitted to the UNFCCC as part of the Paris Agreement includes a commitment to implementing nature-based climate solutions as a mitigation and adaptation strategy (China, 2021). Chinese President Xi Jinping has pledged to end deforestation by 2030, and China's Ministry of Ecology and Environment (MEE) is working to integrate carbon emissions into environmental impact assessments (EIAs). China also hosted the Convention on Biological Diversity (COP-15) in Kunming in October 2021. At the meeting, China pledged 1.5 billion yuan (U.S.\$232.5 million) toward a new Kunming Biodiversity Fund. The Kunming Declaration (n.d.) that came out of the first phase of the meeting links biodiversity loss and climate change. In 2021, the central government also ratified the Kigali Amendment to the Montreal Protocol to phase down hydrofluorocarbons (HFCs) on time.

National Energy and Emissions Trends

During the COVID-19 pandemic, China's emissions surged even as emissions in other countries fell as shown in Figure 2. China's per capita carbon dioxide (CO_2) emissions (8.4 tonnes per person) also now exceed that of the European Union (6 tonnes per person), although are still a far cry from U.S. per capita emissions (14 tonnes per person). A major reason for this trend is China's fossil fuel usage. Overall, in 2020 and 2021, fossil fuel power generation increased by 2.5 percent and 11.9 percent respectively compared to pre-pandemic levels in 2019. However, there are signs that emissions growth may be slowing down. China's emissions fell by an estimated 1.4% in the first quarter of 2022 as a result of slowdowns in the construction sector and increases in renewable energy deployment.

Improvements in curtailment rates have led to an increase in total power generated by renewable sources (China Electric Power Enterprise Federation, n.d.). Combined, wind and solar in China accounted for 11.7% of total power generation in 2021, up from 9.5% in 2020. Nuclear power hovered at about 5 percent in both 2020 and 2021. Hydropower declined slightly in 2021, making up 15.9 percent of total power generation compared to 17.8 percent in 2020. However, coal-



Source: International Energy Agency.

fired power still makes up the majority of power generation in China. China's total 2020 coal consumption reached 2,829 megatons of coal equivalent (Mtce) and increased again in 2021 to 2,934 Mtce, a major driver of China's growing emissions during the pandemic.

Provincial Climate Targets and Policies

Based on China's pledge to achieve carbon peaking by 2030, all provinces are required to submit detailed carbon peaking plans. Currently, more than 80 cities and provinces proposed peaking dates, with a number of pioneer provinces announcing plans to peak earlier than the national timeline. In particular, Beijing stated in its 14th Five-Year Plan that it will peak carbon dioxide emissions within the next five years. Shanghai has also announced that it will peak its carbon emissions in 2025. Other provinces, including Hainan, Guangdong, Jiangsu, Tibet, Qinghai and Henan have expressed willingness to peak emissions earlier than 2030 as well. Shanghai and Hainan have 2050 carbon neutrality targets, ten years ahead of the national target.

In addition to carbon peaking plans, provinces in China are also announcing their carbon intensity and energy targets which differ from the overall national targets. Provinces have set carbon intensity and energy intensity goals (intensity is per unit GDP) in their 14th Five Year Plans (2021-2025). In an assessment of ten provinces,⁶ the majority aim to reduce their carbon intensity by the national target of 18%. Jiangxi has a more aggressive target of reducing carbon intensity by 19.5%. For energy intensity targets, some have higher targets than the national government including Guangdong (14%), Inner Mongolia (15%) and Jiangxi (14.5%) (CCCI, 2021).

Selected sectoral subnational climate policies in China

In addition to quantitative indicators, provinces also have climate strategies based on different sectoral priorities.

On carbon pricing, since 2011, China has developed carbon market pilots in seven provinces and cities, specifically, Beijing, Tianjin, Shanghai, Chongqing, Shenzhen, Hubei and Guangdong. So far, each pilot has completed seven to eight years of compliance, with a cumulative turnover of nearly 10 billion yuan and an average transaction price of about 24 yuan/ton (Zhang et al., 2022). These

⁶ This includes Fujian, Guangdong, Hainan, Heilongjiang, Inner Mongolia, Jiangsu, Jiangsi, Shanghai, Sichuan and Zhejiang.

	Focus	Selected Subnational Example	
Renewable Energy	Increasing installed capacity of solar, wind and energy	Guangdong • Renewable energy: increase to 22% • Non-fossil fuel: increase to 29% • Nuclear: increase to 7% • Natural gas: increase to 14% • Coal: reduce to 31%	
Transportation	New energy vehicles and improving charging infrastructure for private and public vehicles	 Shanghai New energy vehicles: 96% of buses 50% of newly purchased vehicles by individuals More than 80% of vehicles owned by state- owned enterprises and public institutions 	
Industry	Reducing emissions and energy consumption in important and high energy consumption industries	 Sichuan Limiting the growth of energy-intensive and high polluting industries Promoting the utilization of industrial residual heat, residual pressure, and waste Prohibiting the construction of heavy metal production plants near farms Exploring carbon capture and sequestration 	
Buildings	Focus on energy efficiency and reduced energy use in new and old buildings	 Jiangsu Reduce energy consumption per unit of floor area by 6% Carbon emissions per unit of floor area by 7% Per capita comprehensive energy consumption of public buildings by 7% 	
Natural and Working Lands/ Nature-based Climate Solutions	Expanding forest coverage, increasing conservation areas	Heilongjiang • Wetland protection rate of 50%.	
Methane	Agriculture and waste sector	 Zhejiang Promote "waste-free city" construction and accelerate low-carbon waste treatment. By 2025, the province's domestic waste recycling rate will reach 70%. 	

pilots were used to inform the development of the national carbon market for the electricity sector which began in 2021. In July 2021, Shanghai started Shanghai Environment Energy Exchange, one of the largest carbon trading markets in China. Hainan, drawing on a government and private sector collaboration, has developed a carbon emissions accounting and tracking system. Zhejiang set up a carbon accounting and tracking mechanism for 1635 key emitting entities.

OPPORTUNITIES FOR SUBNATIONAL COOPERATION

Since the Paris Agreement in 2015, several subnational climate initiatives formed and operated to enhance states, cities and local government's role in addressing climate change, providing

numerous venues for collaboration and coordination. The U.S. and China have also collaborated on the subnational level, where California has signed climate-focused MOUs with Chinese subnational governments including Jiangsu Province, Shenzhen and Guangdong, among others. Since the joint declaration at Glasgow in 2021, a new development on the bilateral and subnational leadership is that Governor Newsom of California renewed the state's Memorandum of Understanding (MOU) with China's Ministry of Ecology and Environment (MEE) to continue the cooperation on climate change and the environment, where several of the areas of cooperation are also consistent with the priorities set in the US-China Glasgow declaration such as methane emissions reduction (Ministry of Ecology and Environment of the People's Republic of China & State of California of the United States of America, 2022). Newsom met the Minister of MEE later and the two sides are carrying out substantive policy exchange and research cooperation on particular topics including methane, Cap-and-Trade, and nature-based climate solutions, among others.

One of the distinguishing features in U.S. and Chinese subnational climate policy is the bottom up versus top down approach, where the U.S. states are driving certain policy changes and use their experiences to push the policy adoption at national level, while in China, provinces and cities often are nominated by the national government to serve as pilots to provide reference and inform the national policy making. Both the U.S. and China have leading states as well as states that are slow-comers in the transition to clean energy, such as in the area of coal phase down; the states' behavior and leadership informs the national policy choices.

Recommendations for expanded subnational engagement

Based on the common objectives of carbon neutrality by and around mid-century, and the differences shared in subnational climate policy in the U.S. and China, there are a few key sectors that are worth exploring for future coordination and collaboration.

- On the transition from coal and fossil fuels, the U.S. and China could consider expanding subnational engagement on coal transitions and economic diversification in coal states/ provinces. The Energy Foundation China organized dialogues in the past linking coal communities from Wyoming and other Chinese coal provinces, setting a good example for future dialogues to include additional stakeholders.
- On energy decarbonization, there are particular areas worth expanding cooperation on, such as the Green Shipping Corridor initiative, wherein currently the Port of Los Angeles and Shanghai are partnering for zero carbon-fueled ships by 2030, which could include additional partners; expanding cooperation on zero carbon building standards and benchmarking, and sharing best practices on clean transportation policy including for Low Carbon Fuel Standards (LCFS) and electric vehicles (EVs).
- On climate adaptation and resilience, the U.S. and China could consider expanding engagement on subnational modeling of extreme weather events; engagement at the city level on heat event management; engagement on flood management best practices.
- On methane emission reduction, there are opportunities for subnational pilots and coordination on better subnational data collection/inventories.
- On carbon market design, the nations could consider deepening ongoing exchange on the integration of subnational and national climate policy in both countries, particularly, the experience from California's cap-and-trade market and China's national and provincial carbon markets.

Governance and institutional coordination

The subnational climate action and cooperation between the U.S. and China, along with the think tanks and NGO activities (Track II) have played a role to supplement the formal bilateral climate engagement (Track I). The U.S.-China Climate Leaders Summit in Los Angeles, California in 2015

was an example demonstrating the importance and potential of state and local implementation of climate commitments made at the national level, while several subnational climate initiatives such as the Climate Alliance and America is All In in were examples to show the determination and consistency of subnational climate action during the backlash of federal climate leadership of the Trump Administration.

From 2013 to 2016, the U.S.-China Climate Change Working Group provided an effective platform for bilateral cooperation and coordination on climate change. Similarly, in the Glasgow Joint Declaration, the U.S. and China also committed to establish a working group to enhance climate action in the 2020s. Institutionally, it is necessary and important to enable subnationals' role in this working group, either through formal or informal ways. By coordinating with the federal and national government, as well as among the states, provinces and cities themselves, subnationals can 1) drive actions at the local level to meet the national climate targets; and 2) provide insurance against political change and a less sensitive forum for working through more difficult issues and during worsening bilateral relations.

In terms of data transparency and progress tracking of climate actions, subnational cooperation can help enhance the understanding of current GHG emissions, policies and progress in the U.S. and China. Particularly, through such subnational cooperation and technical exchange, academic and scientific platforms could be built jointly to monitor, evaluate and share policy innovations, as well as assessment of climate risk for more integrated climate risk planning.

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REFERENCES

- California Air Resources Board. (2015). Overview of ARB Emissions Trading Program. California Air Resources Board. <u>https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/guidance/cap_trade_overview.pdf</u>
- 2. California Climate Investments. (n.d.). *California Climate Investments 2022 Mid-Year Data Update*. California Climate Investments. <u>https://www.caclimateinvestments.ca.gov/annual-report</u>
- 3. Center for Climate and Energy Solutions. (n.d.). California Cap and Trade At-a-glance. Retrieved September 5, 2022, from <u>https://www.c2es.org/content/california-cap-and-trade/</u>
- China's Achievements, New Goals and New Measures for Nationally Determined Contributions. (2022). https://unfccc.int/sites/default/files/NDC/2022-06/ China%E2%80%99s%20Achievements%2C%20New%20Goals%20and%20New%20 Measures%20for%20Nationally%20Determined%20Contributions.pdf
- 5. China. (2021, October 28). China's Mid-Century Long-Term Low Greenhouse Gas Emission Development Strategy. United Nations Climate Change. <u>https://unfccc.int/documents/307765</u>
- 6. Connecticut. (2021, July 6). *Connecticut Public Law 21–115: An Act Concerning Climate Change Adaptation* | *Adaptation Clearinghouse*. <u>https://www.adaptationclearinghouse</u>. <u>org/resources/connecticut-public-law-21-eo115-an-act-concerning-climate-change-adaptation.html</u>
- 7. Dai, Fan, Emily Yen, Jessica Gordon, Louise Bedsworth, Zhinan Chen, Jennifer Perron, Fredrich Kahrl, and Erica Grignaschi. (2022). States Climate Action for Achieving Carbon Neutrality: What's out there and yet to be done? California-China Climate Institute, University of California, Berkeley, Berkeley.

- 8. Davis, M. (2022, July 11). *Estimated \$29.4 Billion in Property Damage from Severe Weather Not Covered by Insurance in Past 5 Years*. ValuePenguin. <u>https://www.valuepenguin.com/</u> severe-weather-property-damages-study
- 9. Energy Overview | UN-Habitat. (n.d.). UN-Habitat. Retrieved September 3, 2022, from https://unhabitat.org/topic/energy
- Hultman, N. E., Clarke, L., Frisch, C., Kennedy, K., McJeon, H., Cyrs, T., Hansel, P., Bodnar, P., Manion, M., Edwards, M. R., Cui, R., Bowman, C., Lund, J., Westphal, M. I., Clapper, A., Jaeger, J., Sen, A., Lou, J., Saha, D., ... O'Neill, J. (2020). Fusing subnational with national climate action is central to decarbonization: the case of the United States. Nature Communications 2020 11:1, 11(1), 1–10. <u>https://doi.org/10.1038/s41467-020-18903-w</u>
- 11. IPCC (2021). Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change. <u>https://www.ipcc.ch/report/ar6/wg3/</u> downloads/report/IPCC_AR6_WGIII_Full_Report.pdf
- 12. Jaeger, J., & Saha, D. (2020). 10 Charts Show the Economic Benefits of US Climate Action. https://www.wri.org/insights/10-charts-show-economic-benefits-us-climate-action
- 13. Kunming Declaration. (n.d.). Declaration from the High-Level Segment of the UN Biodiversity Conference 2020 (Part 1) under the theme: "Ecological Civilization: Building a Shared Future for All Life on Earth." <u>https://www.cbd.int/doc/c/df35/4b94/5e86e1ee09bc8c7d4b35aaf0/</u> kunmingdeclaration-en.pdf
- 14. Larsen, J., King, B., Kolus, H., Dasari, N., Hiltbrand, G., & Herndon, W. (2022, August 12). A Turning Point for US Climate Progress: Assessing the Climate and Clean Energy Provisions in the Inflation Reduction Act. Rhodium Group. <u>https://rhg.com/research/climate-clean-</u> energy-inflation-reduction-act/
- 15. Lewis, J., & Edwards, L. (2021). *Assessing China's Energy and Climate Goals*. <u>https://www.americanprogress.org/article/assessing-chinas-energy-climate-goals/</u>
- 16. Little, A. (2005, June 16). *An interview with Seattle Mayor Greg Nickels on his pro-Kyoto cities initiative*. Grist. <u>https://grist.org/article/little-nickels/</u>
- 17. Markolf, S., Azevedo, I. M. L., Muro, M., & Victor, D. G. (2020). *Pledges and progress: Steps toward greenhouse gas emissions reductions in the 100 largest cities across the United States*. Brookings. <u>https://www.brookings.edu/research/pledges-and-progress-steps-toward-greenhouse-gas-emissions-reductions-in-the-100-largest-cities-across-the-united-states/</u>
- 18. Massachusetts. (2018). *Massachusetts State Hazard Mitigation and Climate Adaptation Plan Appendix F: Local Climate Adaptation and Climate Action Plans*. <u>https://www.mass.gov/</u> doc/2018-statewide-hazard-mitigation-and-climate-adaptation-plan-appendix-f/download
- Ministry of Ecology and Environment of the People's Republic of China, & State of California of the United State of America. (2022). *Memorandum of Understanding Between the Ministry of Ecology and Environment of the People's Republic of China and the State of California of the United State of America*. <u>https://www.gov.ca.gov/wp-content/</u> <u>uploads/2022/04/4.18.22-China-CA-MOU.pdf</u>
- 20. The United States of America. (2021). The United States of America Nationally Determined Contribution Reducing Greenhouse Gases in the United States: A 2030 Emissions Target. https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%20 21%202021%20Final.pdf
- 21. The White House. (2021, November 6). *Fact Sheet: The Bipartisan Infrastructure Deal*. The White House. <u>https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/06/</u>fact-sheet-the-bipartisan-infrastructure-deal/

- 22. Pandey, N. (2022, July 21). *Natural disasters cost China* \$13.13 billion in 2022 so far: *Report*. WION. <u>https://www.wionews.com/world/natural-disasters-cost-china-1313-billion-</u>in-2022-so-far-report-499479
- Peng, W., Iyer, G., Binsted, M., Marlon, J., Clarke, L., Edmonds, J. A., & Victor, D. G. (2021). The surprisingly inexpensive cost of state-driven emission control strategies. *Nature Climate Change*, 11(9), 738–745. https://doi.org/10.1038/s41558-021-01128-0
- 24. Sperling, D., & Eggert, A. (2014). *California's climate and energy policy for transportation*. https://doi.org/10.1016/j.esr.2014.10.001
- 25. U.S. Climate Alliance. (n.d.). U.S. Climate Alliance *Alliance Principles*. U.S. Climate *Alliance*. Retrieved September 4, 2022, from <u>http://www.usclimatealliance.org/alliance-principles</u>
- 26. U.S. Climate Alliance. (n.d.). *SLCP Challenge to Action. U.S. Climate Alliance*. Retrieved September 4, 2022, from http://www.usclimatealliance.org/slcp-challenge-to-action
- 27. Xu, M., & Maguire, G. (2021, October 22). China coal surge puts supply record, power jump within reach. *Reuters*. <u>https://www.reuters.com/business/energy/china-coal-surge-puts-supply-record-power-jump-within-reach-2021-10-22/</u>
- 28. Zhang, X., Yu, R., Qi, S., & Yang, G. (2022). *Theory and Practice of China's Carbon Emissions Trading System*. <u>http://www.3e.tsinghua.edu.cn/storage/app/media/uploaded-files/theory-</u> and-practice-of-chinas-ets-thu3e20220509.pdf
- 29. United Nations. (2020, September 22). 中国国家主席习近平联大致辞:中国积极投身 国际抗疫合作 争取2060年前实现碳中和. [Remarks 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: China actively involves in the international fight against COVID-10 and aims to achieve carbon neutrality before 2060]. United Nations News. <u>https://news.un.org/</u> zh/story/2020/09/1067222
- 30. Xinhuanet (2020, December 12). *习近平在气候雄心峰会上的讲话(全文)*. [Statement by H.E. Xi Jinping President of the People's Republic of China at the Climate Ambition Summit]. Xinhuanet. <u>http://www.xinhuanet.com/politics/leaders/2020-12/12/c_1126853600.htm</u>
- 31. Xinhuanet (2021, April 22). *习近平在*"领导人气候峰会"上的讲话. [Remarks by H.E. Xi Jinping President of the People's Republic of China at the Leaders Summit on Climate]. Xinhuanet. <u>http://www.xinhuanet.com/politics/leaders/2020-12/12/c_1126853600.htm</u>
- 32. Xinhua News Agency. (2021, March 13). 中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要. [Outline of the 14th Five-Year Plan for National Economic and Social Development and Vision 2035 of the People's Republic of China]. <u>http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm</u>
- 33. China Electric Power Enterprise Federation (n.d.). 2021年全国电力工业统计快报一览 表. [2021 China Electric Power Industry Statistics]. <u>https://www.cec.org.cn/upload/1/</u> editor/1642758964482.pdf

