11th U.S.-India Track II Dialogue on Climate and Energy
March 1, 2, and 3, 2022

On March 1, 2, and 3, members from the U.S. and Indian Delegations of the Track II Dialogue on Climate Change and Clean Energy met via Zoom for the 11th meeting of the Dialogue. This year, the Track II Dialogue engaged on key issues related to India's and the U.S.'s bilateral climate and energy relationship, including how the two countries can yield significant benefits on the topics of climate finance, subnational action, water and climate resilient solutions, engagement with China, and green hydrogen.

The Track II Dialogue, co-convened by the Aspen Institute Energy and Environment Program and Aspen Ananta Center has for the last 11 years provided a necessary medium for non-partisan, independent and open discussion among distinguished representatives from academia, research institutions, civil society and industry. The U.S. and Indian delegations sit in a uniquely impactful position in their capacity to feed recommendations into Track I, inform policy decisions, and influence the private sector. The following summary offers a high-level, not attributed review of the discussions held across the three days.

Summary of Overall Outlook

In light of the most recent IPCC report's increasingly dire projections associated with every tenth degree of warming, both delegations were especially cognizant of the shared work that lies ahead. While the U.S. and India made significant pledges at COP26 in Glasgow, both their own and global ambition and action still falls short of where it must be to prevent the most catastrophic climate impacts and the likely 2.4°C temperature rise of the planet.

There was consensus that much greater focus should be on countries with the greatest emissions who are least aligned with the 1.5°C targets, like China and Indonesia. This does not exclude the U.S., who still has room to enhance its net-zero targets set against 2050 and in fact, the spotlight should be on major players like the U.S. and China and India can play a role in impacting their positions. The coming decade is crucial in determining the trajectory of climate action and global temperatures. The two delegations remain committed to strengthening their own ambitions and encouraging increased ambition and actions from others, especially in the lead up to COP27 in Cairo.

This Track II meeting was convened against the backdrop of the ongoing Russian invasion of Ukraine, which in some way threatens to distract from the necessary climate action at hand, while also raising the profile of the issue of energy security. Thus far, the conflict has increased investments in oil and gas. With countries seeking to replace Russian assets, there is a risk that they will turn to gasses like LNG to fill the gap and stall short term climate goals. In this restructuring of geopolitical energy security and reassessment of supply chains, it needs to be clarified globally that there is no security in pursuing carbon intensive pathways.

With the recent COP, IPCC report, and geopolitical circumstances in mind, the U.S. and Indian identified key opportunities for and challenges to collaboration. Some of these opportunities included linking mitigation and adaptation solutions to elevate the focus on innovative resilience solutions, a global

investment risk mechanism to unlock greater investment for the Electric Vehicle transition and more broadly unlock greater investment across climate solutions, collaborating with the International Solar Alliance on powering Africa, sharing technological and nature based solutions, partnering on the development and deployment of green hydrogen especially in the shipping industry, among many others.

Both countries also identified the importance of tackling climate issues with a full toolkit of options, and remaining open to multiple actions, across authorities - rather than relying on one executive action or ministry to solve the entire problem. Both countries are grappling with the implementation of a just transition, such that the phase-out of fossil fuels is complemented with realistic and place-sensitive retirement and re-employment opportunities for fossil fuel workers. Equity considerations are key to both countries and remain top of mind; climate impacts disproportionately burden vulnerable communities and individuals, least responsible for the crisis at hand. Less developed countries rightfully seek the opportunity to access the resources necessary to develop at the same rate and pace as those that have come before them.

Summary of India State of Play

India continues to be predominantly dependent on coal with the 5th largest reserves in the world and an industry that employs 1 million individuals. Unlike the U.S., India is a developing country and thus requires more room to adjust to its new targets to ensure a just transition.

One area in which India has taken a strong lead is on solar energy development. Enhanced U.S.-India collaboration has the potential to further unlock the breakthrough technologies needed for India to deploy renewables at the required scale. Other potentially impactful policies in the pipeline include: green hydrogen, electricity, biofuels, and agriculture.

India recently announced a new initiative on green hydrogen, which offers a significant transition pathway to its 2030 goals and beyond. Currently, its approach is to put in place a set of policies that cover the upstream, midstream and downstream aspects of the hydrogen ecosystem in order to reduce the costs. This green hydrogen rollout is still in very early stages and is not at a stage where renewable energy will potentially get diverted. Rather, to some extent, green hydrogen offtake could reduce the offtake risks that renewable energy developers face from discoms.

The Electricity Act amendment was not tabled in Parliament during the budget session because the withdrawal of farm bills in November of 2021 delayed power sector reforms, which are essential to enable significant renewable development. One significant challenge facing electricity reform is that reforms in sectors where the states have an important role to play get politically muddled. There needs to be a center-state coalition or a political contract to push ahead with reform, else this issue will remain locked into the election cycles of state governments. States must be taken on board and cooperation must be fostered, otherwise implementation at the state level will be limited.

While the discom reform is central to how India reaches its low carbon goals, the central government has already taken steps that go beyond past actions. For example, in February, the government of India brought out a policy on using Distributed Renewable Energy for Livelihood Applications - the first such policy in the world. There remains opportunity for the government to further shift its thinking about energy access so it subsidizes not consumption but productive enhancing investments that incentivize farmers to use reliable electricity that they can afford.

Regarding biofuels, conflicting signals are coming from different ministries and there is no clear consensus. The latest agriculture budget put out strong signals on natural farming methods, including a 5 kilometer pilot corridor, but there remains need for more climate resilient crops.

There is a need for greater collaboration among subnational actors, government ministries, and between the private sector and central government. Climate change impacts not only the environment, but also development, the economy, society, and health. Ministries must coordinate across these silos to view the breadth of issues outside the limiting scope of the "environment". Partisan challenges that cripple U.S. climate action are not present in India, rather, there is consensus. It is the political economies of key sectors and these silos that slow action.

State Action Plans on Climate Change are currently being revised to account for the new commitments made at COP26. There is some concern that state level carbon targets would likely be challenging, as these types of state targets do not even exist in the U.S. NRDC and partners, however, are exploring with Maharashtra passing a resolution on a state net zero goal ahead of the national goal.

Beyond breaking the silos within ministries, it was suggested that bridging adaptation and mitigation would also be central to integrating development, sustainability, and other issues and goals to better address and coordinate dealing with both. This is especially true as today's numerous adaptation programs are future mitigation measures. A good place to start would be in addressing sea level rise and coastal resilience because the conversations are not that different between adaptation and mitigation.

There is an opportunity to better inform and educate younger generations from an early age of the climate crisis and their role in the issues. Much later down the education line, in management schools, there should also be greater training to ensure future executives and leaders can make decisions through a climate lens.

On Methane - The best option for bilateral cooperation would be to reduce emissions from the oil/gas sector where the U.S. has technical expertise and India has strong interest. India was a partner in the Global Methane Initiative, which makes this an easy place to start. However, when talking about greenhouse gas emissions, the focus should be more on the rate of increase of carbon dioxide emissions, rather than methane.

On an individual scale, 10% of Indians account for 47% of carbon emissions and significant lifestyle modifications are necessary to address this inequity. Some of these modifications discussed included vegetarianism (though currently 18% - this number is increasingly decreasing).

Summary of U.S. State of Play

The U.S. delegation offered an overview of its own efforts to accelerate its clean energy transition and build out its baseload power solutions through investing in renewables including offshore wind, storage technology, the retention of nuclear energy, and more. Beyond the increased ambition across the board of

the federal government, it is also the administration's directive that equity be woven into every aspect of this transition.

Currently, 80% of the Quad's energy is drawn from fossil-based energy, and the U.S. administration is thinking about its baseload power question in terms of a number of different decarbonization solutions in order to move away from this fossil-based energy. Some of these potential pathways include recently passing a nuclear retention credit for aging facilities, an option-based measure to keep nuclear running; recently holding an auction for offshore wind that brought in 4.5 billion in private sector bids, beginning the implementation of the President's offshore wind goals and ushering in an energy source that can be a replacement for some baseload of power; and driving a 90% cost reduction in storage technology from the Obama administration, with solar and storage getting bundled together in financing right out of the gate. The administration has also prioritized closing and remediating abandoned coal mines and building solar on remediated lands (for example, Peabody).

Looking at other sectors, in the electric vehicle sector, the U.S. administration is looking to get to 50% on the path to zero-emission vehicle sales (though states are probably further ahead in advancing zero emission policies as they have seen real development). The industrial sector, which has traditionally been harder to decarbonize, the administration feels much more optimistic about with green hydrogen and other cleaner sources of hydrogen as options. The transportation sector is also ripe for cooperation, has political backing in the U.S. and India and is a large source of emissions.

In the context of energy security, the Biden administration has been thinking about short term stabilization, recognizing and thinking about both the supply and demand side. The U.S. has made progress on the demand side alone, but the supply side needs to also be managed effectively. This involves recognizing the vulnerable position vulnerable families, communities and developing countries are in and having a clear sense of how to bring down demand and supply with these equity considerations in mind.

Carbon capture was also discussed as costs have come down by half, when paired with clean provisions, like cleaner cement, and with the availability of technology and appetite of the market, it has the potential to open up 100 million metric tons that would not likely have otherwise been in the U.S. sights to decarbonize. Another area for increased optimism on U.S. side is on the path to cut global methane. The former Republican administration passed a bill that made Kigali fully achievable, and the current administration has made progress in the last year, with the path to 50% continuing to be anything but steep and slippery, but also one in which there is traction and tools to make considerable progress.

The U.S. is also looking at diversifying its international supply chains as it is currently heavily reliant on China, which creates an opportunity for the U.S.-India relationship, not only in the areas of recovery of critical minerals (lithium, cobalt) but also on the upgrade of refinement capacity. Specifically with regards to its refining capability, the U.S. is making a big bet investing in recycling these technologies, one of which is capable of recycling 95% of materials of battery at a commercially viable cost, right now the U.S. is shipping these to China. Innovation as it relates to chemistry solutions, lower disruption, upgrade capacity, and recycling capacity (recycling capacity helps with value retention on electric vehicles and helps with retention) offers an important opportunity for bilateral cooperation.

While the U.S. 's goal of 50% reduction in greenhouse gas emissions by 2030 is appropriately ambitious and domestic efforts have been strong, the U.S. still needs congress to pass climate legislation, if not it will have a knock down effect in the U.S. and for the whole world. This legislation must include clean energy tax credits and be accompanied by strong regulation, especially on power plants, vehicles, and appliances, and with strong state and local actions. All three pieces of this puzzle are needed and interlock, as for example, strong legislation will enable stronger rules.

Specifically, climate finance was identified yet again as a critical issue going forward. The U.S. needs to massively increase flows from the private sector through the de-risking of investments so that basic risk and reward calculus draw in big investments with respect to adaptation, especially. Adaptation finance will demand a larger amount of donor country government funds- not as able to mobilize private capital. This could entail significant reforms (starting with the world bank) and will only happen if taken on board by leaders (i.e., the finance ministers of main countries put in charge, G7 leaders).

There is also opportunity for important initiatives at the plurilateral level, including methane and deforestation, and as more and more groups of countries work together on cutting emissions in the industrial sector. The UK, France, and the EU worked with South Africa recently on coal mine closures and assisting in financing a just transition – a model that can be replicated with other countries, including India. Replicating the South Africa deal with India would require the financing costs of plant closures and just transition and would depend on India and others being prepared to put on the table an expedited closure schedule.

A kernel of the core challenge that India faces in the political economy of coal, is similar for the U.S. as the administration grapples with a just transition away from coal. There are three aspects to the U.S. administration's strategy: 1) Making sure that the underlying insurance system works and is well funded, including health care, pension benefits, and unique social need programs like the black lung program; 2) Meeting people where they are and talking about jobs that they can transition to (i.e. shifting from mining to remediation); and 3) Ensuring that approaches are place sensitive and economic opportunities are created where people are.

Summary of China Presentation

This session focused on what India and the U.S. can do to apply useful pressure to China in the context of the COP26 call to companies to ramp up ambition and action. Together, China, the U.S., and India are the world's largest emitters and how the three countries move forward is critical to determining whether the planet stays below the 1.5°C threshold, as well as having enormous geopolitical considerations.

The fundamental priority in Glasgow was to ramp up country targets enough to keep this 1.5°C goal alive, and while there was significant action in terms of targets set, the country that did not come forward was China, the nation responsible for 27% of global emissions, compared to 11% for U.S. and 6.6% for India. Had China made more significant commitments in Glasgow, it would have been a huge success, as they account for more emissions than all of the developing countries put together.

There was some skepticism with the potential for trilateral cooperation, especially as direct cooperation between India and the U.S. is not currently viable, with their relationship at a low point. India recently abstained from the vote against Russia in the Ukraine conflict because they could not afford to rupture

their relationship with their biggest source of weaponry. Chinese foreign direct investment into India has also fallen. With the right strategic course of action that leverages competition, however, the U.S. and India can work bilaterally to push China to begin phasing out coal. So far their posture has been that they will not be ready to phase out coal until 2026, but shutting down the worst coal plants could be a strategy to start the process and get significant emissions reductions.

A number of technical and practical solutions were identified as useful levers to drive action in China. First by working to increase awareness around the economic benefits of climate action to move beyond the outdated perception that climate action is a cost to the economy rather than an investment and then supporting the investments necessary for net zero pathways. The two countries can also help China to attract the investment to support and manage a just transition, as well as share experiences and modeling/analytic tools to identify and address the benefits and tradeoffs for workers. There is also opportunity to engage philanthropy to build capacity locally.

Methane was also raised as relatively low hanging fruit, as it is equivalent to the 7th largest emitter in terms of output with relatively low costs of action to address. China and India have yet to join the methane pledge, but they are engaging in this area. China also produces 80% of air conditioners, which the U.S. and India are importers of, and there are opportunities to use climate friendly refrigerants.

There are opportunities to cooperatively support the development of technology and standards for green hydrogen to decarbonize industries like steel and cement, electric vehicle deployment and infrastructure, and tackle issues associated with strategic minerals. These measures could be framed as a cooperative approach to balance what is coming forward from the European Union. The importance of this topic was underscored as there does not currently exist an architecture for an industrial fuel for the 21st century.

The Quad is also fundamentally about technology and Quad cooperation on green technology (green hydrogen alliance, green shipping network), electric vehicles, strategic minerals, including setting standards, structures and coalitions could challenge China to change their own policies. Energy technology was identified as an important source of pressure on China and technological collaboration offers an opportunity to encourage race to the top pressure.

The U.S. recently invested in the first solar facility in Tamilnadu and raised the importance of sending signals that the U.S. government and companies in the EU and U.S. are seeing greater risk in purchasing in China because of human rights concerns. This raises the question of creating alternative supply chains, with a number of companies expanding their capacity to produce solar panels. It was suggested that India could be a natural alternative for solar panel production because of their ability to manufacture at relatively low costs. Increased investment in processing capacity outside of China will also be key to de-bottleneck the processes around electricity and chemicals.

Given the recent Port of Shanghai and the Port of LA green shipping corridor announcement, it was also raised that there might be an opportunity to cooperate in an area that already has some regional traction.

There is an opportunity to push China on overseas climate finance, as there was a sense that they got off the hook in Glasgow with respect to overseas finance, and to develop new economic structures that are more inclusive of climate and revise MDB/MFI policies that are currently the biggest barrier to de-risking. One significant challenge identified was that the Treasuries/Finance Ministries oversee the MDBs and don't see climate as what should drive MDB policy. In this climate finance vein, it was also suggested that the U.S. and India can go further in questioning the investments China is making.

If India and the U.S. work together to phase down coal with a program analogous to the South Africa model - this could also apply pressure on China. Specifically, a more nuanced approach to shutting down the really bad coal plants in India and improving the better functioning, more efficient ones, while refraining from building new ones would go a long way in this effort.

Through this cooperation the U.S. and India can challenge China to change its own policies, while diversifying international clean energy supply chains.

Summary of High-Level Presentation

A high-level presenter offered an overview of the U.S.'s role in India's Nationally Determined Contribution (NDC) and decarbonization goals, and the U.S.'s efforts to enhance and support its ambition, characterizing the current phase of work as the implementation plus phase. The U.S. is encouraging India to enshrine netzero by 2070, reduce its carbon intensity by 45% by 2030, and increase its non-fossil fuel energy capacity in an enhanced NDC. Specifically, India will need to nearly quadruple its renewable energy capacity and identify specific renewable priorities to do so.

In order to capitalize on these opportunities for renewable expansion, India will need to assemble a multi donor climate finance platform (including interested donors, G7 countries, Nordics, UAE, philanthropic organizations, sovereign wealth funds, green bond guarantees), expanding solar, developing battery storage, offshore wind, and hydrogen, and working together on adaptation efforts like reforestation (some of which run through USAID). For example, if India could install 63 GW of storage, no new coal power would be needed.

While methane emissions which come predominantly from the agriculture sector and are more of a third rail issue given all of the agriculture issues in India, there is important work underway by the U.S. Department of Energy that can be leveraged to enhance technical bilateral cooperation. Thus far, India has declined to join the Global Methane Pledge, but some of the work underway by the Department of Energy can be a foundation for its efforts.

Even if India meets its renewable energy targets, however, it will need to decarbonize heavy trucking, steel, cement, fertilizer, and other areas. U.S. Department of Energy labs can provide technical assistance to support these efforts. Revived talks on civil nuclear reactors and American companies interested in operations in India, position nuclear, specifically SMR reactors, as an alternative to coal and a potential area of bilateral cooperation.

Financing is key to unlocking Indian climate ambition and the U.S. State Energy Bureau is helping to revise the regulatory landscape to attract more investor capital as well and through the Development Finance Corporation is looking to approve a significant amount in debt financing (up to $500 million). The U.S. has a significant role to play in offering financing solutions to support renewables and expand the deployment of non-fossil energy. India still needs to reform its state power distribution.

The importance of a just transition was also raised as millions of Indians in the Eastern state derive income from the coal sector and the U.S. expressed its commitment to supporting the generation of alternative livelihoods to make sure no worker is left behind. In this vein, the political sensitivity around coal was again raised, as it currently makes most sense to go after the least efficient coal power plants, rather than aiming for a full blown South Africa modeled deal, where coal usage is only a fifth of India's, as India is not yet ready to entirely decommission coal. There was some push back on this point, however, with coal closures being crucial to the 500 gigawatt goal and thus wanting to continue to push on these closures. CCUS was also raised as potentially controversial in this way because of this push and pull

between working with dirty plants and going straight for renewables. The issue of a just transition has complex human dimension issues which are also embedded in the politics of subnational governments.

Other opportunities include advancing clean transportation, which has great political momentum in India, and leveraging the existing partnership under ISA to do solar deployment in Africa.

Summary of Climate Finance Working Group Session

This session covered some of the outstanding challenges and opportunities related to the mobilization of climate financing, which can be particularly helpful in markets lacking sufficient investment momentum. Globally, the scale of financing necessary is around 2 trillion dollars and to fill this gap in capital, investments must rapidly accelerate.

There was agreement that the risk in financing this large of a transition and scaling emerging critical technologies cannot be borne by the private sector alone, but must also be paired with a significant increase in the public outlay. Increasing the public outlay could be supported by a modulated tax structure in India to crowd in renewable energy investments. This also relates to emerging critical technologies, where the upfront investment from public funds cannot be escaped and the risk of failure cannot be borne by the private sector alone. While the U.S. congress can do more to support these necessary investments, subnationals in India can also work to create signals and incentives to increase the attractiveness of investments (for example, by increasing confidence, developing predictable standards, and reducing tax burdens).

Lending out more for renewables, however, will also require significant regulatory change, as financial ecosystems will have to go beyond their entire stock of exposure. Suggestions were also made to structurally reform multilateral development banks or potentially consider bypassing this reform and establishing a new de-risking facility under G20 (financial de-risking is key to enhance credit and bring in more private capital without destabilizing the rupee). Presently, multilateral development institutions are a significant obstacle – requiring tear down or significant rebuilding. Though the Development Finance Corporation has the ability to lend to companies and financial intermediaries providing liquidity and absorbing risk. Another suggestion was that insurance come in in India to create a climate risk insurance facility that can leverage private capital.

Energy security was raised as an important topic of conversation, as there currently exists severe vulnerability in India's manufacturing system. On the topic of emerging critical technologies, it was raised that these technologies should be leveraged to forge a better bridge between the global north and south, ensuring that the conversation is not just about technology transfer, but about co-ownership, which can contribute to driving an energy secure energy transition. The crisis in Ukraine and Russia also highlights the importance of distributed supply chains to avoid dependence on any one nation.

There are significant other benefits to distributed supply chains as well, as the world should not be almost entirely reliant on one nation for solar and for the processing of critical materials, and framing a shift towards a clean energy future as one towards reduced reliance on any one country is a strong pitch. On solar, there was a shared interest in continuing to explore U.S.-India collaboration in Africa to increase their development and deployment of solar energy.

Specifically, India is also a natural place for manufacturing given its footprint and prowess and can become a critical player in the supply chain and processing (for solar PVs, electric batteries, electrolyzers,

etc.). The Quad is a possible mechanism through which to engage on supply chains, particularly through a hydrogen partnership, and driving resilience; this could be via a Quad Plus structure of like-minded countries, wherein India and US could be at the heart of a green hydrogen alliance and create a rules-based alliance, and in doing so avoid exposing themselves in energy insecure ways as has been the case for solar and wind. The U.S. and India could also work together through the Quad on carbon markets.

There is significant momentum on renewables, particularly in solar in India, however, currently, there exists insufficient momentum in the Indian transportation sector (which accounts for 20-25% of emissions). The U.S. and India can work together to de-risk and provide the capital necessary to increase the adoption of two- and three-wheel vehicles in India. Official lending can be used to de-risk greater investment in the electric 2-3 wheel vehicle market. The U.S. and India can work together to share risk on the development of capital, and provide the catalytic capital to increase the adoption of electric 2 and 3 wheel vehicles in India.

Summary of Climate Resilience & Water Working Group Session

The Climate Resilience & Water working group emphasized the importance of adaptive solutions, which are ready in hand, but must be replicated and scaled up adequately. This requires identifying and elevating climate risk, better integrating this risk into policy, plans, and importantly investments. Climate finance has a significant role to play in funding resilient solutions, as currently they have difficulty attracting capital and if the benefits of these adaptive initiatives can be better translated they can better attract private investment and be scaled up. These solutions also require political buy-in at the national and subnational level.

The two countries can look at both adaptation and mitigation together. Some of these opportunities included climate adaptive start-ups and nature-based solutions, both of which require enabling environments and sustainable financing models to scale up and support. Specifically, agri-tech, which has grown explosively, solid waste management which deals with urban food waste, and water start-ups were raised; all of which are most successful when in close collaboration with NGOs and those in closest contact with those most impacted. Nature-based solutions, including forests and mangroves also have significant potential because of the carbon they sequester, though they must be sold to governments at scale. America's National Parks system could serve as a good model for Indian entities looking to scale up forest solutions.

Climate impacts often speak through water, whether it be by floods, droughts, or wastewater. For example, a huge number of rural Americans are living without sanitation, circumstances which are exacerbated by climate change, was brought up as an example of the uneven distribution of climate impacts and the focus that the U.S. government has tried to turn to these climate justice issues. In these contexts, technological solutions have failed to offer adequate solutions to vulnerable communities. While a federal government response is important to addressing environmental justice, all solutions must require community buy-in and adequate engagement including local voices in planning, otherwise the community will not be interested or effective in implementation. The importance of climate education was raised on both the U.S. and Indian sides where there is dismal awareness, particularly in rural communities of the complex phenomena that have the potential to displace and alter the livelihoods of many.

The Indian side also raised the combined impacts of climate change and ecological disruptions on health, for example as the most recent IPCC report highlighted worsening malaria outbreaks, cholera and other physical and mental health issues associated with water and climate. Beyond health, issues like, for example the changing patterns of tiger occupancy, caused by climate instability have significant impacts on the livelihoods of local villagers and farmers as well and resilience measures are essential for the communities (about 80% of Indians) around impacted, vulnerable ecosystems.

Other opportunities for collaboration might include: the U.S. replicating one of the myriad of India's institutions on water governance and the U.S. sharing its water recycling technology with India.

Summary of Subnational Working Group Session

While national policy and climate finance are necessary, they are not sufficient and subnational action must also be leveraged to drive climate action. Within India, some of the challenges with subnational work are: a lack of political champions and a lack of political buy-in as actions are disconnected from the experiences people are having on the ground. It is a positive sign, however, that discussions on climate have moved away from just the Ministry of Climate & Environment to the ministry of housing, energy, and transport and across states on the subnational level. With regards to electric mobility, however, which is encompassed across five ministries, there does need to be a ministry allocated towards coordinating across. With stronger leadership at the local level, which is aimed to be bolstered by a year-long climate change management program among other efforts, there should be more local champions that can take up the climate story and push action forward at the subnational levels.

In the U.S., even with a strong leader in the white house unlocking national ambition, California has continued to lead, working to strategically capitalize on investments from the Infrastructure Bill, structuring its state budget, and working to rapidly transition to a clean grid. Political elections, including upcoming midterms, and a competitive spirit between states to lead the way on subnational ambition, both influence sunbational action. Carbon markets, water/climate resilience, and equity issues were all raised as opportunity areas for subnational action.

Electric mobility, which has been previously discussed in past Dialogues, was identified as a key area for potential collaboration and an area where the two countries can share knowledge and unlock investment. Public transportation has become much more common in India and can be massively scaled up (aim to be at 100% eclectic buses before 2027) and lessons can be shared with the U.S. where individual vehicles are much more commonly used. Similarly, the U.S. is just starting to more deeply explore electric school buses (focused on building demand - only manufactured 1000 in the U.S. last year and India also needs to focus on the manufacturing side - offering a good opportunity to diversify away from China manufacturing) and explore micro mobility initiatives including 2 and 2 wheelers, which can be shared with Indians. A focus on electric buses could be a significant way to prioritize equity given their accessibility and public health benefits. Electric buses also meaningfully contribute to the storage needs that both countries need to balance renewables and both software and hardware cooperation could be helpful across countries.

While there is less knowledge sharing on the heavy duty side, there does exist a fair amount on the automaker side. Within California, where ½ of the nation's electric vehicles are on roads, there exist strong regulations and incentive structures which can be replicated and shared with India. This includes knowledge sharing from the U.S. Advanced Clean Truck and Advanced Clean Fleet programs which put specific requirements on manufacturers and set certain numbers of fleets of electric vehicles on the roads.

In the electric vehicle sector, states in India can play a big role in building trade unions and reskilling the work force to deal with electric vehicles repairs, among other issues. In the U.S., there has been a movement to help guide state implementation of the electric vehicle transition and building the necessary infrastructure at the state and municipal level, but this is an important consideration to focus on. Without building out the necessary infrastructure and workforces on EVs and other projects like water, ambitious targets will be unachievable, and opportunities to collaborate on these issues would be useful. In the U.S. states have invested in public universities and community colleges to develop the climate workforce of the future, but there remain significant opportunities to take this further.

Within the context of California's lithium stores at the U.S.-Mexico border, subnational cooperation between India and the U.S. could be a lever to unleash rare critical materials that will be necessary in the electric transition.

In India, the Finance commission has successfully incentivized states, specifically having a big impact on states dealing with deforestation. Similarly to the U.S., competition has also driven action at the state level though weaker states need support around capacity building to maintain the pace of more progressive states. In the U.S., incentive and punishment structures have also been used to drive subnational action with the federal government withholding dollars from states that do not develop air quality plans and other creative grants, tax credit incentives, revolving loans, and even ways to encourage individuals to use public transport.

In India, states are making State Action Plans for Climate Change, which cover a lot of issues related to the vulnerability of states and communities to climate impacts, including issues on water, agriculture, heat stresses, and livelihoods, and the Track II was suggested as a potential venue to share work plans associated with these interventions.

The Dialogue could collaborate at the state-level on coastal zone management, among other resilience issues that had previously been raised (nature based solutions, linking adaptation and mitigation, forestry and agricultural management, and water sanitation).

Summary of Green Hydrogen Session

The technology of green hydrogen is well-proven and governments and investors are bought into the potential of this energy source. The U.S. government has made significant commitments ($8 billion dollar commitment to hydrogen hubs in 2021, established $40 billion loan program, etc.) to green hydrogen and the technology and cost will be incredibly viable in the years to come. This momentum extends to asset managers as investors have also seen the potential value of green hydrogen and its efficiency (can be generated on site without transporting). With scale increasing, price is also expected to go down exponentially as well. Even for countries less focused on green hydrogen, but on cheap energy energy, energy security, reducing imports and air pollution, green hydrogen will likely help every one of these issues as well.

In India, there is interest and political will from the Prime Minister and a motivation to move away from fossil fuels and displace some of this fossil-based energy with green hydrogen, with their national green hydrogen mission to be expected anytime in the next few weeks. From this document, there are a few important provisions impacting green hydrogen, including an interstate and intrastate wheeling charges for moving power between and within states and accounts for 50-70% of green hydrogen costs; banking, which can help to optimize electrolyzer and can reduce costs by 40%; signaling from the government on wanting to create an export hub in India. Some of the objectives of this mission document are to create a market (switch grey to green in next decade), blend green hydrogen and natural gas and replace natural

gas and to create cost offsetting and enable significant production from India, which could also diversify away from an existing dependence on China for imports.

The U.S.-India partnership, alongside the QUAD, can help to develop a global green hydrogen coalition, which can help to drive scale rapidly. The two countries can also collaborate on joint R&D - taking existing technology and increasing efficiency, knowledge sharing across standards, regulations, and harmonization (particularly in localities), exchange on natural gas pipeline adaptation and storage, facilitate collaboration among technical experts, share knowledge from private sector business models, share safety questions, and collaborate on production.

LA is a concrete example of how green hydrogen is being driven forward in four key ways: energy solution for grid locally (in-basin), energy solution for power generated out of basin, fuel for zero emission vehicles (passenger + heavy duty trucks), and power industrial equipment at ports, potentially ships. To further advance this work, USAID could also fund cities and states directly to cooperate directly with foreign partners on issues like green hydrogen, as LA and other cities cannot fully engage without this support.

The Track II can support the advancement of the Green-Shipping Network launched by the Quad. The network is led by a taskforce of the ports of Los Angeles, Mumbai Port Trust, Sydney (Botany), and Yokohama, with the intention of building a network dedicated to greening and decarbonizing the shipping value chain. LA-Shanghai have also recently announced a green corridor, in a process facilitated by the Aspen Institute, that opens up the prospect of constructively engaging China in this too. This effort will require demand aggregation to create an energy secure clean shipping network, which the Track II could work to support. It was also raised that a land side component of the shipping initiative would also be useful in ensuring goods are moved forward with zero emissions trucks as well, an effort which this group can encourage LA and Shanghai on.

Quad discussions have been difficult on the climate side but there might be more general agreement on technology. There might also be opportunities to collaborate on end-uses specifically as well. The production model that people are focused on: heavy duty industry replaces gas or coal and heavy duty vehicle fleets need to be elevated. There is also a lot of interest in the related issue of green ammonia, specifically as a shipping fuel, which the two countries can collaborate to build up markets.

The caveat was added that while in the U.S., there has been a significant focus on supply side innovations, demand side initiatives need more attention to accelerate decarbonization in this decade and there are significant opportunities for reducing carbon emissions through demand-side measures in the short term.

Several energy system models for the US suggest that hydrogen from biomass waste with CCS can be an important contribution to carbon removal. A WRI study found that it could be about 1/3 of the hydrogen in 2050, but most of the technological carbon removal. There are several startups in California trying to commercialize this pathway, but it remains to be seen if this will be as significant in the real world as it is in the decarbonization models. In India, the supply chains don't exist yet for biomass.

Resources Shared

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