

# Green Finance Working Group

Recommendations to help accelerate the  
world's transition to a low-carbon economy



# Members of the Green Finance Working Group

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Goldman Sachs — Co-Chair

International Finance Forum — Co-Chair

Bank of China

BASF

Contemporary Amperex Technology Co., Ltd. (CATL)

China Energy Conservation and Environmental  
Protection Group (CECEP)

Dow Chemical

General Motors

Honeywell

Paulson Institute — Partner

Shanghai United Assets and Equity Exchange (SUAEE)

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# Executive Summary

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Nearly half of the decarbonization required to get to net zero by 2050 is reliant on access to clean power generation.<sup>i</sup> But in many parts of the world, energy that is inexpensive, reliable, and clean is not available at scale. And the decarbonization of transportation, buildings, and industry will require a complex ecosystem of new and innovative low-carbon technologies beyond the supply of clean power. Driving the investment and innovation needed for a more inclusive low-carbon transition will require a combination of thoughtful public policy, private sector engagement, and capital market solutions.

This is why, in December 2021, Goldman Sachs and the International Finance Forum (IFF) convened global companies — including financial institutions and key sector participants from the United States, Europe, and China — to launch the Green Finance Working Group (“the Group”). Over the last year, the Group explored the following five key pillars, which were discussed and analyzed over a series of meetings, in order to develop recommendations for how to accelerate the global climate transition:

1. Lowering the Major Components of Carbon Cost Curves
2. Accelerating Capital Facilitation for Climate Transition
3. Identifying Policy and Regulatory Principles to Further Incentivize Green Finance and Inclusive Transition
4. Assisting in the Development of Emissions Trading, Carbon Derivatives, and Futures Markets
5. Developing Metrics to Measure Meaningful Progress Towards the Climate Transition

Across these five pillars, this inaugural white paper from the Group developed six tangible and action-oriented recommendations for both policymakers and the private sector, largely based on lessons learned from innovative, first-of-their-kind case studies from member companies that can be replicated and scaled more broadly.

The Group believes that the most significant impact the private sector can have on the energy transition is in providing capital, ideas, and innovation to the areas where they can be most helpful. As this paper highlights, the private sector is beginning to step up to this opportunity and has invested in creative solutions to reduce the cost of decarbonization, develop innovative technologies, create millions of jobs, drive large-scale economic growth and protect biodiversity – all of which have significant economic value and are important to driving sustainable growth. But, in a world of increasing cost of capital, more supportive public policy frameworks across jurisdictions will play an essential part in increasing the flow of private capital to green infrastructure and new technologies. As such, there is greater need for other stakeholders like policymakers to incentivize or directly support green and transition capex.

Public-private partnerships are critical to drive decarbonization progress forward, with a particular need to focus on decarbonizing the highest-emitting sectors. Financial institutions, investors, and policymakers can proactively engage with these high-emitting sectors to develop or accelerate transition plans, and to identify and support the low-carbon technologies that will be needed for them to reach net zero.



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While thinking globally, the Group places a special focus in this paper on China, given its critical role in achieving sustainable outcomes. China today represents about 30% of global carbon dioxide (CO<sub>2</sub>) emissions and presents a massive opportunity for decarbonization.<sup>ii</sup> Of the USD 100–150 trillion of investment required globally over the next 30 years to decarbonize,<sup>iii</sup> it is estimated that upwards of USD 66 trillion is needed in Asia.<sup>iv</sup> China's ambitious plans to decarbonize therefore will have a meaningful impact on global emission reductions and drive significant progress towards global goals, as well as have broader implications from a supply chain perspective.<sup>v</sup>

This white paper is organized around the Group's six solutions-focused recommendations on how best to leverage green finance and capital markets as key tools to mitigate climate change and transition to a low-carbon economy. The background information set forth in the paper is based upon publicly available research, and the case studies that are included throughout each section have been provided by each of the member companies of this Group. Ultimately, the goal with this paper is to highlight the many perspectives of our different member companies to facilitate further dialogue on climate action in key jurisdictions across the globe with both private sector and public sector representatives.

# Recommendations of the Green Finance Working Group

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- 1 Continue developing innovative efforts to lower cost curves to drive decarbonization efforts. This can be achieved through the development of private sector partnerships and long-term offtake agreements, as well as by leveraging economies of scale to lower the cost of new technologies and systems (such as renewable power, hydrogen, carbon capture and storage, recycling processes and circularity).
- 2 Devote significantly more capex to green and transition finance projects to achieve net zero goals. Non-traditional, innovative forms of capital – such as blended finance, philanthropic capital, green bonds, mangrove restoration bonds, blue bonds and transition bonds – can be supported to help increase capex and solve the financing gap in transition projects as well as to support biodiversity goals, facilitate carbon reduction, and accelerate green finance initiatives.
- 3 Implement additional incentives for financial institutions to practice green finance through a combination of fiscal means (such as via taxes, subsidies, and public procurements), industry policies (market access), and financial policies (both monetary and regulatory).
- 4 Explore financial mechanisms that reduce reliance on coal-fired power plants and other carbon-intensive assets while promoting a just transition that prioritizes energy reliability and affordability. These include responsible phaseout of high-emitting assets and creative transition finance vehicles.
- 5 Strengthen carbon pricing systems globally. This can be achieved by adopting an Emissions Trading System and, in the case of China, amending the requirements to encourage broad participation in the established ETS – such as by moving forward with benchmark setting for new sectors, allowing an expansion of the sectors that can participate, incentivizing more institutional participants by facilitating the trading of carbon derivatives, and enhancing transparency and disclosure mechanisms to improve the credibility of the trading system.
- 6 Encourage companies to leverage consistent, comparable, and decision useful metrics to assess progress towards real economy decarbonization. Such metrics could include green capex, green revenue, emissions intensity and emissions avoidance to measure energy transition impact.

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Continue developing innovative efforts to lower cost curves to drive decarbonization efforts. This can be achieved through the development of private sector partnerships and long-term offtake agreements, as well as by leveraging economies of scale to lower the cost of new technologies and systems (such as renewable power, hydrogen, carbon capture and storage, recycling processes and circularity).

As is illustrated in the case studies below, there are a number of effective tools that can be used by the private and public sectors to lower cost curves, develop innovative technologies, increase feasibility of projects, and decrease risk associated with first-of-a-kind plants or technologies still under development. This can be achieved through financing projects, partnerships with early-stage companies, and long-term offtake agreements. Additionally, technological innovation will play a critical role in driving a just and orderly global transition because it can help expedite the development of solutions that may not be available at scale today.

### Cross-Company Incentives and Private Sector Partnerships

Lowering the cost of capital for innovation is critical. [Bank of China](#) has been focusing on financing innovative decarbonization technologies in recent years to lower the cost for green transformation. The bank recently led a team to support the world's largest and China's first 10,000-ton level solar-generated green hydrogen project, which featured forward-looking and cutting-edge technologies.<sup>vi</sup> If successful, the project may be able to be replicated in the Chinese market and give decarbonization technologies a lower cost basis while incentivizing more financial institutions to make financing available.

***Cross-company collaboration and private sector partnerships enable combined expertise to accelerate the development of new solutions, for decarbonizing both existing operations and developing game-changing technologies for the future.***

For example, in 2020, [Dow](#) entered into a joint development agreement with Shell to accelerate technology to electrify ethylene steam crackers, which make base chemicals that are transformed into a range of finished products. The joint program was awarded EUR 3.5 million (USD 4.2 million) in Mission-driven Research, Development and Innovation subsidy scheme funding from the Netherlands Government.<sup>vii</sup> The companies also joined forces with the Netherlands Organisation for Applied Scientific Research (TNO) and the Institute for Sustainable Process Technology (ISPT) to further accelerate technology development. Today's steam crackers rely on fossil fuel combustion to achieve the required high temperatures in their furnaces, making them highly CO<sub>2</sub> emissions intensive. Using low-carbon electricity to heat steam cracker furnaces could become one of the routes to decarbonize the chemicals industry. The challenge is to develop a technologically and economically feasible solution to achieve these high temperatures via electrification. In its first year, the partnership has advanced electrification solutions for today's steam crackers while also pursuing game-changing technologies for electrified crackers longer term. This dual path approach supports significant efforts required to meet Dow's 2030 CO<sub>2</sub> emission reduction ambition and target to achieve net zero CO<sub>2</sub> emissions by 2050 or sooner, in line with the Paris Agreement.<sup>viii</sup>



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***Additionally, larger, more established incumbent corporations should be incentivized to partner with early-stage companies to help them scale technologies faster, provide better access to customers, and advance research and development to help drive down the cost curve and drive sustainability at the global level.***

In 2021, [Honeywell](#) partnered with United Airlines to invest in a new clean tech venture from Alder Fuels to drive the production of first-of-a-kind technologies for existing refineries to convert to produce sustainable aviation fuel (SAF) at scale. SAF is a low-GHG alternative to conventional, petroleum-based jet fuel that is helping the aviation industry lower its carbon footprint. It is produced with used cooking oils and animal fats as feedstocks that are blended seamlessly with petroleum-based jet fuel at commercial scale. Honeywell first pioneered SAF production technology and applied it in China in 2011, and now will use its development process to partner with Alder Fuels to commercialize its technology.<sup>ix</sup>

More than a decade later, Honeywell announced its cooperation with Zhejiang Jiaao Enprotech Stock Co., Ltd. which will build a SAF production facility in the Jiangsu Province in China using Honeywell's Ecofining technology. The new facility will expand SAF production capacity in China and facilitate reduction of GHG emissions in aviation through the deployment of ready-now technologies, and support China's goal to achieve carbon neutrality by 2060. With Honeywell's advanced commercialized technology and Jiaao Enprotech's experience in waste oil processing, the companies will build the project into a new benchmark for SAF production in China.

***Given their experience within capital markets and wide client reach, banking institutions have a unique ability to collaborate with companies to raise significant capital to help drive the development and integration of low-carbon solutions. One example of this collaboration is facilitating long-term offtake agreements for private companies that mitigate future risks and allow the companies to make long-term investments in new low-carbon business lines.***

For example, as electric vehicles and renewable energies proliferate, one of the biggest hurdles to mass adoption has been scaling battery manufacturing in a sustainable way. To that end, in 2019, [Goldman Sachs](#) helped lead a USD 1 billion equity investment in Sweden-based lithium-ion battery manufacturer Northvolt alongside Volkswagen, after working with Volkswagen to secure procurement of batteries at scale.<sup>x</sup> In 2021, Goldman Sachs again partnered with Volkswagen, and other investors, to invest an additional USD 2.75 billion of equity – the largest private capital raise in Europe's history – to help fuel the company's global expansion and increase capacity at its factory in the far north of Sweden.<sup>xi</sup> From 2019 to 2021, Northvolt secured USD 27 billion in total contracts for its batteries, which, along with equity investments in the company, have allowed for the production of electric vehicle batteries at scale and driven down cost.<sup>xii</sup>

### Renewable Power, Hydrogen, and Carbon Capture and Storage (CCS)

***Technological innovation that is specifically focused on accelerating renewable power, hydrogen, and carbon capture and storage (CCS) are effective tools that can be used by the private and public sectors to lower cost curves to reduce GHG emissions.***

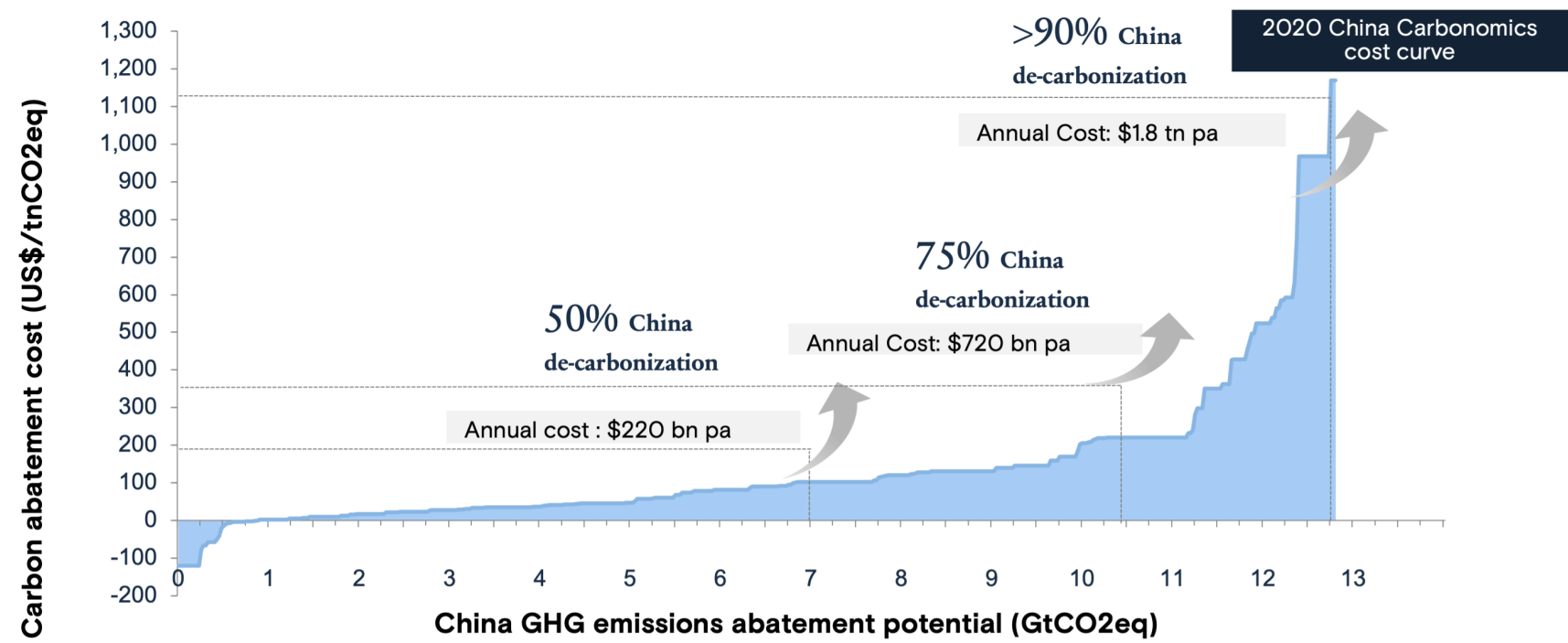
This could be particularly important for China given its significant focus on its industrial and power generation sectors. Net zero is becoming more affordable as technological and financial innovations, supported by policy, are flattening the decarbonization cost curve. As the world's largest CO<sub>2</sub> emitter, China's pledge to achieve net-zero carbon by 2060 and reach peak emissions before 2030 represents two-thirds of the ~48% of global emissions from countries that have pledged to achieve net zero.<sup>xiii</sup> The scale of China in the context of global climate change and emissions, alongside its ongoing economic expansion, makes its 2060 ambition a critical milestone for global decarbonization efforts.

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China’s emissions are distinct in terms of scale and sectoral mix. More than 80% of China’s emissions are attributed to two key emitting sectors: power generation, and industry & industrial processes.<sup>xiv</sup> These two sectors make up the vast majority of China’s carbon abatement cost curve, compared with about 55% for the European Union and about 50% for the United States across both the power generation and industry & industrial processes sectors.<sup>xv</sup> Not only is this significant in terms of China’s overall emissions mix, but it is also significant on the global scale. In 2021, China’s total CO2 emissions were estimated to be 12.5 gigatons, and China’s power generation and industry & industrial processes sectors accounted for approximately 10 gigatons (~80% of the total), which is roughly 26% of global emissions.<sup>xvi</sup> This difference makes the evolution of the country’s energy mix one of the most important determinants of global decarbonization.

This decarbonization will require the continued building of large-scale, connected infrastructure of grids and pipelines as well as microgrids and energy storage facilities that can leverage China’s construction and planning capabilities.<sup>xvii</sup> There is a steep cost curve for decarbonization, with renewable power on the low end and heavy transportation and heavy industry at the top, requiring more clean technological innovation to become economically viable.<sup>xviii</sup> As shown in Figure 1, based on current technologies and costs, it is estimated that 75% decarbonization would cost China USD 720 billion annually and USD 1.8 trillion annually for greater than 90% decarbonization. Moreover, China’s net zero by 2060 path could create a USD 16 trillion clean technology infrastructure investment opportunity, potentially creating 40 million net new jobs by 2060 across all sectors.<sup>xix</sup>

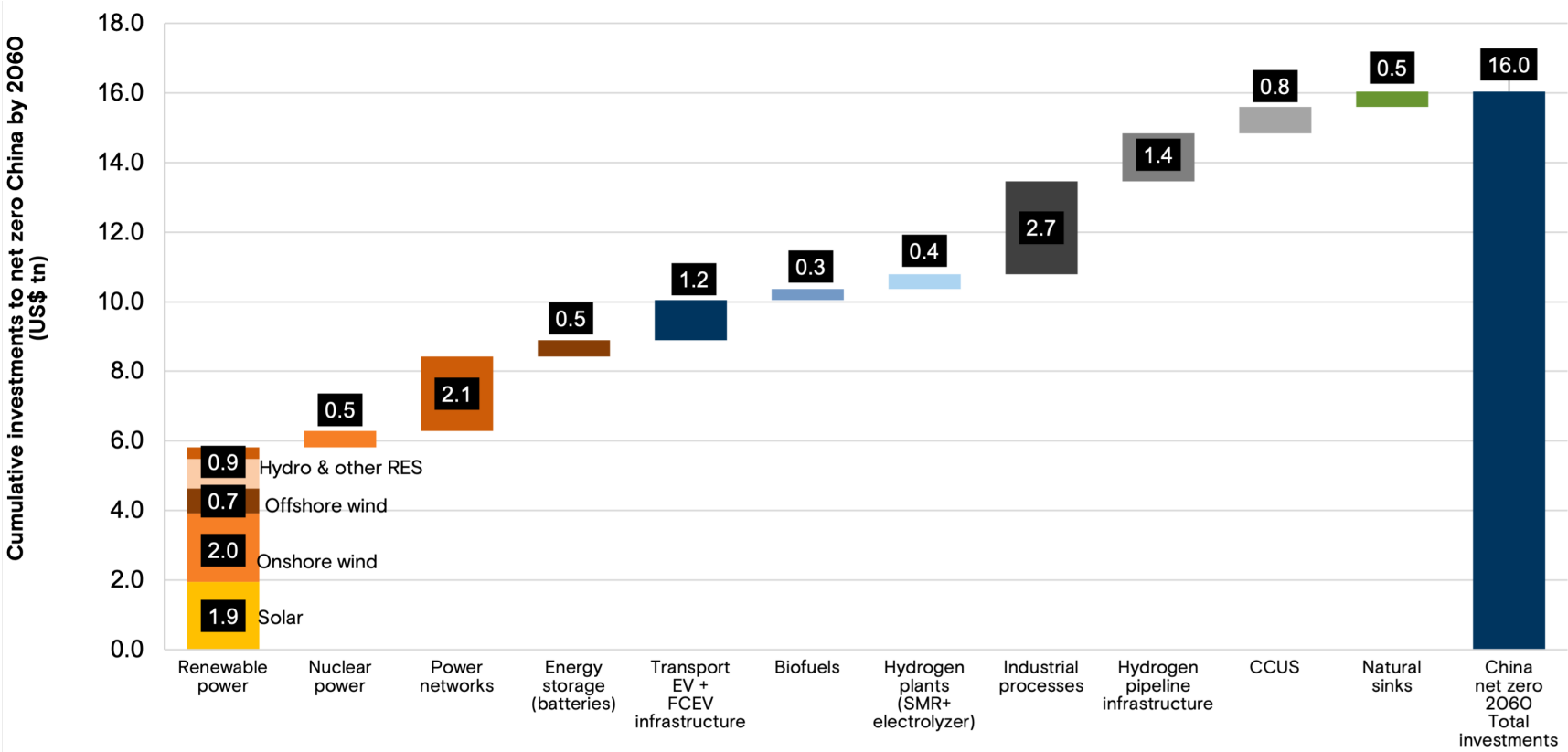
Figure 1: Decarbonization Cost Curve for China



Source: Goldman Sachs Research<sup>xx</sup>

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Figure 2: Cumulative investment opportunity across sectors for China net zero by 2060 (USD trillion)



Source: Company data, Goldman Sachs Research, UNEP – ILO – IOE – ITUC, EuropeOn, IRENA, NBSC.<sup>xxi</sup>

Because China’s cost curve is dominated by power and industry, three interconnected scalable technologies will be transformational for China’s path to net zero:

- **Renewable power** is the most important and economically attractive technology for decarbonization. It has the potential to decarbonize about 50% of Chinese CO2 emissions with power generation tripling by 2060.<sup>xxii</sup> This will be dominated by wind, solar, nuclear, and hydro power generation, driving increased demand for base metals such as copper and a complete overhaul of China’s power networks. At the same time, energy storage, as an auxiliary and supporting industry for the development of wind power, photovoltaic, and hydropower, also deserve attention. At present, China has proposed that the energy storage industry will achieve full commercial development by 2030, which will usher in new opportunities for the energy storage market.
- **Clean hydrogen** is a transformational technology for long-term energy storage enabling increasing uptake of renewables in power generation, as well as aiding the decarbonization of some of the harder-to-abate sectors, with a critical role in several industrial processes (iron and steel, and petrochemicals), long-haul transport, and heating of buildings. This technology could potentially drive about 20% of decarbonization in China, mostly in industry and heating.<sup>xxiii</sup>
- **CCS technologies** could decarbonize 10–24% of China’s annual carbon emissions, mostly from China’s industrial process emissions, without having to completely rebuild existing industrial infrastructure.<sup>xxiv</sup> Converting existing industrial infrastructure to be net zero can cost as little as 25% of building new green infrastructure, with CCS playing an important role.<sup>xxv</sup> CCS innovations encompass a range of technologies and processes that are designed to capture the majority of CO2 emissions from large industrial point sources and then to provide long-term storage solutions or utilization. CCS will also be vital for the production of blue hydrogen, which is hydrogen produced from natural gas and supported by CCS. It will also aid the decarbonization of industrial sub-segments where there are no alternative net-zero technologies in existence today (such as cement).



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***Large firms with cost advantages have a unique ability to promote decarbonization through technological transformation and equipment updates.***

As an example, the most energy-intensive aspect at one of **Dow**'s largest manufacturing facilities in the Asia-Pacific region is the distillation process, which accounts for 60% of on-site energy consumption. At this facility, Dow successfully implemented process optimization technology reducing steam consumption by 15% and redesigned a kiln burner to lower natural gas consumption, reducing overall CO<sub>2</sub> emissions by approximately 20,000 tons per year.

### Recycling, Circularity, and New Smart Technologies

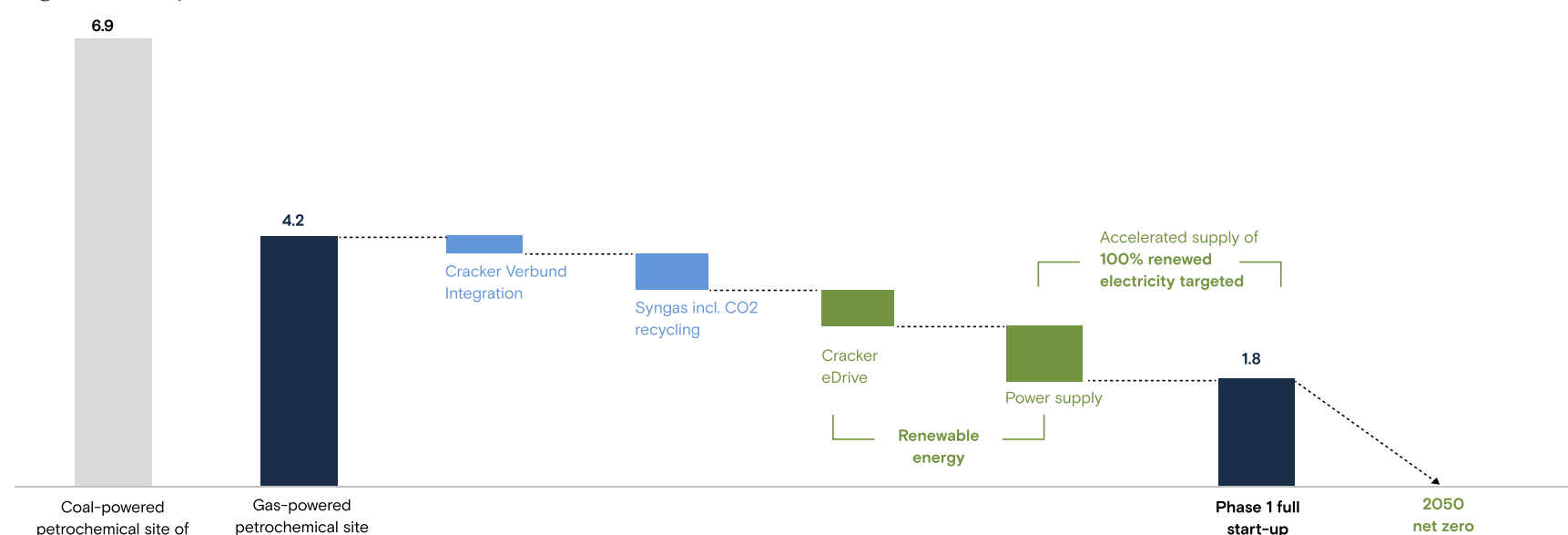
***Developing scalable technologies around circularity and recycling can be an innovative way for companies to reduce emissions, lower the cost of decarbonization and create new and more efficient processes to decrease waste.***

**BASF**, a German-headquartered multinational chemical company, has been using technology and innovation at their integrated "Verbund" sites to increase efficiency and drive long-term profitable and sustainable growth. BASF has six Verbund sites worldwide in which by-products of one process are used as starting materials for other processes. BASF saves on raw materials and energy, minimizes emissions, reduces logistics costs, and realizes synergies. The system is an important component of BASF's energy efficiency strategy – waste heat from one plant's production process is used as energy in other plants. Approximately 50% of the Verbund advantages stem from resource savings (energy, steam, electricity and water) compared to BASF's non-Verbund sites. The remaining 50% of the savings are achieved in logistics and material handling due to integration, such as by using pipelines instead of transporting via truck, railway, or shipping.<sup>xxvi</sup>

BASF is currently building a seventh Verbund site in Zhanjiang, China, which will be the largest investment project in the company's history (a EUR 10 billion, or USD 10.4 billion, investment by 2030). The site is designed to be a frontrunner in sustainability and will use renewable power instead of a conventional natural gas or coal-based power plant, electricity instead of steam-driven turbines, and other new technologies – which will reduce CO<sub>2</sub> emissions by more than 50% in comparison to conventional sites. Electricity from renewable sources is an important lever for decarbonization in the chemical industry, and BASF acted as a pioneer in developing a new Renewable Direct Power Purchase (R-DPP) concept. Its new plants in Zhanjiang that are coming on stream in 2022 and 2023 will be powered with 100% renewable energy. BASF has also signed a 25-year framework agreement with the State Power Investment Corporation to purchase renewable electricity for the next phases of the site and has the ambitious target to achieve 100% share of renewable electricity in 2025.

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Figure 3: Projected CO2 Emissions of BASF at Verbund Site in South China



Source: BASF Investor Presentation<sup>xxvii</sup>

**Companies can also reduce reliance on new fossil fuels by adopting a circular economy framework which has the potential to drive cost efficiencies, energy efficiencies, reduce GHG emissions, and reduce impacts on the environment.**

For example, **Dow** is leading its industry to prevent and remediate plastic waste in the environment through circular economy logic, collaborating across the value chain and innovating new products. Advancements in the United States and Europe through the creation of waste ecosystems will enable Dow to produce circular polymers from materials previously considered unrecyclable while at the same time targeting a GHG footprint that is lower than products derived from a traditional energy source.<sup>xxviii</sup> These advancements reduce GHG emissions, reduce waste, and enable the production of plastics through advanced recycled feedstock that provides customers with the same performance as virgin plastics derived from fossil fuel-based feedstocks. An initial supply of fully circular polymers will be available to Dow customers starting in 2023. With a focus to Transform the Waste, Dow recently announced a new commitment to commercialize 3 million metric tons (~25% of its total polyethylene capacity) of circular and renewable solutions annually by 2030, which will enable it to surpass its original 1 million metric ton Stop the Waste target.<sup>xxix</sup> Additionally, Dow aims to have 100% of its products sold into packaging applications to be reusable or recyclable by 2035.<sup>xxx</sup>

**Recycling and circularity are not the only types of innovative technologies that can be brought to scale; companies can develop their own smart technologies to reduce their carbon footprint.**

**Sichuan Contemporary Ampere Technology Limited (CATL-SC)**, for example, is one of the world's largest electric vehicle battery production bases. CATL's main source of carbon emissions is the combustion of natural gas. Since its establishment, CATL-SC has developed a series of innovations to achieve its energy savings and emission reduction goals. They independently developed a smart energy management system and steam condensation recovery system, which helps reduce energy consumption significantly. The plant also implemented a digital production management system to improve production efficiency and reduce energy consumption per unit of product. They also developed an intelligent logistics system for the unmanned and electrified mobility within the plant. Through these innovations, the plant achieved carbon neutrality in 2021, making the plant the world's first zero-carbon battery factory. As such, it offers

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a new technology solution for achieving carbon neutrality of world-class electric vehicle battery production bases and serves as an example for achieving carbon neutrality in the lithium-ion battery industry.

As the leading enterprise of the battery industry supply chain, CATL-SC has driven the low-carbon transition of upstream companies, as the plant's suppliers of cathodes and separators have announced their carbon neutrality targets. Based on the plentiful practices by the industry supply chain to achieve carbon neutrality, and backed by abundant hydro resources in Sichuan Province, the Sichuan Provincial Department of Ecology and Environment and Department of Economic and Information announced the Work Plan for Pilot Projects of Near-zero Carbon Emission Zones in Sichuan Province, which aims to construct 25 near-zero carbon emission zones by 2025.<sup>xxxix</sup>

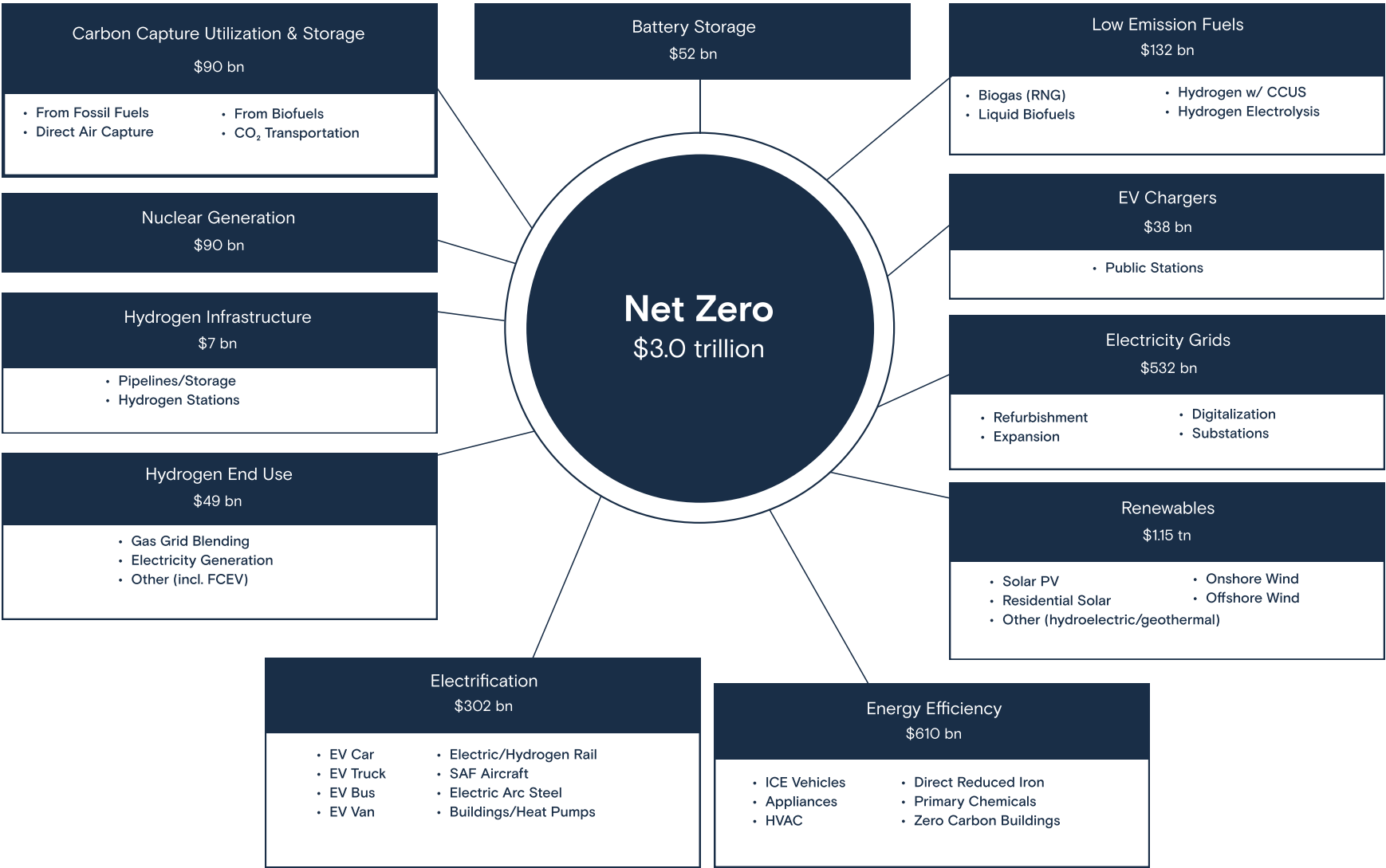


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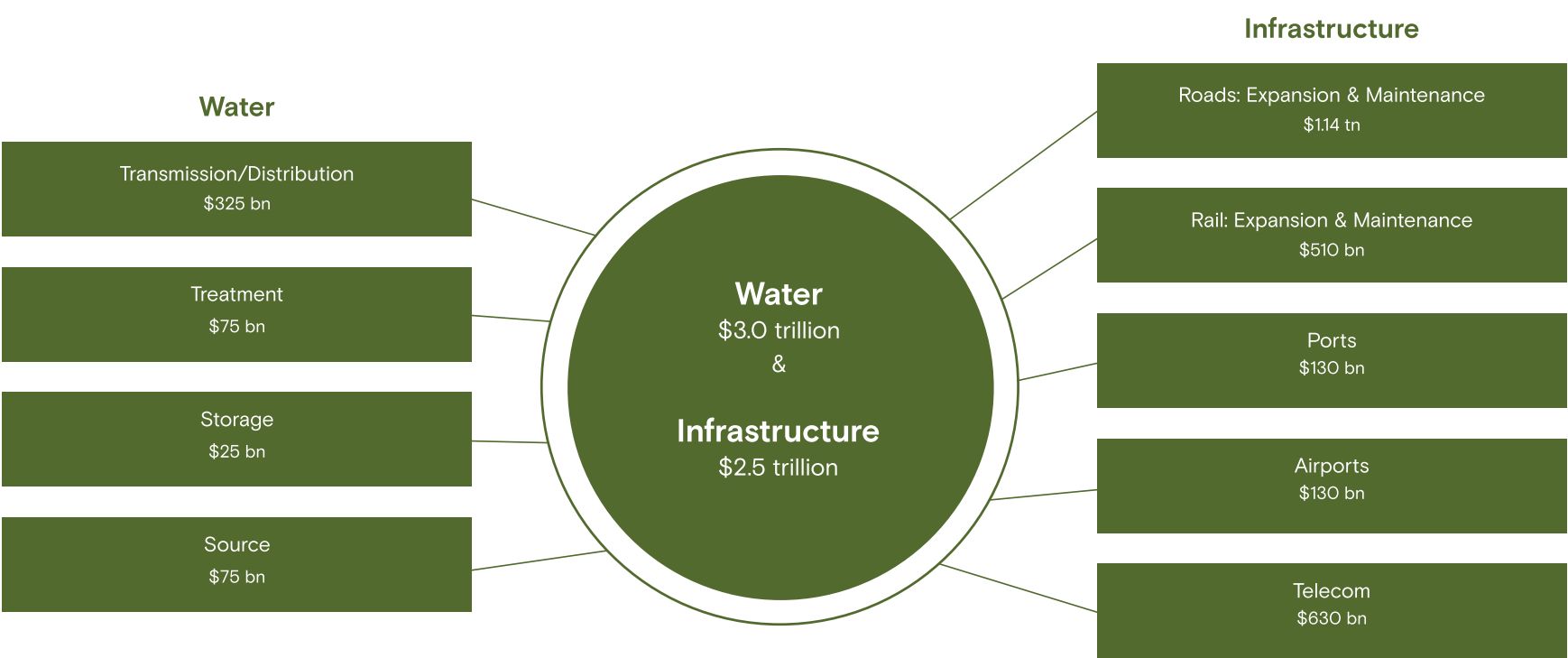
Devote significantly more capex to green and transition finance projects to achieve net zero goals. Non-traditional, innovative forms of capital – such as blended finance, philanthropic capital, green bonds, mangrove restoration bonds, blue bonds and transition bonds – can be supported to help increase capex and solve the financing gap in transition projects as well as to support biodiversity goals, facilitate carbon reduction, and accelerate green finance initiatives.

Green capex will likely be the dominant driver of global infrastructure over the next decade, with significant investments needed from a combination of governments, private companies, and public companies to achieve net zero goals. In fact, USD 6 trillion of investment is needed annually to align with net zero by 2050, including to address clean water needs and shore up transportation and other critical infrastructure.<sup>xxxii</sup> This is a substantial increase from the USD 3.2 trillion per year invested from 2016–2020, and would require an incremental USD 2.8 trillion in annual run rate of green capex in the 2020s to support net zero, infrastructure, and clean water pathways.<sup>xxxiii</sup>

Figure 4: The Net Zero, Infrastructure and Clean Water Mosaic



# Recommendation 2



Source: IEA, McKinsey, OECD, Company data, Goldman Sachs Research<sup>xxxiv</sup>

Of the USD 2.8 trillion overall that is incrementally needed per year, just shy of USD 1 trillion in green capex is currently on track to come from the private sector.<sup>xxxv</sup> It is estimated that publicly traded companies should have approximately USD 0.9 trillion per year of spare capacity of green capex from critical sectors, concentrated in the Oil & Gas, Metals & Mining, Software and Semiconductors sectors. This is because very few sectors with above average corporate returns are reinvesting more than 60% of cash flow into capex, which suggests that there is capacity for further private sector investment.<sup>xxxvi</sup> However, even if this spare capacity were deployed, approximately USD 1 trillion per year of additional investment from some combination of governments, individuals or corporates would still be needed.

Notably, the spike in commodity prices and disruption in commodity supplies due to the Russia Ukraine conflict has brought to the forefront the need not only to transition to clean energy but also to have adequate supply of energy reliability. Innovation in hydrogen, battery storage and other renewables is likely to increase, in part as a result of commodity price inflation coming from higher prices in Europe and oil prices globally. As the public and private sectors look to deploy capital towards scaling renewable energy, they must also consider how to broaden markets for procuring critical minerals and raw components that are essential for these projects. For example, the metals and mining industry will need to invest USD 1.7 trillion cumulatively over the next 15 years to supply enough copper, cobalt, nickel, and other critical minerals for the transition and USD 21 billion of investment will be needed to finance lithium demand by 2025.<sup>xxxvii</sup>

And multiple sectors – from semiconductors to shale to solar – have seen lower costs as a result of greater investment and innovation. The cost of energy for renewable power has decreased by more than 70% since 2008, the cost of lithium-ion batteries has dropped by 97% since they were first commercially introduced in 1991,<sup>xxxviii</sup> and the overall cost curve of carbon abatement has also decreased due to innovation and scale.<sup>xxxix</sup>

But there is no one-size-fits-all capital solution that exists to help solve the financing gap in projects that are focused on decarbonization and energy transition efforts. Instead, as set forth below, the private and public sector should think creatively about how to tap into innovative and non-traditional forms of finance.

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### Blended Finance Solutions

*While the private sector has a significant role to play to achieve global energy transition goals, it alone cannot solve the climate change crisis. That is why blended finance, where commercial capital works alongside other forms of capital, is key — particularly in emerging markets like those in Asia.*

Blended finance investments can be in the form of debt or equity and include funds from multilateral development banks, institutional and private equity investors, government organizations and other financial institutions. In these transactions, concessionary or below-market rate capital, along with other tools such as guarantees from development banks and governments, can help reduce risks and encourage the private sector to increase their capital investments. Over the last decade, the blended finance market has comprised 56 deals per year on average, amounting to USD 10.7 billion in annual financing.<sup>xi</sup> Although the market has remained steady over this period, a significantly higher volume of blended finance opportunities is required to achieve net zero goals, particularly in emerging markets.

*The private and public sectors can facilitate and accelerate the adoption of new low-carbon technologies in regions that have not historically received as much climate investment.*<sup>xli</sup>

As an example, in September 2021, [Goldman Sachs](#) and Bloomberg Philanthropies joined together with the Asian Development Bank (ADB) to launch a Climate Innovation and Development Fund (“The Fund”) to deploy capital and catalyze investment in clean energy projects across South and Southeast Asia, with a special focus on India and Vietnam. Structured as a blended finance facility, the Fund is seeded with USD 25 million of grant capital and has the potential to unlock up to USD 500 million in private sector and governmental investments in critical solutions to accelerate technologies and markets for a net zero future. Managed by the ADB, the Fund will target projects with direct, measurable, and positive climate-related outcomes, including clean energy systems, sustainable transportation, and energy efficiency. The Fund will pursue project types and financing models that are replicable and have a high potential to scale up in the broader market once initial transactions demonstrate success.

In October and November 2022, the Fund announced its initial investments in India and Vietnam.<sup>xlii</sup> In India, the Fund mobilized a USD 60.5 million financing package, approximately 14 times its investment capital, to support the purchase of 255 electric buses to replace existing diesel buses operating on 56 high traffic intercity routes.<sup>xliii</sup> Additionally, the Fund will support the construction of charging infrastructure including solar-plus-battery solutions at the bus depots to maximize potential emission reductions. The solar-plus-battery solution has emerged as an innovative, additional step in tackling climate change by using a green power source instead of procuring predominantly thermal energy from the grid and would have not been possible without the use of concessionary capital. The project expects to reduce approximately 15,000 tons of CO<sub>2</sub> emissions per year, reflecting a particularly critical decarbonization effort in the country given that the road transportation sector in India is largely fossil fuel based and contributes nearly 12% of the country’s total emissions.<sup>xliv</sup>

In Vietnam, the Fund mobilized a USD 135 million total financing package for Vietnam’s first domestic car company and electric vehicle manufacturer, for manufacturing the country’s first fully electric bus fleet for public transportation and the first national electric vehicle charging network.<sup>xlv</sup> The project aims to build up to 140 electric buses and 150,000 charging ports across 2,000–3,000 stations throughout the country. Deploying first-of-a-kind technologies in new regions where there are regulatory uncertainties is highly risky and would not have been possible without the Fund’s capital. The Fund’s initial investment will address the limited availability of long-term financing for sustainable transportation in the region and also provide capex related to installing solar-plus-battery storage at the depots to maximize GHG emissions reductions. The financing package also includes USD 950,000 in technical assistance in



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Vietnam, focused on raising consumer awareness about e-mobility's economic, environmental, and social impacts to help advance its market penetration.<sup>xlvi</sup>

### Philanthropic Capital

***Private sector companies can also accelerate a transition that is inclusive and community-focused through partnerships and investments, including philanthropic capital.***

In 2021, **General Motors (GM)** launched Equitable Climate Action, an initiative dedicated to helping ensure its all-electric future is inclusive for its current and future workforce, customers, and communities that may be more likely to disproportionately experience the effects of climate change. As part of Equitable Climate Action, GM created the now USD 50 million Climate Equity Fund aimed at addressing equity gaps in the transition to electric vehicles and other sustainable technologies. As of September 2022, the Climate Equity Fund has supported over 30 nonprofit organizations that are helping to implement inclusive solutions for a net zero future. GM believes that they can have the most impact in accelerating the transition to an inclusive zero-emissions economy through deepened engagement at the community level.<sup>xlvi</sup> As an example of this work, GM is a founding member of the Climate Equity Collaborative, an initiative focused on addressing the disproportionate impacts of climate change on vulnerable communities and youth. The Climate Equity Collaborative aims to engage communities, youth and nonprofits in designing and implementing equitable and inclusive climate solutions, including elevating environmental justice and education within the broader climate conversation. Climate change does not impact every community equally, and so GM is partnering with nonprofits and leading collaboration such as this to develop and implement solutions that bring everyone along to a zero emissions future.<sup>xlvi</sup>

### Mangrove Restoration Bonds

In November 2018, the **Paulson Institute** launched a study on China's Mangrove Conservation and Restoration Strategy to identify key challenges facing China's mangroves and outline corresponding policy recommendations. Two years later, the Chinese government released its national action plan for mangrove conservation and restoration, which set the target of creating and restoring 18,800 hectares of mangrove forests by 2025.

***Therefore, there is a unique blended finance opportunity in China related to the potential development of a bond to secure needed capital for this effort. Specifically, a government-issued bond to restore mangroves, paid for by the Chinese government or Chinese banks, offers a low-risk solution to securing the needed financing to restore all of China's mangroves and achieve the 2025 Action Plan goal.***

In addition, a mangrove restoration bond could provide China with considerable ancillary benefits including carbon sequestration credits towards its national climate targets, coastal flood protection, sustainable fisheries and aquaculture benefits, and tourism opportunities. Mangroves, once restored, offer considerable economic, social, and environmental benefits that could, in theory, be monetized to provide revenue for a mangrove restoration bond. These include carbon credits that could be used within the provincial or national carbon markets trading systems (as discussed below) or by the national government toward its climate commitments; coastal flood protection paid for by governments or by insurance companies; lease or tax revenue from sustainable fisheries and aquaculture; or fees from local tourism.

However, these revenue streams alone are not sufficient to support a bond issue of this scale, which is why the only financially-viable and low-risk solution to financing mangrove restoration is a government-issued bond, paid for by government revenues and backed by the security of China's banks and national, provincial or local governments.

## Recommendation 2

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As the Paulson Institute notes, a bond for mangroves should be feasible based on the overall, and rapid, increase in bond issuances by China in the last two decades, the corresponding rapid increase in China's issuances of green and blue bonds in the last few years (described below), and the recent and strong increased participation by both onshore and offshore investors in purchasing China's bonds. That said, a Chinese bank or government agency must agree to take on responsibility for the issuance and repayment of the bond.

### Green Bonds<sup>1</sup> and Blue Bonds

*Blended finance opportunities are not the only creative capital raising solutions; governments can also issue green bonds to raise capital given there is wide demand from investors including banks, fund managers, and insurance companies.*

In fact, China is a major participant in global bond markets, as the world's second largest onshore bond market and second largest sovereign bond market.<sup>xlix</sup> Additionally, China is annually the number one or number two issuer of green bonds globally. Moreover, the three Chinese policy banks – the China Development Bank, the Export-Import Bank of China and the Agricultural Development Bank of China – have been actively promoting the development of the green bond market and have focused on investing in green projects with their funds. While most China green bonds are issued in the onshore market, a growing number of issuances are offshore and helping to reach a more diversified global base of investors. For example, in June 2022, the [Bank of China](#) issued the first-ever USD 500 million green bond aligned with the updated version of the Common Ground Taxonomy. The net proceeds from this bond issuance are used for green projects in China, Germany, and Holland, and in multiple fields, including wind power, pumped storage, urban railway, electric bus, and high-efficiency energy-saving equipment manufacturing.<sup>1</sup>

Almost all of China's green bonds are for climate and energy projects, and the majority are issued by either financial or non-financial corporates. But, as described below, there are increasing numbers of government-issued green bonds in China to secure capital for forest, water, and wetland protection. China's onshore bond market is already huge and open to global investors, but recent developments in China for issuing green bonds in offshore bond markets are opening more opportunities to attract a wide range of global investors.

Corporate green finance frameworks can also help to accelerate capital towards green projects. For example, [General Motors](#) created a new Sustainable Finance Framework and in August 2022 issued USD 2.25 billion of investment-grade green bonds, which was their first capital markets activity specifically supporting the company's electric vehicle strategy.<sup>li</sup>

*Another type of innovative financing instrument that can support biodiversity protection goals is a blue bond, which is a debt instrument issued to support investments in healthy oceans and blue economies.*

In a blue bond, earnings are generated from investments in sustainable blue economy projects, which use ocean resources for economic growth while preserving the health of the ocean ecosystem. Similar to green bonds, a framework is required to define which projects are eligible for funding, but examples might include wastewater and sanitation, circular economy, ecosystem management and restoration, coastal and marine tourism, marine renewable energy, aquaculture and fisheries. In 2020, the [Bank of China](#) issued a 3.2 billion RMB (about USD 448 million) 10-year blue bond to finance offshore renewable energy and water management projects that have positive environmental, economic and climate benefits. Proceeds of these blue bonds will be used to boost the expansion of sustainable blue economies through marine-related green projects across various domestic and overseas markets including, but not limited to, offshore renewable energy and wastewater treatment.<sup>lii</sup>

<sup>1</sup> We note that there are a range of taxonomies that have been created or are in the process of being created across various jurisdictions, and jurisdictions globally use and rely on different definitions of what qualifies as “green.”

## Recommendation 2

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### Transition Bonds and Transition Finance

Transition bonds and transition finance are an important supplement to the green financial system and an integral part of the path to carbon peaking and carbon neutrality in China.<sup>liii</sup> Whereas traditional green finance supports “pure green” or “close to pure green” projects, transition finance refers to projects intended to finance the low-carbon transition of carbon-intensive industries and businesses. Transition finance not only will help provide necessary funding to support businesses in hard-to-abate sectors, but can also help allow them to adopt cleaner technologies, increase energy efficiency and become greener over time.<sup>liv</sup> To date, however, transition finance has not received sufficient financial support, which is detrimental to the low-carbon transition. To help industries of heavy pollution and high emission transition to a low-carbon economy, China vigorously encourages the development of transition finance, as long as the underlying firms use the proceeds for climate transition-related activities.

In June 2022, the [Bank of China](#) worked with Huaneng International to issue five first-of-a-kind transition bond projects launched in the interbank market.<sup>lv</sup> These five projects disclosed in detail the overall transition plan and pathway on the issuer side, the sectors of fundraising projects, and the expected or actual transition impact, with third-party verification reports covering the full range of the issuers' low-carbon transition plans, use and management of transition funds, evaluation and selection of projects, environmental impact and disclosure. Additionally, in 2021, the Bank of China issued a transition bond totaling 5 billion yuan (about USD 690 million), marking the first public offering transition bond by a financial institution in the world, to support natural gas combined heat and power projects, natural gas power plants, and waste heat recovery projects for cement plants to accelerate the low-carbon or zero-carbon transformation of traditional sector customers.<sup>lvi</sup> In 2022, the Bank of China and the S&P Dow Jones Indices launched the first climate transition index focusing on listed companies in the China Greater Bay Area.<sup>lvii</sup> This index is designed for the low-carbon transition of the Greater Bay Area, providing investment options for investors who seek climate transition development opportunities in the region, with a goal of driving more capital to flow to low-carbon transition companies.

## Recommendation 3

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Implement additional incentives for financial institutions to practice green finance through a combination of fiscal means (such as via taxes, subsidies, and public procurements), industry policies (market access), and financial policies (both monetary and regulatory).

As noted throughout this paper, decarbonization of the world's energy is a critical transformation across the global economy that will take time, ingenuity and investment. Policy solutions and support from governments should continue to remain focused on increasing investment in the energy transition that optimizes for affordable, reliable and clean energy. This can be achieved, in part, through fiscal solutions, such as tax incentives and subsidies, as seen with the passage of the U.S. Inflation Reduction Act, which will direct about USD 386 billion in energy and climate spending, including about USD 265 billion in tax incentives, over a 10-year period.<sup>lviii</sup> Although such incentives are not an immediate panacea to fully fill the gap of what is needed globally to be on track with net zero pathway goals, the legislation will likely accelerate both investment and innovation and is expected to put the United States on track to decrease GHG emissions by about 40% below 2005 levels by 2030.<sup>lix</sup> At the same time, policymakers, particularly in Europe, are also grappling with the global energy crisis that has been triggered by the Russia-Ukraine conflict. Ensuring there is a reliable and secure energy supply, both in terms of fossil fuels in the short term as well as clean energy, could impact policymakers' decarbonization goals over the long-term.

### Incentivizing Green Finance and Just Transition in China

With respect to China, policymakers there have set an ambitious goal to decarbonize China by 2060. To achieve carbon emissions peak before 2030 and carbon neutrality by 2060, while maintaining a high annual GDP growth rate of more than 5%, China will need to make a significant adjustment to its current energy structure over the next decade. Carbon emission reductions within China will hinge on the following factors and challenges:

- **Size of industrial sector:** China has an outsized industrial sector which is energy intensive, and reliant on fossil fuels, with many industrial sub-segments lacking alternative technologies that leverage renewable energy (e.g., cement). In fact, approximately 40% of China's emissions still come from coal-fired power generation, and coal releases more CO<sub>2</sub> compared to other fuel sources when used to generate electricity.<sup>lx</sup> In addition to fuel, coal is an essential part of the input for key upstream commodities such as steel, cement, and chemicals.
- **Coal-fired power generation:** Coal-fired power generation remains a key source of energy production across both developed and developing markets given its cheap costs and existing infrastructure.<sup>lxi</sup> In April 2021, China announced that it will stop financing the construction of new coal-fired power plants abroad<sup>lxii</sup> and that it will begin to phase down coal consumption as part of China's net zero ambitions.<sup>lxiii</sup> These ambitions have been complicated by recent power shortages that have forced China to increase coal supply to meet electricity demand; however, experts believe that the ramp-up of coal is a short-term policy adjustment and does not represent a "walk back" by China on its long-term climate commitments.<sup>lxiv</sup>
- **Age of coal-fired power plants:** China, as well as other countries in Southeast Asia, rely on young operating fleets of coal-fired power plants that will run well beyond 2050 given the technical life of a power plant is approximately 40-50 years. In 2020, the average age of existing coal power plants in Southeast Asia was 11 years and in China was 13 years.<sup>lxv</sup>
- **Employment consequences of coal phaseout:** Although the employment population in China's coal mining industry has declined in recent years, there are still more than two million people working in this industry.



## Recommendation 3

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Therefore, the energy transition will have a significant impact on those employed in the coal mining and processing, coal power generation and crude oil extraction, processing and refining sectors. This could lead to these workers facing unemployment, poverty, and exclusion from mainstream society.

- **Financial risk caused by the imbalance of regional development:** The reduction of the coal mining industry not only affects a large number of enterprises, but it also makes it difficult to relocate them. The resource-exhausted cities with single industry and independent mining areas face the most prominent difficulties, particularly those regions with great transition difficulties and heavy coal occupation, such as in Northeast China.
- **Energy security:** Geopolitical conflicts have triggered a global energy supply crisis and soaring energy prices, which could require China to reconsider its energy security needs and timeframe of its carbon neutral goal.
- **Low-carbon transition activities not fully supported:** As described earlier, low-carbon transition finance activities are not yet fully supported under China's existing green finance framework, and therefore climate finance related to the transition of high-carbon industries to low-carbon emissions has not received sufficient financial support.

Despite these challenges, China continues to make progress on its net zero goals. In 2021, under a top-level design framework established in China called the “Guidelines for Establishing the Green Financial System,” the People's Bank of China (PBOC) introduced green finance development pillars, which have played an increasingly important role in supporting China's low-carbon transition and high-quality development. By the end of 2021, the balance of China's green loans in domestic and foreign currencies approached RMB 16 trillion (about USD 2.21 trillion), up 33% year-on-year.<sup>lxvi</sup> In the first half of 2022, the overall scale of China's green finance market exceeded 20 trillion yuan (about USD 2.8 trillion), making it one of the world's largest green finance markets and one of the first countries to establish a systematic green finance policy framework.<sup>lxvii</sup> For comparison, the U.S. green bond market reached USD 556 billion of issuances in 2021.<sup>lxviii</sup>

In order to continue increasing investments to support efforts to tackle climate change, China has set up six provincial level pilot zones for green finance reform and innovation across China and has approved 23 additional pilot regions for climate investment and financing.<sup>lxix</sup> These pilot regimes will actively develop and test key projects with significant climate benefits, strengthen the supervision of the quality of emission data, and proactively build platforms for international exchange and cooperation. In these pilot zones, financial institutions have prepared environmental information disclosure reports and carried out carbon accounting pilot projects, which ultimately could be expanded across China in the future. The Chinese government will summarize and assess progress and results of the pilot work on a regular basis to determine best practices, striving to explore an array of development models for climate investment and financing. Based on the success of these models, climate investment and financing will be scaled across China.

***Policymakers can support adoption of innovative technologies through incentives to increase de-carbonization initiatives and accelerate the commercial viability of de-carbonization.***

**Honeywell**, for instance, has developed Solstice® R-1234yf (Solstice), which is an ultra-low global-warming-potential (GWP) refrigerant for use in automotive air conditioning systems that is a near drop-in replacement for current hydrofluorocarbon (HFC) refrigerants. Compared with traditional HFC refrigerants, the Solstice refrigerant also provides reduction in overall emissions, and is approved for automotive air conditioning, chillers, industrial process cooling, and more. By the end of 2022, Solstice will be used in almost 185 million vehicles globally according to sales projections. Using Honeywell Solstice has helped avoid the release of high global warming potential molecules equivalent to more than 295 million metric tons of CO<sub>2</sub> into the atmosphere.<sup>lxx</sup>

## Recommendation 3

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China has ratified the Kigali Amendment to the Montreal Protocol which will phase down high GWP HFCs, and the auto industry is expected to be one of the first movers in this transition. To support this effort, Honeywell has collaborated with NIO, a leading Chinese electric vehicle maker that took steps ahead of the national HFC phase down and adopted Solstice for their smart electric flagship sedan (ET7) in 2022.<sup>lxxi</sup> This collaboration has made NIO one of the first automakers to introduce the use of the Solstice refrigerant in the Chinese market. Policymakers in China should also consider creating incentives for automakers and even individuals to help drive the transition to lower GWP HFC alternatives. Other countries have regulations in place or have created a credit system that have been critical to support the transition.

***Carbon emission reduction support tools and targeted relending programs can mobilize additional private funds to invest in green and low-carbon projects.***

As an example, in November 2021, the People's Bank of China (PBOC) issued a decarbonization support tool with favorable, low-cost interest rates available for commercial loans made by institutions to support renewable energy and energy efficient projects. For qualified carbon emission reduction loans, the PBOC provides the commercial lenders with funds worth 60 percent of the principal at the rate of 1.75 percent.<sup>lxxii</sup> The tool will guide those institutions in providing loans to firms in key carbon reduction fields; those investment decisions will be taken independently by the financial institutions, based on their own risk tolerances. By leveraging this tool to grant emission reduction loans to the eligible projects, the [Bank of China](#) is able to lower the cost of capital, which in turn reduces the financing cost borne by real economy enterprises as well as providing further impetus to green technology. In the second quarter of 2022, with carbon reduction supporting tools, the Bank of China issued a total of RMB 18.4 billion (about USD 2.5 billion) carbon emission reduction loans to 231 projects, with a weighted average loan interest rate of 3.59%, resulting in an annual carbon emission reduction of 5.1 million tons of CO<sub>2</sub> equivalent.

Additionally, the Bank of China has established a national low-carbon development strategy and continuously adjusts its green financial incentives and measures to support the transition. It has carried out comprehensive green finance evaluation of regional banks and has included green loans and green bonds into its quantitative evaluation to guide them to gradually increase their green asset ratios. The Bank of China also incorporates ESG standards into its investment decision making and is committed to achieving long-term competitive financial returns as well as positive impact on the environment and society.

***In addition to direct financial incentives from the PBOC, using sovereign loans from international organizations can help provide necessary capital to fund critical decarbonization projects in China that can be adopted on a large scale by major emitting industries and enterprises.***

One innovative example is that of the [China Energy Conservation and Environmental Protection Group](#) (CECEP), the largest service-oriented scientific industrial group in the energy conservation and environmental protection field in China. CECEP is managing and administering a project with the ADB to improve the air quality in the Beijing-Tianjin-Hebei region of China. Specifically, the ADB approved a loan to set up a regional emission-reduction and pollution-control facility, which uses advanced technologies, including hydrogen-based low-emission transport, geothermal-based district heating, biogas and organic fertilizer production facilities, and smart micro-grids. CECEP identified subprojects, matched them with appropriate business models for deploying advanced technologies at scale, and helped mobilize financing, including debt and equity investments, to eligible subprojects. After nearly three years of operation, the CECEP-ADB Fund has implemented projects such as industrial waste heat utilization, replacement of coal with electricity, waste resource utilization, park energy conservation and environmental protection. These projects are expected to reduce coal consumption by nearly 730,000 tons and CO<sub>2</sub> emissions by 1.3 million tons every year, equivalent to taking more than 280,000 cars off the road.<sup>lxxiii</sup>

## Recommendation 3

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### Suggestions for How Chinese Policymakers Can Enhance China's Green Finance and Transition Finance Programs

The following recommendations may help China improve its green finance and transition finance programs:

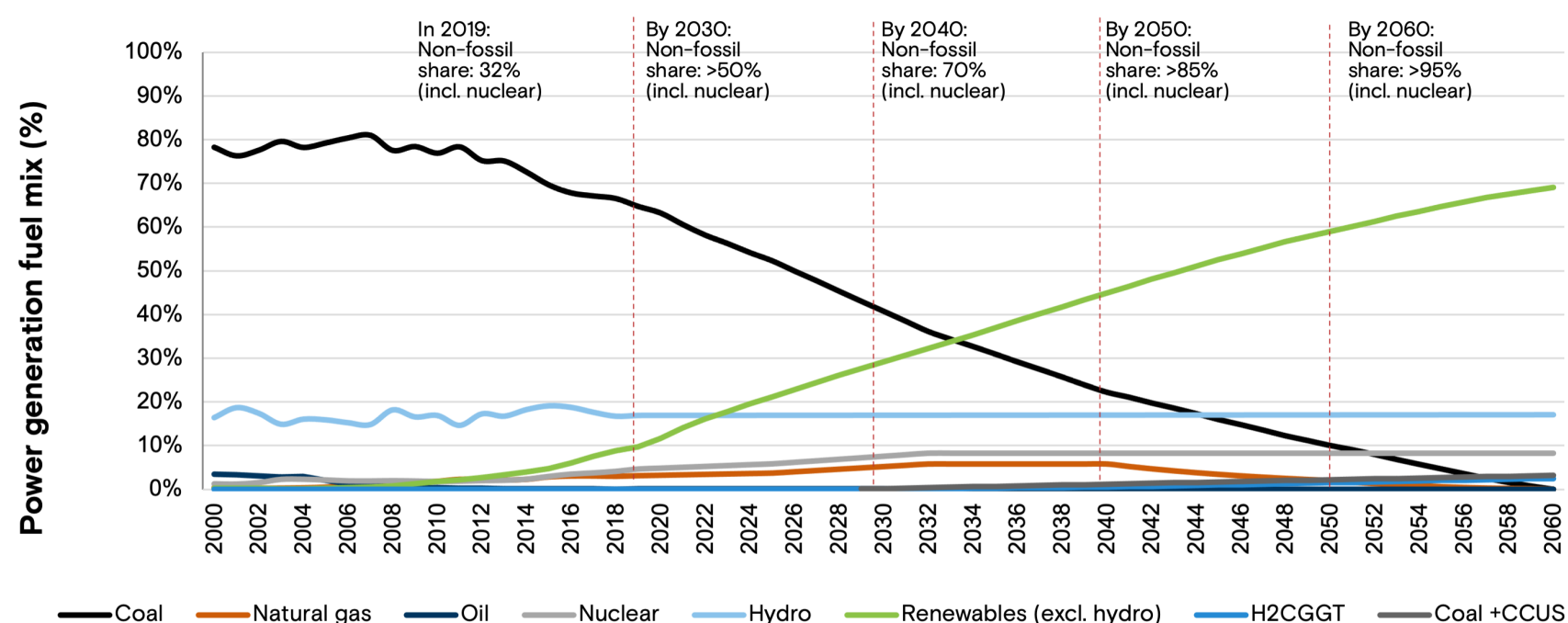
- **Improve the top-level design of green finance<sup>lxxiv</sup> programs** by accelerating the building of domestically unified, internationally compatible, and clear and practical green financial standards, as well as by creating a uniform taxonomy that would allow financial resources to more accurately be matched to green projects and technologies.
- **Improve green finance standards and information disclosure standards**, including by putting more emphasis on green finance incentives for non-bank financial institutions and by strengthening the performance evaluation standards in China of green finance (such as by integrating the carbon footprint into the evaluation standards and strengthening third-party performance evaluation of green finance).
- **Incorporate provisions that encourage the development of green finance in the formulation of environmental laws and regulations**, and identify the need for supervision and management of financial institutions' environmental and climate risk prevention and control functions.
- **Introduce stronger policy incentives for financial institutions to practice green finance.** This can be achieved by: further expanding the PBOC's carbon emission reduction supporting tools; increasing the proportion of qualified collateral for high-standard green bonds in monetary policy operations; providing tax concessions, interest subsidies, and other appropriate incentives to encourage financial institutions to actively participate in the design, issuance and investment of green financial products; issuing special government loans; increasing government green procurement; and attracting non-governmental funds to energy conservation and low-carbon sectors.
- **Enhance efforts to develop transition finance**, and ensure that emission-intensive sectors also have the opportunity to participate in the green finance market and finance their transitory activities.
- **Identify and evaluate the adverse effects in the low-carbon transition in the energy sector**, including assessing whether the planned transition will lead to mass unemployment (and, if that is the case, taking action to mitigate the impact on employees).

## Recommendation 4

Explore financial mechanisms that reduce reliance on coal-fired power plants and other carbon-intensive assets while promoting a just transition that prioritizes energy reliability and affordability. These include responsible phaseout of high-emitting assets and creative transition finance vehicles.

Given China's energy-intensive primary industries and that China's resource endowment is still dominated by coal, China's carbon neutrality goal cannot be achieved without the transition away from coal-fired power. To that end, China will need significant public and private sector capex and research & development investments to improve key carbon abatement technologies, such as carbon capture and storage (CCS), clean hydrogen and renewables. That said, while the long-term profile of coal is in a contracting trend, Chinese coal demand may stay more resilient in the medium term. It is estimated that coal demand will decline to 88% of the current level by 2030 and further decline to 0-13% by 2050-2060. As shown in Figure 5, renewables are expected to gain market share in China as the long-term profile of coal demand contracts; renewable energy contribution of total energy consumption is targeted to increase to 20% in 2025, 25% in 2030 and 80% in 2060 (up from 17% in 2021).<sup>lxxv</sup>

Figure 5: China's Power Generation Mix – Renewables Expected to Gain Market Share



Source: BP Statistical Review, Goldman Sachs Research<sup>lxxvi</sup>

To manage this transition, China is taking steps to develop innovative models to phase out coal-fired assets, improve deployment of renewables, and scale CCS to help minimize the emissions impact of current industrial facilities that may otherwise become stranded. The potential exit of coal in the long run could be a challenging transition, in terms of managing the large liability (including bank loans) and the large number of workers that would be impacted. Specifically, the total financial liability of China's coal mining sector and thermal coal-fired power assets as a result of the transition from coal would be RMB 3.7 trillion (about USD 510 billion) and RMB 10.7 trillion (about USD 1.48 trillion) respectively, and the direct number of workers in the two sectors is 3.2 million and 2.6 million, respectively, which underscores the need for responsible plans for credible phaseout of these assets and thoughtful transition to low-carbon solutions.<sup>lxxvii</sup>



## Recommendation 4

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### Responsible Phaseout of High-Emitting Assets

High-emitting assets and infrastructure – from power plants to steel mills, from planes to ships – power today's global economy and hold significant value for investors, workers, and communities. Transition of this capital stock to new zero-emissions assets is necessary to meet globally agreed decarbonization goals, but that poses the financial risk of asset stranding. Financial institutions (including lenders, investors and insurers) focused on shrinking their portfolios' carbon footprint should engage in financing the responsible phaseout of high-emitting assets, even when the objective is to reduce GHG emissions through early retirement. Failure to adequately finance these assets can lead to marginalization of companies that are critically important to the low-carbon transition. Under-financing high-emitting assets without a responsible approach to how they will be phased out over time may have unintended consequences that work against goals of reducing emissions, such as transferring ownership to parties with lower climate awareness or ambition to participate in the transition.

*The development of a responsible phaseout approach for high-emitting assets provides an alternative to divesting from these assets and can support real economy decarbonization while preventing unintended impacts such as reduced energy access, prolonged lifespan of the asset, or worsened environmental performance of the asset.*

**Goldman Sachs**, together with a broad range of other financial institutions, is engaged to define positive ways for how financial institutions can support a responsible phaseout as part of an orderly and just transition towards net zero.<sup>lxxviii</sup> The financial sector is working on the continued development of a set of principles and guidance on how a responsible phaseout approach could provide economically viable structures to support asset-level transition and be seen as a credible approach by a variety of stakeholders.

There are many challenges associated with a phaseout of high-emitting assets, and financial institutions have been hesitant to engage in transition financing for a variety of reasons including:

- Assets with high emissions intensity will negatively impact carbon intensity of bank financing portfolios.
- Reputational risk with perceived contradiction against climate commitments and/or exclusionary policies.
- A lack of financial viability and/or capacity.
- A lack of ambitious transition plans from asset owners.

The financial sector is looking to develop solutions for addressing these challenges, including near-term actions to establish responsible phaseout of high-emitting assets as part of net zero transition planning. Two near-term actions that are relevant to our Group include outlining innovative financing mechanisms that support responsible phaseout and bring in a wider group of stakeholders to help drive credibility and scale, such as blended finance, securitization or corporate sustainability-linked structures, and developing appropriate metrics to support responsible phaseout (as detailed on page 31).

## Recommendation 4

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### Creative Transition Finance Vehicles

*Asia can only realize its climate goals if it pursues a transition away from coal-based energy in the near-term. To accelerate the transition in the region, development banks like ADB have developed creative financing vehicles, such as the Energy Transition Mechanism (ETM), which is a scalable, collaborative initiative developed in partnership with developing member countries that leverages a market-based approach to accelerate the transition from fossil fuels to clean energy.*

Specifically, governments, multilateral banks, private sector investors, philanthropies, and long-term investors will finance country-specific ETM funds to retire coal power assets on an earlier schedule than if they remained with their current owners. In parallel, proceeds from the assets or other investments will be mobilized toward renewable energy plants and enabling infrastructure such as grids and storage to provide clean energy. The precise structure of the ETM funds and corresponding transactions will be determined by regional and local needs and conditions.

There are a number of benefits of an ETM:

- **Accelerate climate action:** Countries participating in ADB’s ETM program will be able to reach more ambitious emissions targets than under their current commitments. Country specific ETM funds will retire coal power assets on an earlier schedule than if they remained with their current owners, which has the potential to significantly shorten the life of legacy coal-fired power plants by at least 10–15 years on average.<sup>lxxxix</sup>
- **Reduce energy costs:** Speeding up the retirement of coal-fired electricity will increase the demand for clean energy by two to three times, lowering overall energy costs in the long run.<sup>lxxx</sup>
- **Drive investment:** ETM funds will help unlock or “crowd in” investment in cost-effective renewable generation and support and enable clean technologies, such as smart grids, hydrogen, and electric vehicles.<sup>lxxxi</sup>
- **Provide a scalable model:** ETM funds have the potential to be scaled up to other parts of Asia and Asia Pacific, as well as Latin America and Africa, which could drive significant reductions in global emissions.<sup>lxxxii</sup>

ADB is joining the Governments of Indonesia and the Philippines to formally launch a partnership to pilot ETM in Southeast Asia. The pilot phase will seek to retire or repurpose five to seven coal-fired power plants in the pilot countries (Indonesia, Philippines and Vietnam) in the near-term. Repurposed plants will be converted to renewable energy generation or alternative uses. Once scaled up, the ETM funds have the potential to be the largest carbon reduction model in the world. For example, retiring 50% of coal power plants over the next 10–15 years in Indonesia, the Philippines, and Vietnam could cut 200 million tons of CO<sub>2</sub> emissions per year—the equivalent of taking 61 million cars off the road.

## Recommendation 5

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Strengthen carbon pricing systems globally. This can be achieved by adopting an Emissions Trading System and, in the case of China, amending the requirements to encourage broad participation in the established ETS – such as by moving forward with benchmark setting for new sectors, allowing an expansion of the sectors that can participate, incentivizing more institutional participants by facilitating the trading of carbon derivatives, and enhancing transparency and disclosure mechanisms to improve the credibility of the trading system.

***Carbon pricing systems are key tools that governments can use to incentivize high-emitting companies to decarbonize and to drive greater investment into lower or zero carbon technologies and solutions.***

Carbon pricing specifically refers to a mechanism that puts a clear price on GHG emissions per ton of CO<sub>2</sub>. Existing emissions trading systems globally vary in their application and operations, as well as the cost per ton of carbon emitted and the scope of sectors and companies that are covered.

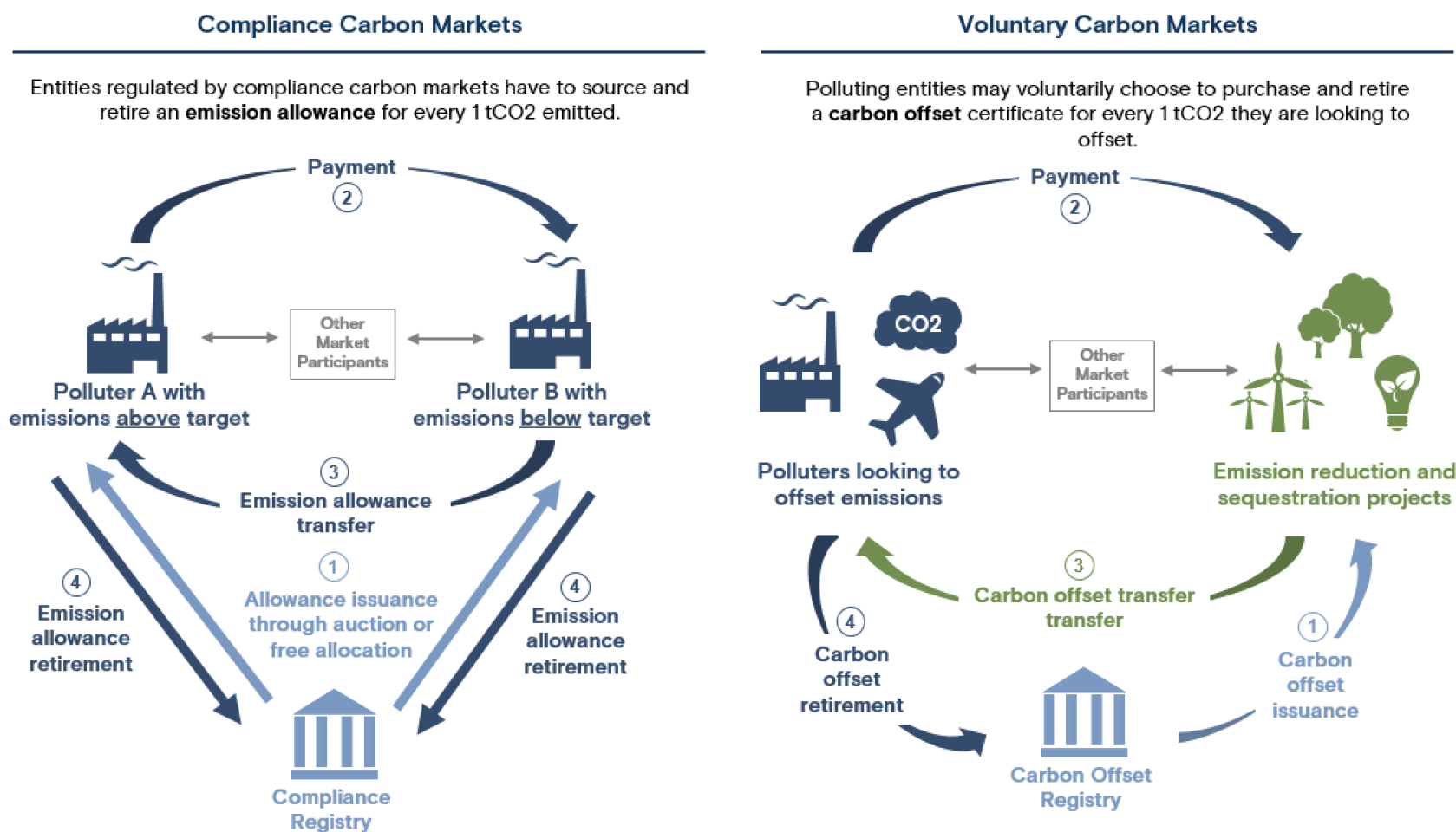
### **Emissions Trading Scheme (ETS)**

As shown in Figure 6, an ETS is a cap-and-trade system where a cap is placed on the total amount of permitted emissions within certain industries and sectors, and those emissions are then allocated out to companies across different sectors. Companies that do not exceed their allocated cap are able to sell their unused emissions allowances to other corporates who must purchase additional allowances for emissions in excess of their allocated free allowance. This creates a market price for GHG emissions, and the total cap on permitted emissions is reduced over time to decarbonize the system. An ETS provides a self-adjusting price that can respond to the impacts of real-time economic conditions. In addition, under an ETS, borrowing, banking, and extended compliance periods allow participants the flexibility to make compliance planning decisions on a multi-year basis, which is important for industries with a long asset life, such as within the industrial sector.

**Dow** supports establishing frameworks that place a price on carbon; in the absence of a mandatory ETS, a market-based voluntary ETS would offer an attractive bridge to a mandatory system in the future. Internationally, there are several mandatory ETS frameworks that have proven to reduce industrial carbon emissions at a low abatement cost and enable investment in emission reduction projects and infrastructure while still allowing economic growth, such as CCS coupled with advanced thermal power generation units and increased sourcing of renewable power. In October 2021, Dow announced its plan to build the world's first net-zero Scope 1 and 2 CO<sub>2</sub> emissions ethylene and derivatives complex in Alberta, Canada. The location was driven in part by established market mechanisms in Canada that put a price on carbon emissions as well as the existing infrastructure in Alberta to capture and sequester CO<sub>2</sub> emissions.<sup>lxxxiii</sup>

# Recommendation 5

Figure 6



Source: Goldman Sachs Global Markets Division<sup>lxxxiv</sup>

## Overview of China’s ETS

China’s national carbon trading market, an ETS, has been under development since 2013. It was officially launched in July 2021 and immediately became the largest carbon market in the world with a total trading volume of 194 million tons of CO<sub>2</sub>.<sup>lxxxv</sup> The ETS is operated by the Shanghai Environment and Energy Exchange Corporation and currently only applies to one industrial sector – the power generation sector – which includes 2,225 regulated power companies that collectively cover approximately 40% of China’s emissions and 12% of global CO<sub>2</sub> emissions.<sup>lxxxvi</sup> The ETS is ultimately expected to expand to cover as many as 8,000 companies across eight industrial sectors (power generation, petrochemicals, chemicals, building materials, iron and steel, nonferrous metals, paper production, and aviation), though specific timing of these sectoral expansions is unclear.<sup>lxxxvii</sup>

Each year by the end of March, entities covered by the ETS must submit the previous year’s GHG emissions, with verification authorized by provincial-level ecological and environmental authorities. These entities must then surrender CO<sub>2</sub> emissions allowances based on their permitted emissions levels. At this stage, carbon allowances are distributed through free allocation (i.e., those that have been freely allocated to them by the government), with auctioning likely to play a bigger role in the future.

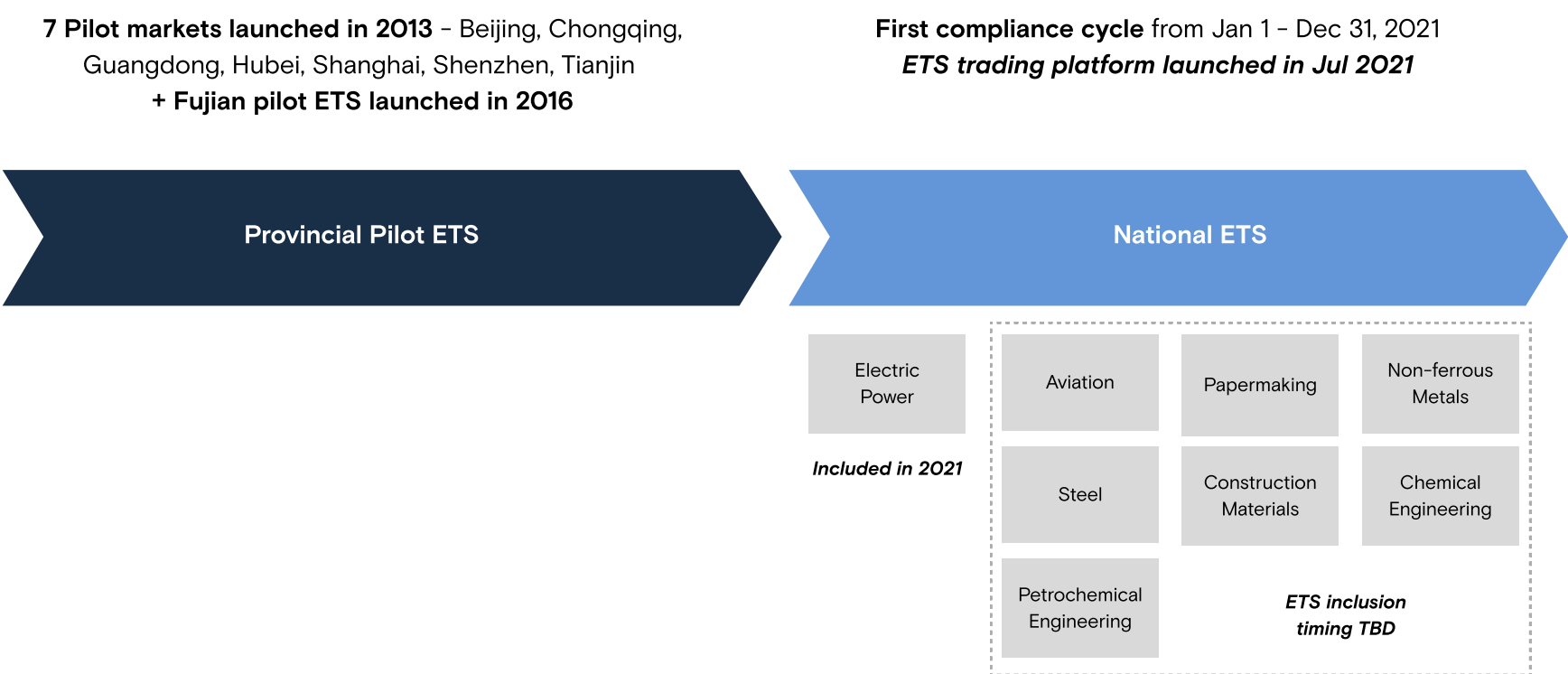
The national ETS trading platform is designed largely based on eight existing Chinese provincial and municipal ETS pilot programs, which are all different from each other, operating under unique rules and infrastructure, including whether they each use carbon offset credits known as China Certified Emissions Reductions Credits (CCERs) and allowance auctions. Specifically, CCERs refer to emissions reduction activities conducted by companies on a voluntary basis that



# Recommendation 5

are certified by the Chinese government. Going forward, CCERs are expected to play a significant role in achieving emissions cost reductions and renewable energy goals as an important supplementary mechanism to the ETS.

Figure 7



Source: Goldman Sachs Global Investment Research<sup>lxxxviii</sup>

The [Paulson Institute](#) believes that the use of nature-based CCERs from carbon sink projects such as forest, grassland, or wetland protection represents a significant opportunity for China to advance ecological restoration and biodiversity protection while at the same time making progress toward their 2030 and 2060 climate goals. In contrast to the national ETS, CCERs are in use in all eight pilot programs, and most of the pilots accept CCERs for forestry and environment.<sup>lxxxix</sup> The Paulson Institute further believes that there appears to be a strong policy basis for the use of nature-based or carbon sink CCERs in the national ETS given that several factors – China’s 2030 and 2060 climate goals, the clear role carbon sinks can play in meeting those goals, the high projected demand for CCERs by ETS regulated companies, and the cost savings of lesser expensive CCERs versus certified emission allowances – all should contribute to the approval of new carbon sink CCERs based on forests, mangroves, wetlands, and grasslands.

[Shanghai United Assets and Equity Exchange \(SUAEE\)](#) has innovated a series of carbon finance products or businesses. For example, it uses allowances and CCER pledge financing to attract more capital into the carbon trading market; it also cooperates with companies to design new funds and trusts to invest in the carbon market, and it helps manage carbon assets of companies that do not have professional carbon trading teams. SUAEE initiated the carbon neutral securities index with China Securities Index and Shanghai Stock Exchange in January 2022. Until July 8, 2022, the first ETF products issued by eight public funds totaled 16 billion yuan (about USD 2.2 billion).<sup>xc</sup> This was the first practical cooperation between the carbon market and the securities market. More than 100 listed clean energy and high-carbon companies from Shanghai and Shenzhen were included.

## Recommendation 5

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### Current Obstacles and Challenges Facing China's Carbon Market

China's national carbon market has been rapidly developing, but it faces a number of obstacles and challenges. These include:

- There is **no regulation or policy that legally defines carbon allowances or carbon credits as an asset class** in China. Without being considered an official asset class, these items may not be protected by national laws, regulations or policies.
- Unlike in the European ETS where the primary allocation method is based on auctions, **allocations in the Chinese ETS involve free emissions allowances and are granted on intensity of emissions instead of absolute emissions**. There is uncertainty on the timing of the mechanism that will reduce these free allocations. In addition, there is currently no designated emissions cap within the ETS, so effectiveness of the ETS in reducing emissions is uncertain.
- Unlike other ETSs (EU, California, New Zealand), which cover a number of industries (such as electricity, industry, domestic aviation, transportation, construction, waste, forestry, agriculture), **China's ETS only currently covers the power generation sector** and the timing of expanding the remaining sectors is unclear. Only covering a single sector by the ETS may lead to fewer deal transactions due to very little marginal mitigation cost difference among all covered entities.
- **There is not yet a carbon derivatives market** for the Chinese ETS. Although China has committed to setting up the carbon derivatives market, only spot trading is currently permitted, and there is an insufficient number and range of participants in the Chinese ETS, particularly since financial institutions cannot currently participate. As a result, carbon prices in the ETS fluctuate greatly, and liquidity is relatively low.
- **The names of the participating companies in the Chinese ETS are unknown** and are only identified by a codifier, which reduces transparency of the ETS participants.
- **The CCER mechanism for voluntary emission reductions is suspended and still financially immaterial for both coal-fired power plants and renewable independent power producers**. Based on existing rules, in China, only renewables projects that can pass certain thresholds can be eligible for CCER applications, which means only new renewable projects with a relatively lower internal rate of return (8% historically being the most widely used benchmark in China) can potentially benefit from the future relaunch of the CCER program. The vast majority of renewable projects in operation may therefore not be eligible.

## Recommendation 5

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### Suggestions to Improve China's Carbon Market

The following recommendations may help China improve its national ETS:

- **Improve the reporting quality, transparency, and accuracy of emissions data** submitted to the ETS by accelerating efforts to validate emissions data to raise data quality and help in the setting of industry emission benchmarks; providing clear guidelines to companies in industries slated to join the ETS on the type of data necessary to provide; implementing a series of regional, industry-wide and product-targeted statistical accounting methods and standards for carbon emissions; and accelerating the establishment of a uniform and standardized carbon emission statistical accounting system.
- **Provide better clarity around steps to benchmark setting for other industries to be added to the ETS**, adding clarity on when the ETS will include other focal industries in order to better prepare companies for data collection and target setting. Over time, this will set a timeline for expansion of sectors' participation in the ETS, including cement, steel and aluminum.
- **Tighten the allowance mechanism through an auction** rather than free allocation and reduce the quotas of auctioned allowances via adjustment in emissions caps over time. This would be in keeping with the EU ETS where regulators have progressively enhanced market dynamics by lowering emissions caps and decreasing the share of auctioned allowances to incentivize decarbonization.
- **Define a specific emissions cap** for sectors operating under the ETS, **increase access to China's ETS in a steady and phased manner**, and gradually incorporate third parties such as financial institutions to participate in carbon trading.
- **Gradually develop the CCER market** as an offset mechanism, and require an external auditor or credible national agent to certify to the appropriate use of CCERs. CCERs can add to the diversity of carbon-based transactions, increase liquidity and motivate companies to participate in carbon trading. This market should be established based on global best practices.
- **Require public disclosure of companies** participating in the ETS by name, rather than by a hidden identifier. With better data quality, the carbon-based spot market will be more reliable, and carbon pricing will improve. A stable spot market with sound systems and a bigger size is required for developing the derivatives market.
- When data quality, liquidity and sectoral participation have improved, **develop trading of carbon derivatives**, which will encourage institutional investors to participate in the ETS and allow hedging of institutional and corporate carbon exposure. Also, incentivize financial institutions and carbon asset management companies to participate in carbon trading, increase liquidity for low-carbon investment, and establish expectations of stable carbon prices.
- **Develop a 2035 long-term development plan** for the national carbon market.
- **Link with other policies on environmental rights and interests**, such as energy rights trading, carbon emission rights and green power trading to avoid redundant regulation and conflicting policies.

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Encourage companies to leverage consistent, comparable, and decision useful metrics to assess progress towards real economy decarbonization. Such metrics could include green capex, green revenue, emissions intensity and emissions avoidance to measure energy transition impact.

There are a number of challenges that remain around the quantification of ESG risks and opportunities, as ESG analysis often requires depth and context not presented in available information. These include the following:

- **Data challenges still exist for forward-looking estimates**, especially in industries with diversified revenue streams or significant levels of product differentiation.
- **There is no uniform or consistent definition of “green”** or consensus on how wide a net should be cast when creating that definition, though China is working to update its green taxonomy.<sup>xcii</sup>
- **There is an inability of companies to consistently and accurately measure their downstream (consumer) emissions.**
- **Although companies in developed markets face challenges to developing their own reliable metrics, companies in emerging markets face an even tougher ability to build capacity to develop metrics** due to lack of experience, financing and depth of the market.

*In addition to static backward-looking metrics, forward-looking metrics can be a helpful tool to measure companies’ progress on decarbonization.<sup>xciii</sup> An EBITDA equivalent for decarbonization that is consistent, comparable, decision useful, and forward-looking is needed.*

As of today, companies that are focused on sustainability and ESG issues are becoming increasingly forward-looking on corporate decarbonization and low-carbon transition.<sup>xciii</sup> The ultimate goal is to have metrics and frameworks that support greater consistency, comparability, and utility in approaches to measure a company’s contribution to climate alignment and decarbonization in the real economy. There are several potential metrics that can be used to evaluate investment and progress around decarbonization. These include:

- **Green Revenue**, which is the amount or percentage of revenue linked to sustainable use cases or climate transition activities. Using green revenue mix could allow the public to increasingly focus on how companies’ product impact is evolving. Across sectors, there will likely be greater pressure to understand how revenue and capex mix is evolving for products or services that help to meet sustainable development goals.<sup>xciv</sup>
- **Green Capex**, which is the amount or percentage of capex and research & development linked to sustainable use cases or climate transition activities. It can measure longer-term potential revenue evolution via near- to medium-term capex mix.<sup>xcv</sup>



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- **Absolute Emissions and Emissions Intensity**, which use a company's own emissions footprint as measured by absolute emissions and emissions intensity. Absolute emissions is a measure of the reduction of the physical amount of GHGs emitted into the atmosphere over time by a particular company. Emissions intensity measures the volume of emissions produced against some other relevant unit, such as kilograms of CO<sub>2</sub>e per megawatt hour of electricity generated. This metric can reflect the close tie between the level of a company's emissions and the scale of its production.<sup>xvii</sup>
- **Emissions Avoidance**, which is how a sector or company's products help to avoid emissions by customers if a direct impact using historical data can be emissions.<sup>xviii</sup>

And companies are doing their part to enhance their internal emissions metrics.

*One innovative method to help companies better understand emissions information is to develop real-time monitoring and data analysis capabilities, which can have a particularly beneficial impact in the oil and gas sector by detecting methane leakage.*

For example, **Honeywell** uses a ground-based technology to measure methane emissions in real time, as opposed to using a model that produces guidelines, averages, or static audits. Current gas leak detection methods require workers to periodically inspect a site with handheld thermal imaging cameras to identify leak sources and arrange for repairs. This approach is time consuming, subject to human errors and can only detect a leak at a specific moment in time when the technician is in the field. Honeywell's system provides continuous monitoring and offers real-time analytics to see and measure concentrations of the leaked gases. Using hyperspectral imaging sensors, the system can see an "optical fingerprint" of the gas cloud, which makes it possible to differentiate multiple gas types. Real-time emissions monitoring and data analysis, as opposed to static audits that only measure a point in time (continuous vs. periodic measurement), can have a disproportionate impact on emissions reductions.

*It is also important for financial institutions and companies who establish net zero frameworks to leverage metrics that support real economy decarbonization and encourage investment in areas where capital is needed most for transition.*

**Goldman Sachs**, for example, established a framework around net zero and target setting that is grounded in a commitment to drive decarbonization in the real economy in partnership with clients. As part of its decision to align its business with a net zero by 2050 pathway, Goldman Sachs developed an initial set of business-related, ranged targets for 2030 across three high-emitting sectors: Oil & Gas, Power, and Auto Manufacturing. This approach, which incorporates ranged targets and physical intensity metrics, acknowledges the complexity of transition, the importance of supporting more carbon-efficient production growth in these sectors, and the key role that policy will play. Measuring Goldman's portfolio through an intensity lens enables them to effectively support clients in high-emitting sectors who can contribute meaningfully to decarbonization through transforming their businesses to more carbon-efficient models.

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***Companies or governments engaged in a responsible phaseout of high-emitting assets (as described earlier) need their own metrics to demonstrate ambition and progress on a net zero aligned decarbonization strategy.***

Specifically, for a responsible phaseout to be successful, there must be independently generated, forward-looking metrics that set out the expected GHG emissions reductions from the responsible phaseout and their timing. The development of metrics that better capture forward-looking decarbonization and phaseout approaches will be critical. Because certain capital may be dependent on the existence and implementation of a phaseout plan, having forward-looking metrics to measure the decarbonization of the asset is essential to financing pilot projects. Such metrics and targets for a responsible phaseout could include:

- Baseline GHG emissions for the assets.
- Expected GHG emissions reduction from the responsible phaseout and their timing.
- The basis for these reductions (e.g., scope included, assumptions made).
- How the responsible phaseout plan aligns with a relevant sectoral pathway for the asset.
- Report on progress against GHG emissions reduction targets.
- Report on any other metrics that will be measured and monitored to track progress.<sup>xcviii</sup>

***Finally, companies can help encourage adoption of decarbonization technologies and heighten awareness by sharing and reporting information to other companies.***

**Vanke**, a major property developer in China, is piloting a carbon neutral community in its former headquarters in Shenzhen, using near-zero carbon, zero waste and biodiversity solutions. It was one of the first Chinese developers to incorporate green principles throughout the life cycle of all projects, including repercussions, procurement, sourcing, project development and sales.<sup>xcix</sup> It has been publishing ESG reports since 2007. Last year, Vanke began to partner with other companies to share its experience and provide a climate risk assessment in the property development sector. Vanke's goal is to better identify different climate risk exposures of its business units and potential opportunities to achieve better performance in managing climate risks and opportunities.

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<sup>lxxiv</sup> In China, “green finance” is defined as an economic activity that supports environmental improvement, the fight against climate change, and resource saving and efficient utilization. It is a financial service provided for project investment and financing, project operation and risk management for environmental protection, energy conservation, and clean energy. In 2016, seven state ministries including the PBoC jointly issued the “Guidelines for Establishing the Green Financial System,” which systematically clarified the definition of green finance for the first time.

<sup>lxxv</sup> “China Net Zero: The Clean Tech Revolution.” Goldman Sachs Research Carbonomics, 20 Jan. 2021, pg. 13.

<sup>lxxvi</sup> Source: NDRC, GEIDCO, Goldman Sachs Research

<sup>lxxvii</sup> “Stimulating Capital and Return on Capital.” Goldman Sachs Research SUSTAIN, 31 Oct. 2022, pg. 32.

<sup>lxxviii</sup> “The Managed Phaseout of High-emitting Assets: How to Facilitate the Early Retirement of High-emitting Assets as Part of a Just Transition to a Net Zero World.” Glasgow Financial Alliance for Net Zero (GFANZ), Jun. 2022, [https://assets.bbhub.io/company/sites/63/2022/06/GFANZ\\_-\\_Managed-Phaseout-of-High-emitting-Assets\\_June2022.pdf](https://assets.bbhub.io/company/sites/63/2022/06/GFANZ_-_Managed-Phaseout-of-High-emitting-Assets_June2022.pdf).

<sup>lxxix</sup> “Energy Transition Mechanism.” Asian Development Bank, <https://www.adb.org/what-we-do/energy-transition-mechanism-etm>.

<sup>lxxx</sup> Ibid.

<sup>lxxxi</sup> Ibid.

<sup>lxxxii</sup> Ibid.

<sup>lxxxiii</sup> “Dow announces plan to build world's first net-zero carbon emissions ethylene and derivatives complex.” 6 Oct. 2021, <https://investors.dow.com/en/news/news-details/2021/Dow-announces-plan-to-build-worlds-first-net-zero-carbon-emissions-ethylene-and-derivatives-complex/default.aspx>.

<sup>lxxxiv</sup> Goldman Sachs Global Markets Division.

<sup>lxxxv</sup> “China: Waiting for the world’s largest carbon market.” Goldman Sachs Research, 15 Jul. 2020.

<sup>lxxxvi</sup> Ibid.

<sup>lxxxvii</sup> Ibid.

<sup>lxxxviii</sup> “ESG Essentials: New ESG data, carbon, equality – Insights across our global research franchise (1Q21).” Goldman Sachs Research, 29 Mar. 2021, Exhibit 19.

<sup>lxxxix</sup> Across the eight pilot ETS there are 200 methodologies for developing CCERs including two for forests and two for bamboo.

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<sup>xcii</sup> “Common ground taxonomy: consolidation of China and EU green definitions.” Seneca ESG, 18 Nov. 2022, <https://www.senecaesg.com/insights/common-ground-taxonomy-consolidation-of-china-and-eu-green-definitions/>.

<sup>xciii</sup> “GS SUSTAIN: ESG of the Future: A forward look at Green Revenue, Green Capex, potential ESG Improvers.” Goldman Sachs Research, 16 Nov. 2021, pg. 9.

<sup>xciv</sup> “Green Capex: Greenflation, Returns and Opportunity.” Goldman Sachs Research, 13 Jun. 2022.

<sup>xcv</sup> “GS SUSTAIN: Accelerating the Energy Transition: Metrics and tools to measure progress.” Goldman Sachs Research SUSTAIN, 17 Nov. 2022, pg. 2.

<sup>xci</sup> Ibid.

<sup>xcvi</sup> “GS SUSTAIN: ESG of the Future: A forward look at corporate greenhouse gas emissions, potential ESG Improvers.” Goldman Sachs Research SUSTAIN, 2 May. 2022, pg. 62.

<sup>xcvii</sup> “GS SUSTAIN: Accelerating the Energy Transition: Metrics and tools to measure progress.” Goldman Sachs Research SUSTAIN, 17 Nov. 2022, pg. 2.

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<sup>xcix</sup> “2021 Sustainability Report of Vanke.” Vanke, pg. 58.

# Members of the Green Finance Working Group

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## Co-Chairs:

International Finance Forum  
(IFF)

**The International Finance Forum (IFF)** is an independent, non-profit, non-governmental international organization founded in Beijing in October 2003, and established by financial leaders from more than 20 countries, regions and international organizations including China, the United States, the European Union and the United Nations. IFF is a long-standing, high-level platform for dialogue and communication, as well as a research network in the financial realm, and has been upgraded to F20 (Finance 20) status.

The Goldman Sachs Group, Inc.

**The Goldman Sachs Group, Inc.** is a leading global financial institution that delivers a broad range of financial services across investment banking, securities, investment management and consumer banking to a large and diversified client base that includes corporations, financial institutions, governments and individuals. In 2019, Goldman Sachs made a commitment to deploy \$750 billion toward sustainable finance, advisory, and investment activities by 2030. Since setting that ten-year goal, Goldman has achieved approximately \$300 billion in commercial activity, including \$167 billion in climate transition, \$50 billion in inclusive growth, and the remainder in multiple themes.

## Partners:

Paulson Institute

**The Paulson Institute** is a non-partisan, independent “think and do tank” dedicated to fostering a US-China relationship that serves to maintain global order in a rapidly evolving world. The Paulson Institute’s focus on US-China is dictated by the reality that it is the most consequential bilateral relationship in the world. The Institute operates at the intersection of economics, financial markets, and environmental protection by promoting market-based solutions to ensure green economic growth and conservation of critical ecosystems. Founded in 2011 by former Treasury Secretary Henry M. Paulson, Jr., the Paulson Institute is based in Chicago with offices in Washington and Beijing.

## Member Companies:

Bank of China

**Bank of China** is China’s most globalized and integrated bank with a well-established global service network with institutions set up across China as well as in more than 60 countries and regions. It has established an integrated service platform based on the pillars of its corporate banking, personal banking, financial markets and other commercial banking business, which covers investment banking, direct investment, securities, insurance, funds, aircraft leasing and other areas, thus providing its customers with a comprehensive range of financial services.



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## BASF

**BASF** creates chemistry for a sustainable future. With around 111,000 employees, six Verbund sites and 232 additional production sites worldwide BASF Group supports customers and partners in almost every country in the world. BASF's portfolio comprises six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF pursues broad sustainability targets and has set a target of reducing its absolute CO2 emissions by 25 percent by 2030 (compared with 2018) and strives to achieve net zero emissions by 2050.

## Contemporary Amperex Technology Co., Ltd. (CATL)

**Contemporary Amperex Technology Co., Limited (CATL)** is a global leader in new energy technology innovation, committed to providing premier solutions and services for new energy applications worldwide. To achieve the goal of realizing fossil fuel replacement in stationary and mobile energy systems with highly efficient electrical power systems that are generated through advanced batteries and renewable energy, and promote the integrated innovation of market applications with electrification and intelligentization, CATL maintains continuous innovation in four sectors including battery chemistry system, structure system, manufacturing system and business models.

## China Energy Conservation and Environmental Protection Group (CECEP)

**China Energy Conservation and Environmental Protection Group (CECEP)** is the largest service-oriented scientific industrial group in the energy conservation and environmental protection field in China. At present, the Group owns 419 subsidiaries and 6 listed companies which are distributed in about 30 provinces at home and 40 countries/regions abroad.

## Dow

**Dow** aspires to become the most innovative, customer-centric, inclusive, and sustainable materials science company in the world, with a purpose to deliver a sustainable future for the world through our materials science expertise and collaboration with our partners. Dow's portfolio of plastics, industrial intermediates, coatings, and silicones businesses delivers a broad range of differentiated science-based products and solutions for its customers in high-growth market segments, such as packaging, infrastructure, mobility and consumer care applications. By 2030, Dow will reduce greenhouse gas emissions 15% versus our 2020 baseline, which is in addition to the ~15% achieved since 2005. Together, that will reduce the Company's net annual Scope 1 & 2 emissions by 30%. By 2050, Dow intends to be carbon neutral (Scopes 1, 2, 3 plus product benefits).

## General Motors

**General Motors** is a global company focused on advancing an all-electric future that is inclusive and accessible. At the heart of this strategy is the Ultium battery platform, which will power everything from mass-market to high-performance vehicles. General Motors, its subsidiaries and its joint venture entities sell vehicles under the Chevrolet, Buick, GMC, Cadillac, Baojun and Wuling brands. GM plans to become carbon neutral in its global products and operations by 2040.

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## Honeywell

**Honeywell** delivers industry-specific solutions that include aerospace products and services; control technologies for buildings and industry; and performance materials globally. Honeywell's technologies help aircraft, buildings, manufacturing plants, supply chains, and workers become more connected to make our world smarter, safer, and more sustainable. Honeywell has pledged to be carbon neutral in its facilities and operations by 2035. In addition, Honeywell has made a commitment to set a science-based target aligned with the Science Based Target initiative (SBTi).

## Shanghai United Assets and Equity Exchange

**Shanghai United Assets and Equity Exchange** is a comprehensive assets and equity trading service institution that is a designated listed trading institution selected by the State-owned Assets Supervision and Administration Commission of the State Council to manage trading of state-owned assets for central enterprises and Shanghai enterprises. It is a professional platform that provides financing services covering equity, real rights, creditors' rights, intellectual property rights and enterprise capital increase.

## Vanke

**Vanke** is one of the world's largest real estate companies. Since its founding in 1984, Vanke has become No. 2 property developer by sales in China, expanding to over 60 cities across Mainland China and to overseas markets in the U.S., Singapore and London.

## Observer:

## The Asian Development Bank (ADB)

**The Asian Development Bank (ADB)** envisions a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty in the region. ADB assists its members and partners, by providing loans, technical assistance, grants, and equity investments to promote social and economic development. ADB maximizes the development impact of its assistance by facilitating policy dialogues, providing advisory services, and mobilizing financial resources through co-financing operations that tap official, commercial, and export credit sources.