



Toward an Indo-Pacific Clean Energy Framework

By Paul J. Saunders and Amelia K. Gilchrist

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Energy Innovation Reform Project is a non-partisan non-profit organization dedicated to promoting policies that advance innovation in energy technologies and practices to improve the affordability, reliability, safety, and security of American energy supplies and our energy economy. EIRP was founded in Washington, DC in 2013. Its work combines policy reports, scholarly research, and economic modeling with creative efforts to bridge partisan differences over energy policy.



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Acronyms

| | |
|-----------------------|---|
| ARRA | American Recovery and Reinvestment Act of 2009 |
| Asia EDGE | Asia Enhancing Development and Growth through Energy |
| APEC | Asia-Pacific Economic Cooperation |
| ADB | Asian Development Bank |
| AIIB | Asian Infrastructure Investment Bank |
| ASEAN | Association of Southeast Asian Nations |
| AUKUS | Australia–United Kingdom–United States |
| BAU | business as usual |
| CCUS | carbon capture, utilization, and storage |
| CEM | Clean Energy Ministerial |
| CO₂ | carbon dioxide |
| CPTPP | Comprehensive and Progressive Agreement for Trans-Pacific Partnership |
| DFC | Development Finance Corporation |
| ERGI | Energy Resources Governance Initiative |
| EU | European Union |
| EXIM | Export-Import Bank of the United States |
| GDP | gross domestic product |
| IPEF | Indo-Pacific Economic Framework for Prosperity |
| IEA | International Energy Agency |
| JCERDC | Joint Clean Energy Research and Development |
| LNG | liquified natural gas |
| NDC | nationally determined contribution |
| NATO | North Atlantic Treaty Organization |
| NSG | Nuclear Suppliers Group |
| PACE | Partnership to Advance Clean Energy |
| Q-CHAMP | Quad Climate Change Adaptation and Mitigation Package |
| RCEP | Regional Comprehensive Economic Partnership |
| R&D | research and development |
| SEP | Strategic Energy Partnership |
| TPP | Trans-Pacific Partnership |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USAID | U.S. Agency for International Development |

Executive Summary

How societies and energy systems develop in the Indo-Pacific region will be critical to global efforts to deploy clean energy and to reduce energy-related greenhouse gas emissions. Active engagement by the United States in building frameworks to support and accelerate clean energy projects—as a leader, an organizer, and a facilitator—can contribute significantly to success while advancing wider American objectives at a time of growing geopolitical competition. Regional frameworks are valuable tools in any such effort.

Energy resources, technologies, and systems are geopolitically significant because they include infrastructure that is critical to security and to modern economies. As a result, energy resources, technologies, and systems can create strategic opportunities or vulnerabilities. New energy technologies accentuate this by reshaping energy systems; governments and corporations are scrambling to win leading positions in the future global energy economy. That they can only guess at its contours only further increases their uncertainty. Questions surrounding the future geopolitical order and possible conflicts between the United States and China, Russia, or both, only add to this.

These parallel dynamics—as both governments and companies work to ensure their survival and prosperity—can prompt close cooperation as well as bitter struggles. For example, while the Biden administration and congressional Democrats likely intended the Inflation Reduction Act's electric vehicle tax credit (which privileges domestic manufacturing) to reduce dependence on China, South Korean officials have said that it discriminates against Hyundai.¹

This is not the only challenge to U.S. policymakers. The tradeoffs between clean, cheap, reliable, and secure energy create complex dilemmas that each government will address differently based on its circumstances and on national and social priorities. Few capitals will settle on approaches identical to Washington's policy. Indeed, the United States itself is unlikely maintain a continuous and unchanging policy, in that political differences surrounding energy and climate issues have produced frequent and sometimes major policy changes.

Some characteristics of the Indo-Pacific region add to these difficulties. Among the most notable are these:

- It is geographically dispersed.
- Its governments have varied institutional capacity.
- Its economies illustrate disparities between the world's wealthiest and poorest.
- Its energy systems depend heavily on coal and on imported fossil fuels.
- Its greenhouse gas emissions are large and growing.

Considering United States and U.S. policy, some appreciation of history is useful. Few recall the U.S. Senate's 1997 Byrd-Hagel Resolution and the forces that produced it are thus underappreciated. Approved with a 95-0 vote—and with support from then-Senators Joe Biden and John Kerry—the

resolution expressed the Senate's objection to any international climate agreement that did not include commitments by developing countries and that would produce "serious harm" to America's economy.

These two concerns remain central objections to policies promoting clean energy within the United States and have shaped foreign policy too, stimulating the George W. Bush administration's Asia-Pacific Partnership on Clean Development and Climate (an effort to reduce the costs of clean energy and to accelerate its deployment in China and India) as well as the Paris Agreement's voluntary structure and the Obama administration's decision to avoid seeking Senate ratification.

Trade policy shapes both energy and climate policy. Then-president Donald Trump's withdrawal from the Trans-Pacific Partnership trade agreement continues to constrain U.S. trade policy in the Indo-Pacific region and globally. The Biden administration has been visibly reluctant to seek new trade agreements. Nevertheless, Washington's intense focus on competing politically and economically with China has deepened America's attention to the Indo-Pacific region.

Australia, India, Japan, and South Korea are core partners for the United States in the Indo-Pacific region. Australia, Japan, and South Korea are key allies, while India is an increasingly close partner. Each is also among America's top 10 goods trade partners and top 15 services trade partners. And each has an important role in clean energy in the Indo-Pacific, whether as a major energy exporter (Australia), leading high-tech manufacturers (Japan and South Korea), or a large developing economy working to transform its energy sector (India). All have central roles to play in building the Indo-Pacific region's future energy systems.

Looking ahead, the Biden administration's Indo-Pacific Economic Framework for Prosperity (IPEF) initiative could contribute substantially to a regional clean energy framework through its Clean Economy pillar. However, IPEF has significant limitations due to its narrow scope, limited appeal, and uncertain future. The Biden administration can address these challenges by changing its approach. We recommend the following steps:

- Broaden the scope of the IPEF's Clean Economy pillar to avoid excluding discussions of clean energy sources such as carbon capture, hydrogen, natural gas, and nuclear power.
- Extend the IPEF's Connected Economy (trade) pillar to explore a possible clean energy trade agreement, to facilitate greater trade in commodities (including clean fuels as well as key minerals) and clean energy systems.
- Link IPEF more closely to U.S. development efforts in the Indo-Pacific region, perhaps by framing IPEF as a development partnership and incorporating development assistance within the existing four pillars.
- Engage deeply with the U.S. Congress, on a bipartisan basis, to seek support for IPEF as an important component of U.S. economic and political strategy in the region.
- Explore a clean energy or clean technology trade agreement within or outside IPEF.
- Pursue complementary frameworks that reinforce IPEF. Within the region, some of the most promising frameworks for clean energy development include U.S.-Japan-South Korea trilateral talks and "Quad-Plus" arrangements that incorporate South Korea, with its leading high-tech economy, and other interested governments.
- Strive to connect Indo-Pacific frameworks to other frameworks including U.S. allies and partners, e.g., the Group of Seven (G7) and the European Union.

With additional effort, the United States can help to establish lasting and effective tools to accelerate clean energy deployment in the Indo-Pacific region and to serve wider U.S. political and economic interests.

Introduction

With its commanding shares of the world's economy, energy consumption, and greenhouse gas (GHG) emissions, as well as its substantial population in developed and developing countries, the Indo-Pacific region will in many respects determine the success or failure of international efforts to build a global clean energy system. Active engagement by the United States in building a framework to accelerate deployment of clean energy in the Indo-Pacific—as a leader, an organizer, and a facilitator—can contribute significantly to success while advancing wider American objectives at a time of growing geopolitical competition.

The Indo-Pacific region is the core of the world economy. It accounts for roughly two-thirds of global gross domestic product (GDP), energy production, and energy consumption.² It includes the world's most populous countries (China, India, the United States, and Indonesia), largest economies (the United States, China, and Japan, in current U.S. dollars), and biggest developing nations (China and India). These developed and developing economies are also leading GHG emitters (China, the United States, and India).

How large and growing economies in the Indo-Pacific region develop their societies and their energy systems will be critical to wider efforts to deploy clean energy and reduce energy-related emissions. As the Biden administration has noted in explaining its focus on the region, many expect it to be the leading source of economic growth worldwide during the next 30 years.³ To accelerate the global transition to clean energy, it will be essential to address existing tensions among economic, security, and energy policies—that is, trade-offs between clean energy, cheap energy, reliable energy, and secure energy—and to leverage energy technologies and financing in wealthier economies to help poorer ones produce clean energy.

Cooperation on these issues can be challenging, as all countries are simultaneously competing economically. For the United States, concerns that promoting clean energy and limiting greenhouse gas emissions could affect global economic competitiveness have constituted a significant political obstacle to greater participation in global negotiations on climate change. The U.S. has concerns about competitiveness not only with geopolitical rivals like China, but also with some technologically advanced allies that rely relatively heavily on manufacturing exports for jobs and economic growth, such as Japan and South Korea.

Rising geopolitical strains are further complicating international cooperation on climate policy as well as on wider foundational policies including trade, investment, and technology research and development. Russia's invasion of Ukraine, and U.S. and allied economic sanctions on Russia, might be most immediate in their impacts. In the Indo-Pacific region, these strains overlay intensifying mutual suspicion, public recriminations, and even hostility between the United States and some allies on one hand and China on the other. China's response to House Speaker Nancy Pelosi's August 2022 visit to Taiwan illustrates this.

In addition to competing in security terms, America and China are competing for economic and political influence across the Indo-Pacific region. This includes competition in their bilateral relations with regional governments as well as within multilateral groups like the Association of Southeast Asian Nations (ASEAN) and organizations such as Asia-Pacific Economic Cooperation (APEC), where the U.S. and China are both members. In the region and beyond it, many governments are understandably reluctant to appear to choose sides for fear of threatening existing relations with either or both powerful countries.

This is the context for President Joe Biden’s proposal to establish a new regional economic arrangement, the Indo-Pacific Economic Framework for Prosperity (IPEF), which he announced during a May 2022 visit to South Korea and Japan. Conceived prior to the launch of the Indo-Pacific Economic Framework, this report proposes policies that could contribute to its Clean Economy pillar as well as to wider approaches to promoting clean energy in the region. We focus special attention on America’s cooperation with fellow members of the Quadrilateral Security Dialogue (“the Quad”)—Australia, India, and Japan—and with South Korea. These four nations are close U.S. allies and, in India’s case, a close partner; they are also leading Indo-Pacific economies, both in energy and emissions terms. The report refers to other IPEF participants on a selective basis.

We hope that this report can contribute to U.S. policy debates surrounding both clean energy and America’s competition with China in the Indo-Pacific region and contribute some useful ideas. Effective policies to address energy security, climate change, and the energy transition can support multiple important U.S. national interests regionally and internationally.

Section 1 summarizes aspects of the geopolitical environment in the Indo-Pacific region; section 2 provides a brief overview of the region’s important economic and energy realities. Sections 3, 4, and 5 review U.S. domestic policy on clean energy and climate change, U.S. engagement on these issues in the Indo-Pacific region, and analogous policies in Australia, India, Japan, and South Korea, respectively. Section 6 offers a wider assessment and sets out recommendations for U.S. policy. The final section, section 7, presents a few final thoughts.



The Akademik Tscherski, a Russian pipe-laying ship that worked on the undersea Nord Stream 2 pipeline from Russia to Germany. Following Russia’s invasion of Ukraine, Germany blocked Nord Stream 2’s operation.

Credit: Jens Bittner/picture-alliance/dpa/AP Images

1. Energy and Geopolitics in the Indo-Pacific Region

Energy and energy technologies are especially vulnerable to deteriorating political, economic, and security relationships because they are strategically important infrastructure systems essential to modern societies and militaries. The fact that new energy technologies are already reshaping geopolitics—and that future breakthroughs could do so again—stimulates high-stakes international competition in innovation, manufacturing, and trade. This competition inevitably extends to key inputs, including not only natural resources, but also investment and human capital.

In the United States, geopolitical competition has turned the attention of administration officials and members of Congress toward energy and energy technology. Among their many responses have been tariffs on imported solar panels, new funds for nuclear energy research and development, policies to boost production of minerals required for battery manufacturing, and calls to increase domestic energy production. Russia's invasion of Ukraine and subsequent disruptions in oil and gas markets have only intensified interest in these topics among policymakers in America and globally. A possible conflict with China over Taiwan or other issues has likewise drawn new attention to many U.S. policy challenges, including energy-related supply chains.

Escalating geopolitical competition has simultaneously encouraged U.S. officials to rally America's allies and partners. In Europe, the North Atlantic Treaty Organization (NATO) has largely unified in opposing Russia's invasion of Ukraine. In the Indo-Pacific, which lacks an analogous collective security treaty, Washington has largely relied upon bilateral talks with allies such as Australia, Japan, and South Korea, among others.

In addition to its formal defense commitments with these three countries, the United States has defense treaties with New Zealand, the Philippines, and Thailand and an informal alliance with Taiwan. Washington is also working closely with many partners, most notably India, ASEAN, and individual ASEAN members such as Indonesia, Singapore, and Vietnam.

The United States also built new multilateral groups such as the Quad, whose leaders met in Tokyo in May 2022. South Korea's new president, Yoon Suk-yeol, has expressed interest in closer South Korean collaboration with the Quad, though U.S. officials believe that the group should focus on developing in its current configuration.⁴ The United States, Australia, and Japan maintain a strategic dialogue.⁵ A new group, AUKUS, incorporates Australia, the United Kingdom, and the United States and reflects a complex wider U.S. attempt to align its European allies with America in the Indo-Pacific region, including through the G7.⁶

In addition to its trade and economic ties, such as the U.S.-Korea Free Trade Agreement, America engages through regional development organizations like the Asian Development Bank (ADB). These organizations link developed and developing economies and provide investment and other financing. An outgrowth of 1960s-era efforts by the United Nations to promote development, the ADB has 68 members,

49 in Asia (defined broadly, to include Armenia, Azerbaijan, and Georgia at its westernmost limits), plus the United States, Canada, Turkey, and 16 European countries.⁷ ADB committed \$35.6 billion to development projects in 2021;⁸ for comparative purposes, the World Bank committed \$83 billion in 2020.⁹ ADB's total energy-related financing from 2009 to 2020 is over \$42 billion.¹⁰

At the end of 2021, the United States and Japan had the largest shares of voting power in ADB, at 12.75% each. Next in voting power are China (5.44%), India (5.35%), Australia (4.91%), Indonesia (4.64%), Canada (4.47%), and South Korea (4.32%).¹¹ Because many key decisions require support from members holding three-quarters of the voting power, the United States and Japan in effect hold a joint veto if they maintain these shares and vote together.¹²

Like America, China is pursuing its own policies to expand trade and investment and to increase its economic and political influence. One example is the Regional Comprehensive Economic Partnership (RCEP), a Chinese-dominated trade pact that came into force at the beginning of 2022. RCEP includes China, Australia, Japan, New Zealand, and South Korea as well as the 10 ASEAN member states. Together they comprise 30% of the world's population and economy.¹³

RCEP incorporates the Asian members of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), the successor agreement to the Trans-Pacific Partnership (TPP) following the Trump administration's withdrawal, but excludes TPP's Western Hemisphere members—Canada, Chile, Mexico, and Peru.¹⁴ Since the Biden administration's IPEF proposal lacks a tariff-reduction component, RCEP appears likely to be the region's most important multilateral trade agreement in the foreseeable future.

Two other important instruments in China's regional economic tool kit are the Asian Infrastructure Investment Bank (AIIB), a development bank rivaling the ADB, and the Belt and Road Initiative (BRI).

Suspicious of China's proposal to establish the AIIB, the United States declined to enter negotiations to become a founding member and has remained outside it since. China holds 26.58% of the voting power in the AIIB; the next largest vote holders are India (7.60%) and Russia (5.98%).¹⁵ In the AIIB, the three-quarters vote required for key decisions provides China sole veto power on some important issues.¹⁶

AIIB started with 37 regional states as members (and almost two dozen countries outside Asia) and had 103 members at the end of 2020.¹⁷ AIIB's 2020 annual report, the most recent available, disclosed the financing of three energy-related projects among a total of 45 projects that year. AIIB's total approved financing in 2020 was \$9.98 billion.¹⁸ Well over half the projects (27) were through AIIB's COVID-19 Crisis Recovery Facility. Prior to the pandemic, in 2019, AIIB financed 19 energy projects, more than in any other sector.¹⁹

The Belt and Road Initiative (BRI) may be Beijing's most visible international economic undertaking of the last decade. On a global basis, BRI's cumulative energy-related investment has totaled \$127 billion; in 2021, energy investments in the Indo-Pacific region went to Cambodia (\$400 million) and Vietnam (\$500 million).²⁰ BRI energy construction projects amounted to \$200 billion worldwide in 2021, with new Indo-Pacific work in Indonesia, Thailand, and Vietnam.²¹ The program has arguably been a leading driver of American concerns about China's growing economic influence and strategic aims and has prompted renewed U.S. attention to global development finance. That said, China's BRI implementation has prompted backlash in some countries and might prove financially unsustainable following the COVID-19 pandemic.

2. Indo-Pacific Economies and Energy Systems

Five characteristics of the Indo-Pacific region are especially relevant to U.S. policies aiming to build a clean energy framework in the Indo-Pacific region:

- It is geographically dispersed.
- Its governments have varied institutional capacity.
- Its economies illustrate disparities between the world's wealthiest and poorest.
- Its energy systems depend heavily on coal and on imported fossil fuels.
- Its GHG emissions are large and growing.

Geography

The Indo-Pacific region is geographically very different from the European Union (EU). The EU is more compact—traveling more than 4,000 miles within EU borders would be difficult (though not impossible)—and it is for the most part territorially contiguous, meaning people and goods can be moved by rail and road with relative ease. In contrast, it is 8,000 miles from Tokyo to Melbourne. The distance from Jakarta to Manila—the capitals of two ASEAN “neighbors”—is greater than that from Paris to Moscow. No less important than these greater distances, many countries are composed of one or more islands; thus, airplanes and ships are essential transportation between them and in some cases within them. These geographic facts have important implications, including for security, trade, and energy.

Capacity

The Indo-Pacific region varies greatly in government capacity. In public service provision, one dimension of government capacity, the Fragile States Index gives Myanmar and Cambodia exceptionally low index scores, among the bottom third of all countries globally, while ranking Singapore, Japan, and South Korea 6th, 12th, and 15th, respectively.²² The Legatum Institute's Prosperity Index shows similar diversity in its rankings of government quality and credibility. By this measure, Singapore ranks 1st globally, New Zealand 11th, and Japan 12th, while Cambodia is 108th, Laos is 128th, and Myanmar is 145th.²³ These wide ranges suggest that Indo-Pacific governments will have widely differing abilities to implement policies to promote clean energy or other aims.

Economic and Social Disparity

Underlying divergent government capacity are extreme variations in national economies and individual incomes. Japan is the world's third largest economy; its GDP in 2020 was \$5 trillion.²⁴ In Laos, 2020 GDP was just \$19 billion.²⁵ This is roughly 10% of the 2017 GDP of Japan's Chiba Prefecture, the location of the Tokyo Disney Resort and Narita Airport.²⁶ Chiba's population is about 15% smaller than that of Laos—a little over 6.2 million vs. almost 7.3 million—and its per capita GDP is well over 10 times higher.²⁷ Indeed, Japan's per capita GDP in 2020 was \$40,193, while the comparable value for Laos was just \$2,630.²⁸

Social statistics comparing education, health, and other indicators show similarly large differences between the region’s wealthiest and poorest. The UN Human Development Index integrates measures of education, health, and standards of living on a scale between 0 and 1 and illustrates the wide gap between highly developed nations like Japan, Singapore, and South Korea, which have scores above 0.900, and developing countries including Cambodia, Laos, and Myanmar, which have scores just above or somewhat below 0.600.²⁹

Dependence

With some exceptions, coal’s share in primary energy in Indo-Pacific countries is at or above the global average. Noting that coal is “affordable, abundant, [and] easy to transport,” International Energy Agency director Fatih Birol observes that many countries, “particularly in South and Southeast Asia,” rely on coal “to provide energy security and energy access, and to underpin economic development.”³⁰ Certainly China has done so.

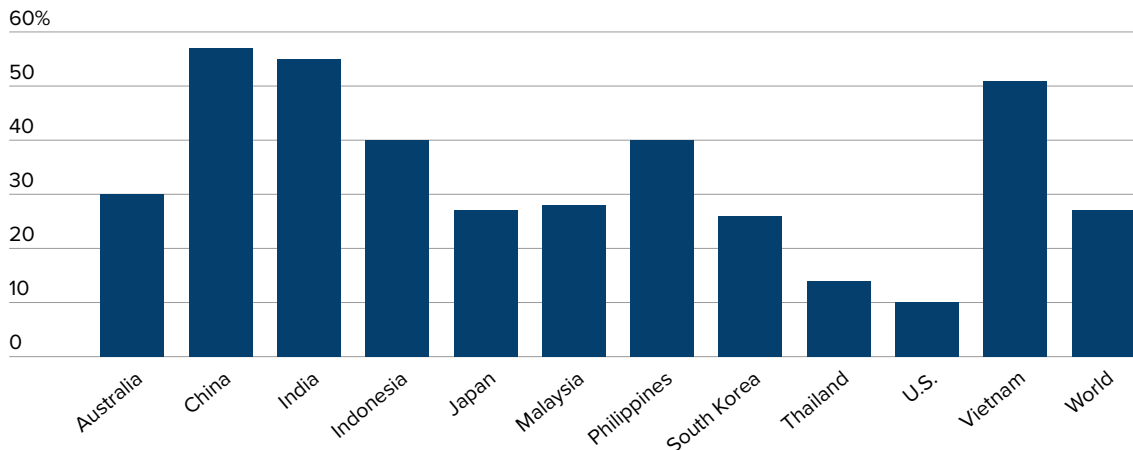
Figure 1 shows coal’s share in primary energy in several large regional economies in 2020; for reference, the global average share was approximately 27% that year.³¹ Only in Thailand and the United States is coal’s share noticeably below the global average. Note that in 2019, China alone consumed nearly 60% of the world’s coal.³²



Credit: Getty Images/dan_prat

Coal’s share in primary energy consumption in Indo-Pacific countries is at or above the global average. In 2019, China consumed almost 60% of the world’s coal.

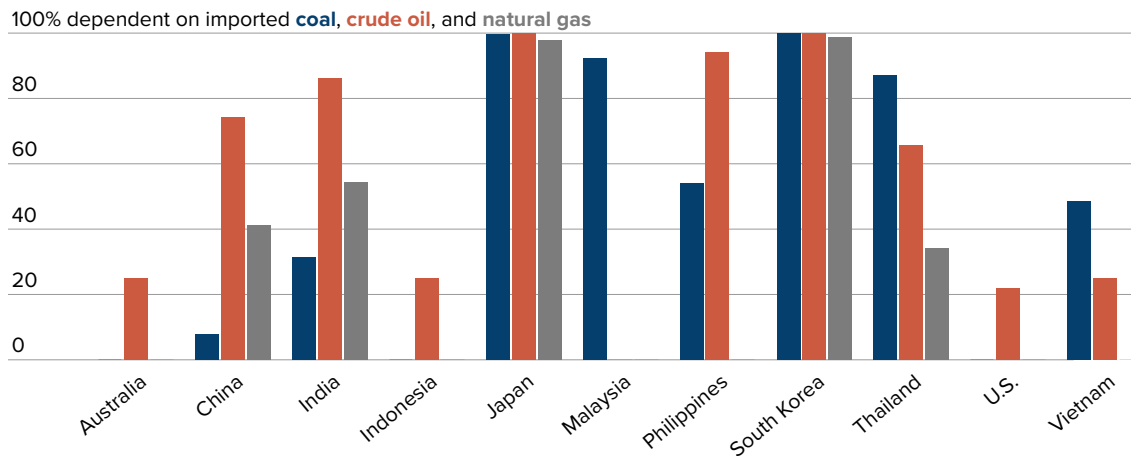
Figure 1. Share of Coal in Primary Energy, Selected Large Economies



Source: BP Statistical Review of World Energy, 2022, <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

Some countries in the Indo-Pacific region are significant energy exporters. For example, Australia and Indonesia are substantial net exporters of coal and natural gas.³³ However, most of the region’s largest energy consumers are dependent or even highly dependent on fossil fuel imports. Figure 2 presents net imports of coal, crude oil, and natural gas as a share of total energy supply for selected nations, in 2019.³⁴

Figure 2. Net Imports of Fossil Fuels as a Share of Total Energy Supply, 2019



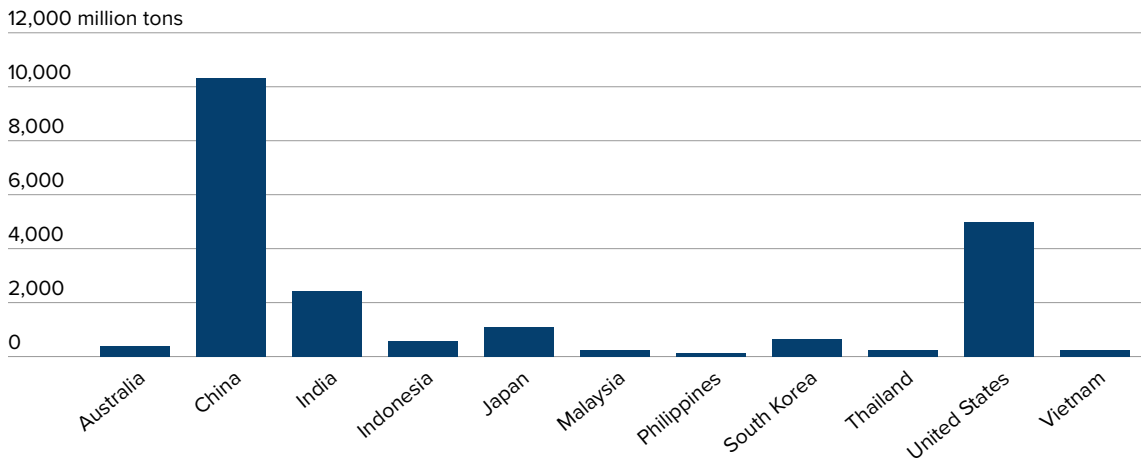
Source: International Energy Agency, <https://www.iea.org/data-and-statistics/data-tables?country=WORLD&energy=Balances&year=2019>.

Most striking is that Japan and South Korea depend almost entirely upon imports for the supplies of coal, crude oil, and natural gas. They are the world’s fifth and ninth largest energy consumers, respectively; China, the United States, and India rank first, second, and fourth among global energy consumers. The gap between China’s and America’s 2019 energy consumption and that of other top consumers is considerable: energy consumption in China and the United States was 151.6 and 100.5 quadrillion British thermal units (“quads”), respectively, while consumption in India, Japan, and South Korea was 31.8, 18.7, and 12.4 quads.³⁵ ASEAN’s large economies—Indonesia, Malaysia, the Philippines, Thailand, and Vietnam—respectively consumed 8.0, 4.0, 2.1, 5.3, and 3.5 quads, and Australia used 6.1 quads.³⁶ U.S. energy consumption exceeds that of the latter nine countries combined.

Emissions

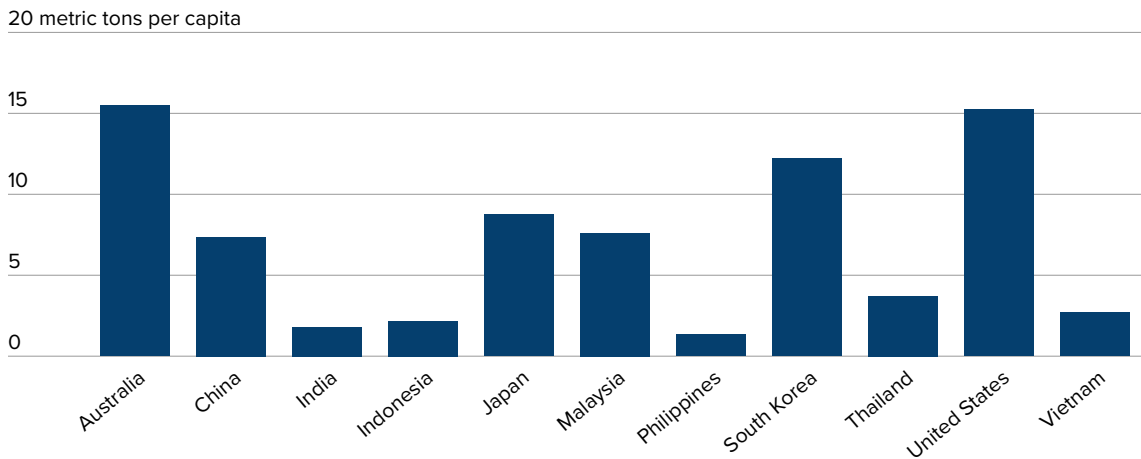
The combination of large and growing economies with relatively high fossil fuel dependence yields significant and growing greenhouse gas emissions. In 2018, six of the world’s 10 largest GHG emitters were in the Indo-Pacific region: they were China (first), the United States (second), India (third), Japan (fifth), South Korea (seventh), and Indonesia (ninth).³⁷ Figures 3 and 4 respectively display total CO₂ emissions and emissions per capita for select Indo-Pacific countries. Emissions per capita are likely to increase substantially in developing nations as they become wealthier. Figure 3 illustrates China’s vast emissions relative to some of the largest economies and GHG emitters in the Indo-Pacific region. Figure 4 demonstrates the higher emissions per person in the region’s developed economies relative to its developing economies and hints at the potential growth in emissions from those developing economies in the future.

Figure 3. CO₂ Emissions, Select Indo-Pacific Countries, 2018



Source: World Bank, <https://data.worldbank.org/indicator/EN.ATM.CO2E.KT>.

Figure 4. CO₂ Emissions per Capita, Select Indo-Pacific Countries, 2018



Source: World Bank, <https://data.worldbank.org/indicator/EN.ATM.CO2E.PC>.

Participants in the UNFCCC’s 2015 Conference of the Parties adopted the Paris Agreement to establish a new approach to combating climate change. In addition to committing signatories to the goal of limiting global warming to 2° Celsius, or preferably 1.5° Celsius, Paris requires participating countries to communicate increasingly ambitious “nationally determined contributions” (NDCs) every five years to set out their emissions reduction goals and adaptation measures.³⁸ Table 1 presents the GHG emissions reduction goals that key countries in the region submitted in their most recent NDCs.

Understanding baselines (the levels from which a government will reduce national emissions) is essential in comparing emissions reductions goals. Since emissions have generally been increasing worldwide, reductions against earlier base years will be steeper in absolute terms than equal percentage reductions from later base years. Likewise, reductions from emissions levels in a specific base year will typically be steeper than reductions from “business as usual” levels, which usually incorporate some degree of emissions growth. Many governments use 2005 as a base year, since this is the year in which the Kyoto Protocol entered into force.

Table 1. Paris Agreement Emissions Goals of Select Indo-Pacific Countries

| | NDC Submission Date | Emissions Reduction Goals |
|---------------|----------------------------|---|
| Australia | June 2022 | 43% below 2005 level by 2030; net zero by 2050 |
| China | October 2021 | Peaking emissions before 2030; over 65% below 2005 carbon intensity by 2030 |
| India | August 2022 | 45% below 2005 emissions intensity by 2030 |
| Indonesia | August 2021 | 29% below business as usual by 2030, or up to 41% with international assistance |
| Japan | October 2021 | 46% below 2013 level by 2030; net zero by 2050 |
| Malaysia | July 2021 | 45% below 2005 carbon intensity by 2030 |
| Philippines | April 2021 | 2.71% below 2020 level by 2030, or up to 75% with international assistance |
| South Korea | December 2021 | 40% below 2018 level by 2030; net zero by 2050 |
| Thailand | October 2020 | 20% below business as usual by 2030, or up to 25% with international assistance |
| United States | April 2021 | 50–52% below 2005 by 2030 ^a |
| Vietnam | September 2020 | 8% below business as usual by 2030, or up to 25% with international assistance |

Source: United Nations Framework Convention on Climate Change, “NDC Registry,” <https://unfccc.int/NDCREG>; Climate Action Tracker, “China,” <https://climateactiontracker.org/countries/china/>; “Cabinet approves India’s Updated Nationally Determined Contribution to be communicated to the United Nations Framework Convention on Climate Change,” <https://pib.gov.in/PressReleaselframePage.aspx?PRID=1847812>.

Note: The table includes only goals that directly refer to reductions in emissions or emissions intensity. Many NDCs include other goals, e.g., to build specified amounts of renewable power generating capacity.

a. President Joe Biden has declared a U.S. goal of reaching net-zero emissions by 2050, but the United States did not include this goal in its nationally determined contribution.

3. U.S. Clean Energy and Climate Policy

Energy and climate policy are politically contested in the United States and, as a result, the U.S. Congress has been unable to pass comprehensive federal legislation limiting GHG emissions. Politics and potential economic impacts constrain executive branch policy as well.

One of the most notable failed legislative efforts was the 2009 American Clean Energy and Security Act (the Waxman-Markey Bill), which sought to establish a combined energy efficiency and renewable power standard in parallel with a cap-and-trade system for emissions.³⁹ The unsuccessful effort to pass the bill, at a time when Democrats controlled the White House, the Senate, and the House of Representatives, has substantially shaped subsequent proposals and political strategies.

In the absence of laws setting emissions limits, the Congress has passed various narrower bills and incorporated energy policy measures into broader legislation. During the Bush administration, the Republican Congress passed the Energy Policy Act of 2005, which created an escalating renewable fuels standard for transportation fuels and provided tax incentives for energy efficiency, renewable energy, and nuclear energy in addition to fossil fuel production.⁴⁰

Four years later, during the Obama administration, the Democratic Congress adopted the American Recovery and Reinvestment Act of 2009 (ARRA) in the wake of the 2008 financial crisis. ARRA provided loan guarantees and tax credits for renewable energy and supported grid modernization, energy innovation, efficiency programs, carbon capture and sequestration, and clean transportation.⁴¹ During the Biden administration, the Democratic Congress enacted the 2021 Infrastructure Investment and Jobs Act, which likewise included funding for a variety of clean energy programs.⁴²

In August 2022, Congressional Democrats passed the Inflation Reduction Act, which provides \$369 billion for clean energy and climate policy, including \$161 billion in new tax credits for clean electricity. Democrats asserted that the law would cut emissions to 40% below 2005 levels by 2030.⁴³ Earlier investment tax credits for solar power and production tax credits for wind power have significantly improved their economic competitiveness and have accelerated deployment.⁴⁴ However, large U.S. states like California and New York have faced varied problems in attempting rapid solar and wind deployment.

Absent systematic federal clean energy or climate legislation, U.S. climate policy rests upon uncoordinated measures like those above as well as presidential executive orders, federal regulations, and the varied policies of America's state and local governments. For example, in December 2021, President Biden signed an executive order directing the federal government to reduce emissions from its operations 65% by 2030 and to achieve net-zero emissions by 2050.⁴⁵ However, in America's partisan energy and climate politics, such efforts are politically unsustainable.

Regulatory approaches to climate policy have relied largely on reinterpreting federal regulations established for other purposes, such as the National Environmental Policy Act and the Clean Air Act. During the Obama administration, the U.S. Environmental Protection Agency (EPA) announced its Clean Power Plan, which sought to reduce power sector CO₂ emissions 32% below 2005 levels by 2030.⁴⁶

TOWARD AN INDO-PACIFIC CLEAN ENERGY FRAMEWORK

After the Supreme Court blocked implementation of the Clean Power Plan, the Trump administration repealed it and proposed the weaker Affordable Clean Energy Rule to replace it.⁴⁷ Court actions blocked that rule as well,⁴⁸ and the U.S. Supreme Court has recently curtailed EPA authority over power plant emissions on a sectoral basis.⁴⁹

4. America’s Global and Regional Engagement

U.S. domestic policy and politics have powerfully influenced the country's global and regional approaches to clean energy and climate change.

In 1998, President Bill Clinton approved U.S. participation in the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), a major international agreement to reduce global GHG emissions. He did so despite the U.S. Senate’s 1997 Byrd-Hagel Resolution, a measure that is not merely underappreciated but largely forgotten in 2022. Byrd-Hagel expressed the Senate's view that the United States should not sign any climate agreements that did not include commitments by developing countries or that “would result in serious harm to the economy.”⁵⁰ Perhaps because Byrd-Hagel was adopted with a 95-0 Senate vote, the Clinton administration did not submit the treaty for Senate ratification during its final years.

In 2001, President George W. Bush publicly rejected Kyoto. U.S. officials offered several reasons for this, including dissatisfaction with a 1990 baseline for emissions reductions that U.S. officials saw as favoring Europe, concern over implementation costs, and frustration over the failure to impose emissions limits on China—the world’s second largest greenhouse gas emitter (behind the United States) at the time—or India.⁵¹ Two of these three objections echoed core elements of the Byrd-Hagel Resolution.

Nevertheless, President Bush and his administration launched several new initiatives to address climate change, many of which remain active today, such as the Major Economies Meeting on Energy and Climate, the Carbon Sequestration Leadership Forum, and the International Partnership for the Hydrogen Economy.⁵² These efforts included America’s first significant and focused effort to advance multilateral cooperation on clean energy in the Indo-Pacific region; the result, the Asia-Pacific Partnership on Clean Development and Climate, was announced in July 2005.⁵³ One rationale for the Asia-Pacific Partnership as a vehicle to address climate change was that its initial six members comprised roughly half of global GDP and half of global GHG emissions.⁵⁴

The Asia-Pacific Partnership dealt with objections to Kyoto by eschewing emissions limits or targets in favor of “developing and accelerating the deployment of cleaner and more efficient technologies and practices,” and by including China and India among its members.⁵⁵ Australia, Japan, and South Korea were the other initial participants.⁵⁶ The effort aimed to expand trade and investment in clean energy technologies and services, to work inside multilateral development banks to support financing of clean energy projects, and to assemble public/private task forces to assess clean technologies for generating and distributing power, mining and processing metals, producing cement, and improving efficiency of buildings and appliances.



Then vice president Al Gore led the U.S. delegation negotiating the Kyoto Protocol following a 95-0 Senate vote rejecting one of its eventual core principles.

Credit: Getty Images/The Asahi Shimbun

President Barack Obama sought a new global climate agreement and—after a failed effort at the 2009 Copenhagen conference of the parties to the UNFCCC—pursued active bilateral negotiations and cooperation with China to secure Beijing’s concurrence. China’s greenhouse gas emissions surpassed America’s in 2006;⁵⁷ Beijing’s effort to reduce emissions thus became even more important both in addressing climate change and in U.S. climate politics. In 2014, the United States and China announced wide-ranging cooperation on climate as well as their commitment to a new international agreement at the forthcoming Paris climate summit.⁵⁸ The Obama administration’s approach ultimately yielded the Paris Agreement at the 2015 UNFCCC conference of parties. Wary of earlier failures to secure congressional support, including Kyoto ratification and passage of Waxman-Markey, President Obama joined the Paris Agreement by executive order.

In parallel with climate diplomacy, the Obama administration worked to complete a significant new trade agreement in the Indo-Pacific region, the Trans-Pacific Partnership. The Bush administration announced negotiations with Brunei, Chile, New Zealand, and Singapore in 2008, after which Australia, Canada, Malaysia, Mexico, Peru, and Vietnam eventually entered the talks.⁵⁹ Following six years of meetings, the group completed the large new trade deal in 2015 and signed it in 2016. The agreement was a major accomplishment and a significant step for U.S. engagement in the region.

Simultaneously, the Obama administration embraced the Bush administration’s attention to developing and deploying clean energy technology. While the Obama team largely set aside the Asia-Pacific Partnership, the group’s mission was subsumed by the much broader Clean Energy Ministerial (CEM), which the U.S. and others announced at the 2009 Copenhagen climate summit and launched at a 2010 meeting in the United States.

The CEM describes itself as “a high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy.”⁶⁰ The CEM includes the Asia-Pacific Partnership’s six members as well as Brazil, Indonesia, Mexico, New Zealand, Russia, Saudi Arabia, South Africa, the United Arab Emirates, the European Commission, and several European governments.⁶¹ The administration continued the Major Economies Meeting, relaunching the group as the Major Economies Forum on Energy and Climate.⁶² In parallel, the Department of Energy announced Climate Renewables and Efficiency Deployment Initiative (Climate REDI), a \$350 million program to help developing countries to deploy renewable and energy efficiency technologies.⁶³

At the 2015 Paris summit, the Obama administration and other governments announced Mission Innovation, a multilateral group whose members pledged to “seek to double” their investment in clean energy research and development (R&D) over five years.⁶⁴ While governments claim they spent a total of \$18 billion in additional “energy innovation investments” during that period,⁶⁵ outside observers have argued based on International Energy Agency data that R&D spending fell far short of this goal.⁶⁶

Shortly after taking office, President Donald Trump announced the U.S. withdrawal from both the Paris Agreement and the TPP. During the 2016 election campaign, both he and his Democratic opponent Hillary Clinton had expressed opposition to the TPP.⁶⁷ The Trump White House cited research stating that complying with Paris would “cost nearly \$3 trillion in reduced economic output, over 6 million industrial jobs, and over 3 million manufacturing jobs.”⁶⁸ President Trump and his administration did not make combating climate change a priority, either domestically or internationally.

The Trump administration devoted considerable attention to competing with China in the Indo-Pacific region and to combating China’s unfair trade practices. In one early step with implications for clean energy, President Trump imposed “global safeguard tariffs” on \$8.5 billion in imports of Chinese-made solar panels.⁶⁹ The U.S.-China trade war expanded rapidly, with destructive consequences for the wider

U.S.-China relationship. In its regional energy policy, the administration stressed access to energy, especially to U.S. LNG exports, as well as market reforms and steps to encourage private investment in energy projects.⁷⁰

One of the most visible and ambitious energy-related initiatives in the Indo-Pacific during this time was Asia Enhancing Development and Growth through Energy (Asia EDGE), which the Trump administration launched in 2018. The administration described Asia EDGE as a program to “promote energy security and access by boosting United States exports and encouraging market-based policies.”⁷¹ The State Department and the U.S. Agency for International Development (USAID) coordinated the effort, which served as a framework for a wide range of projects to compete with China’s active role in power sector development, especially in ASEAN.⁷²

The Energy Resources Governance Initiative (ERGI), which the Trump administration announced in June 2019, was a parallel attempt to reduce dependence on China’s mineral mining and processing by strengthening alternative suppliers. Early U.S. partners included Argentina, Australia, Brazil, Botswana, Democratic Republic of Congo, Namibia, Peru, the Philippines, and Zambia. ERGI focused heavily on minerals required for electric vehicles (EVs) and batteries.⁷³

In another significant step during this period, the U.S. Congress established the U.S. Development Finance Corporation (DFC) by law in 2018. DFC integrated the Overseas Private Investment Corporation with USAID’s development lending organization, the Development Credit Authority. More narrowly, but indicating the administration’s competitive orientation, the Export-Import Bank of the United States (EXIM) announced a new external advisory body to focus on “strategic competition with the People’s Republic of China” in September 2020.⁷⁴

President Biden rejoined the Paris Agreement on his first day in office. Soon thereafter, he signed an executive order “putting the climate crisis at the center of United States foreign policy and national security” and announced a government-wide approach.⁷⁵ The executive order announced the Leaders Summit on Climate, the reconvening of the Major Economies Forum on Energy and Climate, and the creation of the Special Presidential Envoy on Climate position, to which he later appointed John Kerry. He also instructed the Secretary of Energy to work with other senior officials “to intensify international collaborations to drive innovation and deployment of clean energy technologies.”⁷⁶



Credit: AP Images/Wang chun yig – Imaginechina

A rare earth mineral mine in China, 2011. The Trump and Biden administrations have worked to reduce U.S. dependence on rare earths and other minerals mined and processed in China.

At the Leaders Summit and the Major Economies Forum, held in April 2021, President Biden announced that the U.S. would aim to reduce emissions by 50–52% by 2030, with the goal of reaching net zero by 2050.⁷⁷ The Biden administration also announced the launch of the Global Climate Ambition Initiative and U.S. International Climate Finance Plan to support developing countries in meeting their Paris Agreement goals, including a pledge to double public climate finance relative to 2013–2016 levels by 2024.⁷⁸

Notably, the Biden administration has continued both Asia EDGE and ERGI. Rebranded as Clean EDGE Asia, the former program places new emphasis on decarbonization.⁷⁹ The latter now involves only Australia, Botswana, Canada, and Peru in addition to America,⁸⁰ though the administration is complementing the group with its new Minerals Security Partnership, which includes Australia, Japan,

and South Korea as well as several European governments and the European Commission.⁸¹ Similarly, the administration recommitted to Mission Innovation, launching a second phase (Mission Innovation 2.0) in May 2021. This phase is considerably less ambitious, however, calling upon members only to “sustain, and wherever possible increase” government investment in clean energy R&D and demonstration.⁸² According to the group, its 25 members have been responsible for more than 90% of global government investment in clean energy R&D.⁸³ The United States will host the Clean Energy Ministerial and a Mission Innovation meeting in September 2022 in Pittsburgh, Pennsylvania.⁸⁴

In February 2022, the Biden administration released a broad strategy document for the region, the Indo-Pacific Strategy of the United States.⁸⁵ With respect to climate change, the strategy declares an intent to “strengthen Quad cooperation,” to begin “new high level engagements” with ASEAN, and to propose an economic framework that would contribute to regional efforts to address “the coming energy and climate transition.”⁸⁶ Describing the Indo-Pacific region as “the epicenter of the climate crisis,” the strategy stressed the need to ensure that infrastructure investment does not work against climate goals and the need to boost resilience.⁸⁷ The administration’s goal is “to serve as the preferred partner as the region transitions to a net-zero future.”⁸⁸ In May 2022, the Quad announced a new Quad Climate Change Adaptation and Mitigation Package (Q-CHAMP). At the time, Q-CHAMP was slated to incorporate cooperation on hydrogen and methane emissions, supply chains, disaster risk reduction and resilience, and green shipping and ports.⁸⁹

Also in May 2022, President Biden announced major new negotiations on the Indo-Pacific Economic Framework described in his administration’s Indo-Pacific Strategy. Acknowledging the lack of domestic support for TPP’s tariff reductions, administration officials have said that the talks will address nontariff barriers to trade.⁹⁰ One of the IPEF’s four pillars aims “to accelerate efforts to tackle the climate crisis” by cooperation in renewable energy and other areas; other pillars address trade, supply chains, and corruption.⁹¹ In addition to the United States, IPEF’s founding members include Australia, India, Japan, New Zealand, South Korea, and seven ASEAN members.⁹² U.S. officials reportedly hoped to conclude agreements in each of the four pillars within 12 to 18 months.⁹³ The Quad has also announced new cooperative efforts in security, health, infrastructure, technology, space, climate, and other areas.⁹⁴

As of this writing, the Biden administration has stated that the IPEF energy/climate pillar will incorporate discussion of “concrete, high ambition targets” in “renewable energy, carbon removal, energy efficiency standards, and new measures to combat methane emissions.”⁹⁵ Carbon removal generally refers both to natural approaches, such as afforestation and agricultural practices, and to technical means like direct air capture; it typically excludes carbon capture, utilization, and storage (CCUS) when not associated with bioenergy.

5. Core Partners in the Indo-Pacific Region

Washington's closest bilateral relationships in the Indo-Pacific region have been with key allies—Australia, Japan, and South Korea—and increasingly with India. Political and security relationships with Australia, Japan, and South Korea are especially deep as they rest upon decades-long Cold War-era military alliances, which are becoming closer as U.S. competition with China intensifies.⁹⁶ Economically, Japan, South Korea, and India are top U.S. trading partners, all ranking among the top 10 in goods exports to and imports from America in 2021.⁹⁷ The four countries were all among the top 15 U.S. services trade partners that year as well.⁹⁸ Within the Indo-Pacific region, they are leading energy producers (Australia) and consumers (India, Japan, South Korea) and leading greenhouse gas emitters.⁹⁹ Each is considered in turn below.

Australia

In June 2018, Australia announced a new pledge to reduce emissions 43% from 2005 levels by 2030.¹⁰⁰ Australia's earlier domestic and international climate targets included reducing greenhouse gas emissions 26–28% below 2005 levels by 2030 and achieving net-zero emissions by 2050.¹⁰¹ The country's previous government, led by conservative prime minister Scott Morrison until May 2022, announced Australia's Long-Term Emissions Reduction Plan in 2021. The plan had four components: investments to reduce clean technology costs, policies to facilitate large-scale deployment of clean technologies, development of new industries (e.g., clean hydrogen), and global and regional collaboration.¹⁰² Anthony Albanese, the newly elected Labor Party prime minister, has suggested that his government will set deeper emissions reduction targets, though he has rejected winding down coal mining or coal-fired power.¹⁰³

Australia's economy depends significantly on mining, which represents 11.5% of economic output and is the country's second largest sector.¹⁰⁴ Energy and energy-intensive mining products dominate the country's exports; in 2020, these included iron ore (31.8%), coal briquettes (14.6%), natural gas (10.7%), and gold (7.1%), as well as smaller but collectively important amounts of crude oil and various ores and metals.¹⁰⁵ These exports earned \$79.6 billion (iron ore), \$36.4 billion (coal briquettes), and \$26.8 billion (natural gas) that year.¹⁰⁶

Gas, coal, and iron ore made up 35%, 28%, and 14% respectively of Australia's exports to Japan in 2020, and 16%, 21%, and 25% respectively of its exports to South Korea.¹⁰⁷ Australia is likewise an important supplier of these and other commodities to many of the Indo-Pacific region's developing economies. Coal comprised some 80% of Australia's exports to India in 2020, and fuels, metals, and minerals were a substantial share of its exports to many ASEAN member states that year.¹⁰⁸ Australia and India signed a major trade agreement in 2022; among other measures, it will eliminate tariffs on coal, LNG, and various metallic ores and minerals.¹⁰⁹

In part to sustain its existing fossil fuel production and exports in a future low-carbon global economy, Australia's climate plans have emphasized developing clean hydrogen for domestic use and for export.¹¹⁰ Analysts assert that hydrogen has bipartisan support in the country and note that with policy

support, a slate of proposed projects could result in a “massive increase” in Australia’s hydrogen production.¹¹¹ To support low-emissions technology development, Australia has established international partnerships with several countries, including Japan, Singapore, and South Korea.¹¹² In early 2022, Australia created a new low-emissions technology partnership with India.¹¹³

In its cooperation with Japan and South Korea, Australia has stressed clean hydrogen and ammonia, low-emissions iron ore and steel, hydrogen power and fuel cells, and carbon capture, utilization, and storage.¹¹⁴ Australia’s partnership with Singapore likewise includes hydrogen and CCUS as two of its key components;¹¹⁵ the partnership with India focuses on hydrogen and solar energy.¹¹⁶ The new Albanese government’s commitment to continuing these partnerships is unknown at this writing.

As significant fossil fuel exporters, the United States and Australia compete in Indo-Pacific energy markets. Nevertheless, government-to-government and business cooperation are well-developed. U.S. investment and technology contributed importantly to Australia’s growth as a major liquefied natural gas (LNG) exporter; indeed, according to the Obama administration, the U.S. deserved credit for propelling Australia into the role of the world’s top exporter.¹¹⁷ (The United States, Australia, and Qatar have led global LNG exports in recent years.¹¹⁸)

The United States and Australia established the U.S.-Australia Climate Action Partnership in 2002. The initial work plan included projects in climate science, renewable and low-emissions energy technologies, technology and policy development, capacity building in developing countries, and GHG accounting practices.¹¹⁹ In addition to executing the work plan, officials discussed energy and climate issues in periodic meetings, though these bilateral discussions appear to have ended after the launch of the Asia-Pacific Partnership.¹²⁰

In his first meeting with his Australian counterpart, in 2009, President Barack Obama indicated a commitment to cooperation on CCUS, including participation in a multilateral Australian initiative to establish a global CCUS institute.¹²¹ By December the following year, the Obama administration had concluded and won Senate ratification of a civil nuclear cooperation agreement with Canberra.¹²² Continuing to work with Labor governments in Australia, the Department of Energy announced several modest new agreements in 2011, including joint funding for seven solar energy technology research projects.¹²³

Energy and climate cooperation slowed somewhat when the conservative Liberal Party came to power in Australia in 2013; in President Obama’s joint press appearances with his Australian counterparts—Prime Minister Tony Abbott (in 2014) and Prime Minister Malcolm Turnbull (in 2015)—neither energy issues nor climate issues were mentioned.¹²⁴ By early 2016, cooperation had narrowed to little beyond joint support for multilateral initiatives like the CEM and Mission Innovation.¹²⁵

In early 2018, the Trump administration and Australia’s conservative government created a Strategic Energy Partnership that focused primarily on developing energy infrastructure in the Indo-Pacific; the project appeared intended to expand access to energy in developing countries by promoting natural gas trade.¹²⁶ In their announcement, the two countries stressed “deployment of low emissions technologies



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A liquefied natural gas tanker in Darwin, Australia. Australia is an important LNG exporter in the Indo-Pacific region.

which support the secure, reliable, affordable and sustainable supply of energy”—also a possible reference to natural gas.¹²⁷ Toward the end of the year, the U.S., Australia, and Japan announced a trilateral partnership to develop infrastructure in the Indo-Pacific, including energy infrastructure.¹²⁸

Under the Biden administration, U.S. energy and climate cooperation with Australia has thus far continued largely within multilateral formats, including the Quad, the CEM, and the Major Economies Forum.

India

In 2016, India pledged “to reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 levels . . . [and] to achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance.”¹²⁹ Prime Minister Narendra Modi added to these goals in 2021, announcing that his country would achieve net-zero emissions by 2070, build 500 GW of installed renewable energy capacity by 2030, and reduce its carbon intensity (emissions per unit of economic output) by 45% by 2030.¹³⁰ India’s federal cabinet recently approved the new goals.¹³¹

As leaders in a developing nation with a large population and a large economy but a relatively low standard of living, Indian officials have sought to balance clean energy goals with the country’s economic development.¹³² Thus, India is “promoting greater use of renewable [sic] in the energy mix mainly through solar and wind and at the same time shifting towards supercritical technologies for coal based power plants.”¹³³ India actively seeks foreign assistance to support its energy and climate policies as well as its broader development goals: “As a climate-responsible developing country,” Prime Minister Modi wrote in 2021, “India welcomes partners to create templates of sustainable development in India.”¹³⁴ India also advocates for such assistance to others.

India’s 2008 National Action Plan on Climate Change (NAPCC), a foundational policy document, outlines eight National Missions, in areas including solar power, energy efficiency, water, agriculture, and research on climate impacts.¹³⁵ Since then, India has announced other missions and policies, such as the National Electric Mobility Mission, the National Smart Grid Mission, a National Policy on Biofuels, the Cooling Action Plan, and the National Hydrogen Energy Mission. Starting in 2010, India’s central government has required states to develop State Action Plans on Climate Change.¹³⁶

While coal dominates India’s power system, the country’s government has worked steadily to build renewable power. Solar is the primary source of renewable energy in India and accounted for roughly 46% of installed renewable energy capacity as of September 2021.¹³⁷ The National Solar Mission’s initial goal was to install 20 GW in solar power capacity by 2022; in 2015, officials increased this goal to 100 GW.¹³⁸ At the same time, India set an overall target of 175 GW in renewable capacity by 2022.¹³⁹ Wind is the second largest source of installed renewable energy in India, accounting for roughly 39% of capacity in September 2021.¹⁴⁰ India had the fourth highest installed wind capacity in the world at the end of 2020.¹⁴¹

India has bilateral strategic partnerships of various forms with Australia, Japan, South Korea, the United States, and ASEAN; energy and climate are important elements in each. In addition to its dialogue with Australia, described earlier, India has established energy dialogues with Japan and with the United States, also described above.

Renewable power development is a part of India’s energy cooperation with ASEAN as well as with the other three Quad members and South Korea; India has civil nuclear agreements with Japan,¹⁴² South Korea,¹⁴³ and the United States. Fossil fuels are most prominent in discussions with America and Australia, both fossil fuel exporters. In addition to the United States, Japan and South Korea have been important sources of both development assistance and foreign investment in support of India’s clean energy goals.

India has increasingly become a leader on some clean power and development issues. In 2015, India and France jointly founded the International Solar Alliance, a multilateral group working to accelerate solar power deployment.¹⁴⁴ Eighty-six nations—primarily developing countries—are now members; another 20 are in the process of joining.¹⁴⁵ India also founded the Coalition for Disaster Resistant Infrastructure (CDRI), which works to develop infrastructure suited to climate and disaster risks. CDRI includes governments as well as UN institutions, development banks, private sector organizations, and other entities.¹⁴⁶

The United States is developing a considerably deeper and broader relationship with India than it enjoyed during the Cold War era. There are many reasons for this, but most center upon India's considerable global presence. In 2020, India's economy was either the world's third largest (in purchasing power parity terms)¹⁴⁷ or sixth largest (on an exchange rate basis).¹⁴⁸ It ranked fourth in energy consumption (in 2019)¹⁴⁹ and third in greenhouse gas emissions (in 2018),¹⁵⁰ two statistics that lend weight to its having the world's third biggest economy rather than its sixth. Forecasts suggest India's economy could grow substantially in the coming decades.¹⁵¹ India had the world's second largest population in 2020—at almost 1.4 billion¹⁵²—and may pass China to become the most populous nation as soon as 2023 or 2024.¹⁵³ Finally, India had the world's third highest military spending in 2020, though there are admittedly large gaps between the first-, second-, and third-ranked governments.¹⁵⁴

Some 20 years ago, in the wake of the September 11, 2001, terrorist attacks against the United States, President George W. Bush sought a substantially closer U.S. relationship with India. While initial efforts focused mainly on counterterrorism cooperation and the U.S. war on the Taliban and al-Qaeda in Afghanistan, the two countries announced plans to expand dialogue on energy, the environment, science and technology, and other issues.¹⁵⁵ The Bush administration's decision to pursue civil nuclear cooperation—and set aside long-standing concerns about India's unwillingness to sign the United Nations Treaty on the Non-Proliferation of Nuclear Weapons—was especially significant.¹⁵⁶

In 2009, during the Obama administration, the two governments launched the India–United States Partnership to Advance Clean Energy (PACE), and in 2015 they expanded its activities.¹⁵⁷ Through PACE, the U.S. Department of Energy and the government of India established the Joint Clean Energy Research and Development Center (JCERDC) in 2010 to “improve energy access and promote low-carbon growth by facilitating joint research and development of clean energy technologies.”¹⁵⁸ By 2016, the United States and India had developed an extensive list of joint activities, including civil nuclear dialogue, solar power deployment, clean energy finance, training, and scientific exchanges, among other efforts.¹⁵⁹ Agreements of various types between the U.S. Department of Energy and its multiple Indian counterparts peaked during the Obama administration.¹⁶⁰

The Trump administration continued some Obama-era projects, including the U.S.-India Clean Energy Finance Task Force and the JCERDC, while also launching a new U.S.-India Strategic Energy Partnership (SEP). Cochaired by the U.S. energy secretary and India's minister of petroleum and natural gas, the SEP undertook dialogue on oil and gas, coal, and India's power sector, and continued discussions of renewable power.¹⁶¹

In April 2021, President Biden and Prime Minister Modi announced a new U.S.-India Climate and Clean Energy Agenda 2030 Partnership incorporating the SEP—reframed and slightly broadened as the Strategic Clean Energy Partnership (SCEP)—and a Climate Action and Finance Mobilization Dialogue, led by presidential climate envoy John Kerry.¹⁶² In May 2022, the two heads of state finalized an Investment Incentive Agreement to facilitate U.S. Development Finance Corporation investments in renewable energy and other projects in India.¹⁶³

Japan

Japan recently increased its emissions reduction goals significantly. In 2016, Tokyo declared that it would cut emissions 26% below 2013 levels by 2030 and 80% below 2013 levels by 2050.¹⁶⁴ In October 2020, then–prime minister Yoshihide Suga announced a more ambitious longer-term goal of becoming carbon neutral—achieving net-zero emissions—by 2050.¹⁶⁵

Six months later, he set a tougher near-term goal, a 46% emissions reduction from 2013 levels by 2030. Japan formally incorporated this and the new 2050 goal into its international pledges in October 2021, along with the aspiration to reach 50% reductions by 2050 if possible.¹⁶⁶



Credit: Shutterstock/PradeepGauris

A solar photovoltaic facility in Uttar Pradesh, a state in northern India. India has set ambitious goals to develop solar power.

As in the United States, attempts to balance economic growth, energy security, and emissions reductions have shaped clean energy policies in Japan.¹⁶⁷ Unlike America, however, Japan depends very substantially on imported energy—a reality that affects its clean energy planning. In 2019, for example, imports were roughly 95% of Japan’s total energy supply but just 24% of America’s.¹⁶⁸

Japan develops broad national energy policy through Strategic Energy Plans drafted by the Agency for Natural Resources and Energy within the Ministry of Economy, Trade and Industry. The most recent plans have been the Fourth, Fifth, and Sixth Strategic Energy Plans, which the government approved in 2014, 2018, and 2021.¹⁶⁹ In parallel, Japan has prepared economy-wide plans to achieve its emission reduction goals through the Long-Term Strategy under the Paris Agreement.¹⁷⁰

In the past, Japan’s attention to energy security drove its development of nuclear power, which in 2011 provided nearly 30% of Japan’s electricity and was then slated to generate 40% of the country’s electric power by 2017.¹⁷¹ The March 2011 Fukushima nuclear accident, resulting from an earthquake and a subsequent tsunami, led Japan to shut down its nuclear plants for safety reviews and inspections. Since then, only 10 of nearly three dozen reactors have resumed operations. Officials hope that nuclear plants will make up 20–22% of the power supply by 2030.¹⁷² Japan’s Kishida government has focused increasingly on building new “next-generation” nuclear plants to strengthen energy security.¹⁷³

Recent Strategic Energy Plans have assigned increasing priority to hydrogen and ammonia as sources of carbon-free energy. The Sixth Strategic Energy Plan calls for further accelerating the development of hydrogen as a source of electricity, mobility (fuel cells), and industrial heat, and it makes clear that this effort will require importing inexpensive hydrogen.¹⁷⁴ The earlier Fifth Strategic Energy Plan described hydrogen as a potential “trump card for mid to long-term energy security and global warming countermeasures.”¹⁷⁵ Japan’s Strategy for Developing Hydrogen and Fuel-Cell Technologies describes Tokyo’s approach.¹⁷⁶

By 2019, increased generation by gas-fired power plants (9%) and solar arrays (6%) made the greatest contributions to replacing Japan’s lost nuclear generation, though coal-fired generation also grew (4%).¹⁷⁷ The Sixth Strategic Energy Plan lists “ensuring optimal siting while living in harmony with local communities” as the first among the government’s specific efforts to promote renewable power;¹⁷⁸ this prominence implies some political tension surrounding the rapid expansion of solar generation, which rose from 3,543 GWh in 2010 to 68,953 GWh in 2019,¹⁷⁹ in a country with 10 times America’s population density.¹⁸⁰

Japan’s international collaboration on energy and climate matters has centered around energy security, clean energy deployment, and clean energy research and development. Australia and the United States are important energy suppliers for Japan, as are Middle Eastern exporters and Russia; all of these are thus important to its energy security. Japan’s recent cooperation with Australia has incorporated hydrogen, which Japan hopes to obtain from other natural gas exporters as well, and the two governments released a joint statement on the topic in 2020.¹⁸¹ In 2021, they announced a Comprehensive Strategic Partnership focused on decarbonization through technology, which commits the countries to collaborate on LNG production and trading, clean fuel ammonia, clean hydrogen, CCUS, carbon recycling, and low-emission steel and iron ore.¹⁸²

Japan and India have steadily deepened their relationship over the last two decades, defining it as a Global Partnership (2000), a Global and Strategic Partnership (2006), and then a Special Strategic and Global Partnership (2014).¹⁸³ In 2014, they added a bilateral energy dialogue.¹⁸⁴ On the other hand, notwithstanding many common interests and their shared status as U.S. allies, Japan and South Korea confront significant constraints in their bilateral relationship due to Japan’s wartime occupation of South Korea, including practices such as forced labor.¹⁸⁵ However, Japan and South Korea do maintain a bilateral energy dialogue.¹⁸⁶



Credit: AP Images/Yomiuri Shimbun

The world’s first liquefied hydrogen carrier, Suiso Frontia, in Kobe, Japan, in 2021. Hydrogen is important to Japan’s and South Korea’s long-term energy plans.

Japan contributes significantly to developing countries’ efforts to address climate change. In June 2021, then–prime minister Suga announced that Japan would provide ¥6.5 trillion in public and private climate finance from 2021 to 2025, equivalent to roughly \$57.1 billion. This financing will help developing countries reduce GHG emissions and implement adaptation measures to help build infrastructure and prevent or reduce damage caused by climate change.¹⁸⁷ Japan’s Asia Energy Transition Initiative (AETI) includes \$10 billion in financial support for various initiatives in and with ASEAN countries.¹⁸⁸

The United States has worked closely with Japan on an extensive array of energy topics, including clean energy, energy efficiency, energy security, and nuclear energy, over a period of decades. Indeed, by some measures Japan has been the U.S. Department of Energy’s top international partner.¹⁸⁹ Especially prior to America’s recent oil and gas revolution, the two countries shared many interests as leading energy consumers and importers; today, the United States is also a significant energy supplier for Japan. Considering the curtailment of U.S.-China collaboration in many technology-related fields, Japan is among America’s most promising potential collaborators in developing clean energy technologies.

In April 2021, the United States and Japan launched the U.S.-Japan Climate Partnership and the U.S.-Japan Competitiveness and Resilience (CoRe) Partnership to “contribute to green growth, advance . . . shared climate goals under the Paris Agreement, and help achieve net zero greenhouse gas emissions globally by 2050.”¹⁹⁰ Later that year, Japan and the United States held the first U.S.-Japan Clean Energy Partnership meeting to “accelerate [Indo-Pacific] decarbonization efforts while achieving energy security and sustainable growth” and fostering “open, competitive and transparent energy markets in line with the vision of a free and open Indo-Pacific region.”¹⁹¹ The United States and Japan have also announced plans to enhance cooperation on technological innovation and climate finance.¹⁹²

South Korea

South Korea's clean energy and climate goals have sharply escalated in recent years, though they remain politically disputed. The legislature's 2010 Framework Act on Low Carbon, Green Growth is a key foundation of the country's clean energy policy.¹⁹³ A presidential decree implementing the act initially committed South Korea to reducing GHG emissions 30% from "business as usual" (BAU) forecasts by 2020, though a 2016 decree amended this to a 37% reduction from BAU levels by 2030.¹⁹⁴ Korea's 2021 NDC submission committed the country to a 40% reduction from 2018 emissions levels by 2030.

Korea's Third Energy Master Plan, released during President Moon's tenure in 2019, aimed to raise the share of renewable power in the country's electricity supply from the 2017 level of 7.6% to 30–35% in 2040 while phasing out nuclear energy and "drastically" reducing coal-fired power.¹⁹⁵ After 2020 parliamentary elections, Moon's government proposed a Green New Deal initiative as a component of a wider Korean New Deal designed to address broader social and economic issues, including pandemic recovery. The Green New Deal would have more than tripled 2019 combined solar and wind capacity by 2025, from 12.7 GW to 42.7 GW.¹⁹⁶

The 9th Basic Plan for Long-Term Electricity Supply and Demand, released in December 2020, calls for boosting renewable energy's capacity share to 35% by 2030 and allowing coal and nuclear power to reach their peak capacity shares in 2024 before declining.¹⁹⁷ In 2021, the legislature enacted a 35% reduction in emissions by 2030 and a commitment to net-zero emissions by 2050.¹⁹⁸ Korea replaced its BAU-based nationally determined contribution later that year with a 40% reduction from 2018 emissions levels by 2030.¹⁹⁹

As a presidential candidate, Yoon Seok-youl suggested that he would end the nuclear phaseout and review the country's wider energy transition goals in consultation with industry leaders.²⁰⁰ After his election, President Yoon's transition committee signaled extensive forthcoming revisions to the country's energy planning, including adding nuclear power to net-zero measures.²⁰¹ The Yoon administration has since reiterated its commitment to Korea's 40% GHG reduction target.²⁰²

Like Japan, South Korea relies almost entirely on imports to meet its fossil fuel needs, and accordingly its international energy policy focuses heavily on energy security. Since Korea also depends significantly on coal and natural gas in its power sector, its clean energy cooperation with Australia has recently emphasized CCUS, hydrogen, ammonia, and other hydrocarbon-based approaches to low-



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The Kori Nuclear Power Plant outside Busan, South Korea. South Korea's new president is reevaluating the previous government's plans to phase out nuclear energy.

and zero-emission power. In November 2021, the two countries announced a Low and Zero Emissions Technology Partnership to collaborate on R&D for these technologies as well as other areas, including solar energy, batteries, and supply chains.²⁰³

India and South Korea upgraded their relationship to a Special Strategic Partnership at a summit meeting between Prime Minister Modi and then-president Park Geun-hye in May 2015. The new partnership included an agreement on cooperation between Korea's Ministry of Trade, Industry and Energy and India's Ministry of Power.²⁰⁴ As in some of India's other relationships, renewable energy was a priority, especially solar power. Korea's ministers of trade, industry and energy pursued these discussions in visits to India in 2016 and 2018.²⁰⁵

While South Korea shares many energy challenges with Japan, the political relationship between Seoul and Tokyo remains complex in no small part due to Japan's occupation of Korea from 1910 to 1945. Indeed, their high-level bilateral visits have not extended beyond the two countries' prime ministers and foreign ministers.²⁰⁶ This suggests that the Korea-Japan energy dialogue operates primarily through lower-level bilateral visits and/or high-level meetings at multilateral events. President Yoon has said that he expects "issues between South Korea and Japan to be resolved smoothly from a standpoint of cooperation for the future."²⁰⁷

Korea established a dialogue on environment and climate change with ASEAN in 2020, following the EU and Japan in doing so.²⁰⁸ South Korea has also sought to support the energy transition efforts of developing countries in Asia and elsewhere through the Global Green Growth Institute (GGGI), a multilateral organization that maintains its headquarters in Seoul, and the Green Climate Fund, an investment fund established by parties to the UN Framework Convention on Climate Change and based in Incheon.

The United States has worked increasingly closely with South Korea on clean energy and climate change in recent years. The two nations created a Clean Energy Partnership in 2011, to focus on energy efficiency, renewable energy, energy storage, smart grids, and carbon capture.²⁰⁹ In 2015, the U.S. and South Korea renewed their civil nuclear cooperation agreement; they also set up a High-Level Bilateral Commission to discuss nuclear fuel and nuclear waste as well as safety and security issues.²¹⁰

During the Trump administration, energy relations turned toward energy security and U.S. LNG exports to Korea; clean energy technology received less attention.²¹¹ By 2020, the United States and South Korea organized the seventh meeting of an Energy Security Dialogue.²¹² However, during this time Washington and Seoul also became enmeshed in a dispute surrounding Korea's potential sale of nuclear reactors to Saudi Arabia, which continues to constrain civil nuclear cooperation.²¹³

During a May 2021 meeting in Washington, President Biden and South Korea's then president, Moon Jae-in, agreed to upgrade their Energy Policy Dialogue and to expand clean energy cooperation on hydrogen storage, various issues related to batteries and storage, and renewable energy deployment.²¹⁴ The two leaders also agreed on civil nuclear cooperation in third countries, but did not fully overcome ongoing differences on intellectual property.²¹⁵ A year later, President Biden met Korea's new president, Yoon Seok-young, during a trip to Asia; the energy portions of their joint statement concentrated on energy security and nuclear cooperation, though the two also committed to cooperate on hydrogen, zero-emission vehicles, and other matters.²¹⁶

6. Analysis and Recommendations

Advancing the clean energy transition in the Indo-Pacific region can support multiple U.S. aims. However, because the energy transition is a complex, long-term, global process, American policy to shape its evolution—in the Indo-Pacific or elsewhere—can succeed fully only if it is coherent, sustained, and undertaken in cooperation with other leading energy producers and consumers. One or more frameworks could contribute to each of these three requirements.

What Are Frameworks?

A framework is a structure around which something can be built as well as a system of rules, ideas, or beliefs that serves as a guide to action.²¹⁷ Advancing the deployment of clean energy systems in the Indo-Pacific region will likely require both structures and systems, some new and some revitalized. From this perspective, building such a framework is an essential process that can facilitate many specific U.S. policies.

In practice, this effort should (and does) include several frameworks rather than one single framework. Some of these extend beyond the Indo-Pacific region in their geographic scope and/or beyond clean energy in their substantive scope, such as the United Nations Framework Convention on Climate Change. Others encompass much (though not all) of the region, such as APEC (which excludes India), or only certain countries, like the Biden administration's IPEF proposal. Moreover, since the Indo-Pacific region as a region is a relatively new idea—and one that neither China nor Russia embraces²¹⁸—its boundaries remain ill-defined. Ultimately, governments in the region will decide whether they want to be members of an Indo-Pacific region and what that means.

In addition to their geographic domain, frameworks operate within one or more functional domains including politics, security, economics, energy, the environment, development, technology, and regulation, among others. And they evolve over time. While it emerged as a forum for political and security dialogue, the Quad has steadily expanded to incorporate discussions of climate change, cybersecurity, development and infrastructure, health, space, and technology.²¹⁹ Frameworks that are useful to participants persist and often grow into new areas, while those that are not useful tend to wither or disappear. Changing circumstances may also undercut frameworks that had been valuable. The SEATO (Southeast Asia Treaty Organization) alliance did not endure beyond French and later U.S. intervention in Vietnam; Pakistan left a few years earlier, after the group failed to provide aid in its conflicts with India.²²⁰

Why Are Frameworks Important?

Frameworks are tools to achieve shared goals. Thus, their importance is linked to the goals that members hope they will achieve or contribute to achieving. Defining U.S. interests and priorities is therefore a necessary starting point in thinking about and advancing frameworks.

America's most important interests relate to preserving its national security, enhancing its prosperity, and establishing and defending an international environment favorable to long-term U.S. security and prosperity. Pursuing these interests requires addressing a variety of challenges, including from rival nations and from climate change. Because U.S. interests are diverse and wide-ranging, policymakers must often weigh relative priorities; in energy and climate change, this often means managing trade-offs between cheap energy, clean energy, reliable energy, safe energy, and secure energy. Table 2 illustrates some of the important national interests that successful work to build regional clean energy frameworks could support.

Table 2. Selected Energy-Related U.S. National Interests

| | |
|---------------|---|
| Political | <ul style="list-style-type: none"> • Relationships with and among allies and partners • Influence relative to China and other rivals • Image as an energy, climate, technology leader |
| Economic | <ul style="list-style-type: none"> • Economic growth, exports, and jobs • Investment in the region and regional investment in America • Favorable trade and technical standards • Development and prosperity in the Indo-Pacific region • Access to affordable, clean, safe, secure, reliable energy in the region |
| Environmental | <ul style="list-style-type: none"> • Sustainable development in the region • High regional environmental standards • Low energy-related pollution • Effective steps in region to address climate change |
| Security | <ul style="list-style-type: none"> • Energy security for allies, partners, others • Resilient energy systems, especially in allied countries • Cybersecurity of energy and electricity systems • Security of energy-related supply chains |

Who Participates?

As the United States works within existing frameworks to promote clean energy—and strives to build new frameworks for this purpose—which governments participate becomes a central issue for policymakers. Which existing frameworks are likely to be most useful in accelerating deployment of cost-effective clean energy? And when creating new structures, which governments should U.S. officials invite to participate in new efforts? Which should Washington exclude?

Globally and within the Indo-Pacific region, the deteriorating U.S.-China relationship, and limited prospects to improve it, are a key consideration in using existing frameworks or building new ones. The poor U.S.-China relationship likely limits further progress in existing structures including both governments. It simultaneously encourages greater U.S. attention to structures including America but excluding China, and encourages U.S. attempts to create new multilateral groups on that basis. The IPEF illustrates the latter tendency. U.S.-Russia relations after Russia's invasion of Ukraine present similar if not greater obstacles to working within existing universal regional frameworks that include Russia and to inviting Moscow to join new frameworks.

In addition to geopolitical realities, a framework's purpose shapes its potential membership. Architects define some frameworks through their universality; examples include the United Nations and many of its derivative bodies and agreements. In other cases, participation in frameworks depends upon meeting political, economic, financial, or other criteria. The G7 is an association of democracies with large and developed economies; the rival BRICS group—including Brazil, Russia, India, China,

and South Africa—is an association of countries with varied forms of governance and big emerging economies. In building energy and climate frameworks, the United States has pursued both universal frameworks (e.g., the Kyoto Protocol and the Paris Agreement) and multilateral approaches (e.g., the Asia-Pacific Partnership, the Clean Energy Ministerial, and Mission Innovation).

Looking ahead, the United States is well-positioned to modify and strengthen existing frameworks while selectively developing new frameworks in some areas. This process could in effect establish an overarching regional framework composed of smaller interlocking frameworks across various geographies and functional areas. Many building blocks exist; what is missing is an integrated U.S. strategy to leverage these frameworks to accelerate deployment of clean energy while serving wider U.S. political, economic, and security interests.

U.S. Strategy

We propose a central strategy for the United States in accelerating clean energy deployment in the Indo-Pacific region: work with America’s technologically advanced allies to help build clean energy systems and related infrastructure in countries with large developing economies. This strategy has many advantages for the United States, including but not limited to these:

- It offers a leading role for the United States.
- It provides a shared positive goal around which to unite U.S. allies.
- It strengthens ties to developing countries in the Indo-Pacific.
- It generates economic opportunities for U.S. firms, investors, and workers.
- It avoids future GHG emissions and/or reduces current emissions.

Except for America’s leadership role, which is likely less important to other countries than to the United States, similar benefits would accrue to U.S. allies supporting such an effort. Developing countries in the Indo-Pacific region would welcome assistance from the United States and its allies in deploying clean energy, as well as the economic, social, and environmental rewards from new clean energy infrastructure in their countries. Indeed, they have requested this assistance. Aid from developed countries to developing countries in reducing their emissions is also a formal obligation under existing international agreements.

Frameworks can contribute substantially to implementing this strategy, yet no existing framework is ideally suited to the task. As the most recent U.S. initiative, the IPEF provides a useful starting point in considering America’s options. Other existing or modified frameworks could complement (or, if IPEF fails) replace the effort.

The Indo-Pacific Economic Framework

The Biden administration’s Indo-Pacific Economic Framework brings together an appropriate group of countries—the United States and a variety of developed and developing countries including several U.S. allies and partners, 7 of 10 ASEAN members, and Fiji, a Pacific Island nation that is assuming greater strategic prominence in U.S. thinking as competition with China deepens. Nevertheless, the IPEF has three serious shortcomings in its Clean Economy pillar: its scope, appeal, and endurance.

IPEF's constrained clean energy scope

IPEF's clean energy scope is sharply constrained by its focus on renewable energy, energy efficiency, carbon removal, and methane. While each can usefully contribute to reducing greenhouse gas emissions, they are insufficient alone. Moreover, they ignore economic and technological opportunities.

Consider renewable power. In 2021, 80% or more of existing solar and wind generating capacity was in the top 10 countries deploying each of these systems.²²¹ Except China (the leader in both areas), India (in the top 10 in solar and wind capacity) and Vietnam (in the top 10 in solar capacity), all are wealthy developed countries that have subsidized renewable deployment. The three developing nations have subsidized it too.

While considered a developing country, China has massively subsidized renewable power and reportedly allocated \$63 billion for this purpose in 2022.²²² In 2021, Chinese officials announced an end to some subsidies; independent analysts described them as “unsustainable.”²²³ India has also subsidized renewable power, though government payments peaked in 2017 and have fallen by nearly half since then,²²⁴ and it has imposed a “renewable purchase obligation” (RPO) on each of its 36 states that requires varied levels of solar and other renewable power.²²⁵ Vietnam has provided feed-in tariffs for solar energy, another form of subsidy that guarantees high prices for solar-generated electricity as it enters the power grid.²²⁶

Absent subsidies in one form or another, solar and wind deployment is unlikely to rise swiftly elsewhere. If solar and wind deployment does increase rapidly, it can disrupt power grids by imposing additional transmission requirements and by introducing variability in power supplies, which in turn requires balancing “firm” power generation.²²⁷ If adequate capacity exists, this means that power plants will run at lower capacity and therefore at higher cost. If adequate capacity does not exist, generators will have to build new plants to operate below capacity and at higher cost. Energy storage is thus far unable to meet seasonal variations in solar and wind power.²²⁸ These factors constrain solar and wind projects, especially in ASEAN, where regional analysts note that grid management practices are a major obstacle.²²⁹

Carbon removal technologies remain extremely expensive, at \$250 to \$600 per ton of CO₂,²³⁰ and will contribute very little to achieving net zero in the near to medium term even in wealthy nations. Natural approaches, like afforestation, require significant financial incentives and have been plagued with problems in accounting for carbon credits and in validating that the activity would not have occurred anyway, for other reasons.²³¹

Energy efficiency faces a different challenge, in that improved efficiency often produces a “rebound effect” through which lower energy costs stimulate greater energy consumption; academic research suggests that this effect is smaller, but still substantial, in consumer-driven economies like the United States and the United Kingdom and can exceed consumption savings in producer-driven economies such as China's.²³² To the extent that other developing countries in the region follow China's development trajectory, energy efficiency improvements might produce similar rebound effects.

Governments have focused new emissions reductions policies on methane because the gas accounts for about one-quarter of global warming (due to its potency in trapping heat in the atmosphere) and because it breaks down in the atmosphere far more rapidly than CO₂, which eases attempts to reduce accumulated concentrations, not only new emissions.²³³ In practice, reducing methane emissions requires new approaches in agriculture (livestock, rice cultivation, and biomass burning are 40–50% of emissions), fossil fuel industries (coal, oil, and natural gas are 30–40%), and waste management (wastewater and solid waste are 14–20%).²³⁴ Reducing these emissions is quite important, but does not address CO₂ emissions, the principal driver of global warming.

Without advancing a wider range of technologies and approaches to reducing emissions, IPEF's Clean Economy pillar is unlikely to accelerate regional emissions reductions substantially. More important than the limitations in its agenda—outlined above—is its failure to address actual energy needs in a region heavily dependent on coal, oil, and natural gas. A more comprehensive Clean Economy pillar could include collaboration on at least four additional issues: natural gas, carbon capture, hydrogen, and nuclear energy. Among the four countries profiled in this report—Australia, India, Japan, and South Korea—none would likely oppose expanding the pillar's scope to include these issues.

Encouragingly, the joint statement following a July 2022 meeting between the U.S. Secretaries of State and Commerce and their Japanese counterparts acknowledged “the need to strengthen investment in the energy sector ... including liquified natural gas (LNG)” to address the current energy crisis.²³⁵ IPEF's other participants would not likely object to this. Reports suggest that a forthcoming September 2022 IPEF meeting might address hydrogen and ammonia.²³⁶ The 2021 Infrastructure Investment and Jobs Act includes substantial investments in regional hydrogen hubs in the United States, including carbon capture.²³⁷ The 2022 Inflation Reduction Act provides substantial new support for nuclear energy.²³⁸

Fuel switching from coal to natural gas has been occurring in many Indo-Pacific countries,²³⁹ though Russia's ongoing war in Ukraine, Russia's energy export policies, and U.S. and allied sanctions have contributed to higher natural gas prices that now discourage this. Indeed, some power generation is shifting to coal in Europe, Asia, and elsewhere.²⁴⁰ Forecasts suggest that U.S. domestic gas prices will fall in early 2023,²⁴¹ though a leading Australian LNG exporter expects global prices to remain high for the next year or possibly the next few years.²⁴² Even absent current interest in fuel switching, IPEF discussion of the regional LNG trade could support future projects.

Carbon capture, use, and storage technologies can effectively reduce CO₂ emissions, though the process is often an energy-intensive one that can shift emissions elsewhere. NetPower's new Allam-Cycle natural gas plant minimizes this problem by redesigning the combustion process to avoid the energy demands and engineering complexities of post-combustion carbon capture systems.²⁴³ When combined with tighter control over methane emissions in natural gas extraction, transportation, and use, this and similar approaches could help transform natural gas from a cleaner “bridge” fuel to a long-term low-emission source of power and heat. CCUS is especially important in the Indo-Pacific region, where coal will remain a major power source for decades to come.

Though also dependent upon natural gas prices, and thus facing challenges so long as current LNG market disruptions continue, hydrogen might become an important source of power and heat. As an intermediate product, hydrogen can also serve as a form of long-term energy storage, e.g., using excess variable renewable power to produce hydrogen through hydrolysis and storing the hydrogen for combustion later, when less renewable power is available. With geology and politics unfavorable to underground CO₂ storage and thus to carbon capture, governments in Japan and South Korea have considered hydrogen to be a key carbon-free fuel of the future. Considering the long lead times required to develop infrastructure, building a regional approach to hydrogen within IPEF would be a good investment.

Some participating IPEF governments have operating nuclear power plants—the United States, India, Japan, and South Korea—but most do not. Among the latter, countries like Indonesia, have explored nuclear power extensively and are on a pathway toward developing it.²⁴⁴ Others, such as Singapore, have rejected existing nuclear power plant designs but remain open to future small modular reactor systems,²⁴⁵ or, like Vietnam, have pursued nuclear power for a time and then set it aside.²⁴⁶ Still, regardless of whether all IPEF participants are interested in nuclear energy or, for that matter, whether U.S. officials would welcome this interest in each case, IPEF discussion of nuclear power could serve U.S. goals by working toward shared high standards. Such engagement could also help Washington in monitoring and acting on Russian and Chinese outreach to develop nuclear reactors.

IPEF's limited appeal

A second weakness of the IPEF is its limited appeal to participants—a direct consequence of the Biden administration's decision to avoid negotiating new market access or tariff reductions in the wake of then-President Trump's withdrawal from the TPP process. Within the Clean Economy pillar, Washington is seeking “concrete, high-ambition targets”²⁴⁷ in areas that require significant expenditures by companies and/or governments without suggesting any source for necessary funding or offering clear incentives to build projects that reduce emissions. The consequences are predictable: regional officials are already complaining that the United States is not offering anything significant to its interlocutors in the IPEF's four pillar areas.²⁴⁸ Considering this, developing appealing components within IPEF could be a greater priority for U.S. policymakers.

One approach could be to extend IPEF's Clean Economy pillar to incorporate a development partnership between the developed and developing countries that have agreed to participate—a structure to facilitate cooperative clean energy projects. This would create specific benefits for the developing countries, which would receive aid and financing to support their decarbonization goals, and for the developed countries, where energy sector firms could execute or contribute to projects. Politically, it would allow all to claim (and hopefully demonstrate) progress toward their existing commitments. Strategically, it could support U.S. efforts to establish alternatives to Chinese infrastructure projects. Because many of the region's developing countries have set conditional GHG reduction targets through their Paris Agreement NDCs, pledging deeper emissions cuts with assistance than strictly through their own efforts, meaningful assistance could also yield better outcomes. This is unlikely to succeed, however, if IPEF's developed countries merely repackage or relabel existing commitments; it would require new financial support.

A bolder option, which would reinforce a development partnership, would be to explore a clean energy or clean technology trade agreement. This would be much narrower in scope than TPP and could accordingly be simpler and less domestically controversial, in that it might divide those skeptical toward TPP in the past. The Biden administration is already enmeshed in investigations and discussions surrounding solar panel tariffs;²⁴⁹ this situation offers a domestic political opportunity to address questions surrounding Chinese efforts to avoid U.S. tariffs in a wider context that could ease solar development in the United States, an administration goal, while offering enhanced export opportunities to those who can demonstrate that their products are not of Chinese origin. A well-negotiated agreement would ensure parallel access for U.S. clean energy goods and services. It could also support U.S. efforts to boost domestic battery and electric vehicle industries while managing new tensions with South Korea surrounding the Inflation Reduction Act's electric vehicle tax credit.

IPEF's uncertain future

The third problem with IPEF is its uncertain future; because the U.S. withdrew from TPP, many participating governments are skeptical that the United States will sustain its involvement in the group beyond the Biden administration. The administration's domestic political standing exacerbates this, as does IPEF's weak appeal to its members. Persuading IPEF participants that the group will endure requires demonstrating greater domestic political support for the project. If successful, this could encourage other governments to commit more fully to IPEF, produce better results, and demonstrate to domestic stakeholders and voters that it is a worthwhile exercise. Ideally, other participants would experience similar dynamics, and IPEF would enter a virtuous circle in which success begets further success. Only successful frameworks survive.

Building domestic support for an initiative like IPEF might be difficult in America's current polarized political environment. Yet, members of Congress in both political parties are increasingly preoccupied by the U.S. rivalry with China—they have introduced several hundred bills and resolutions referring to China during the 117th Congress, which opened in January 2021.²⁵⁰ Concentrating on political and economic competition with China could help to win greater backing for the project, especially if administration officials avoid divisive boundaries among the many forms of clean energy. The Inflation Reduction Act already established a much broader definition of "clean." Engaging the Congress more actively as the administration negotiates would also help to secure wider political support.²⁵¹

Complementary Frameworks

With modifications, and eventual expansion, the IPEF could provide a strong framework for clean energy development in the Indo-Pacific region. Nevertheless, even in an improved form, IPEF alone is insufficient; it is simultaneously too large and too small. Complementary frameworks can address this problem.

IPEF is too large in the sense that it includes a highly diverse assortment of large and very small developed and developing countries. Their interests, priorities, and capacities diverge widely. Three smaller frameworks could complement its clean energy work: the Quad, a potential "Quad-Plus" group incorporating the existing Quad members and South Korea, and/or a trilateral alignment among the United States, Japan, and Korea. A larger Quad-ASEAN dialogue also merits consideration, as do wider frameworks.

Quad leaders recently announced deeper cooperation on climate change, including the Quad Climate Change Adaptation and Mitigation Package, dubbed Q-CHAMP. Notably, Q-CHAMP incorporates some areas the IPEF avoided, including CCUS and hydrogen.²⁵² As the United States has signed civil nuclear cooperation agreements with the other three Quad states, nuclear energy could be another appropriate topic for discussion, perhaps starting with safety and wider nuclear standards. Gradual but timely (and geographically expanding) work to harmonize standards will be essential in ensuring rapid deployment of emerging nuclear technologies under development in the United States and elsewhere. Though Australia has banned nuclear power, some groups have called for reversal of this policy.²⁵³ Notably, Australia has now elected to build nuclear-powered submarines through the new AUKUS alignment among Australia, the United Kingdom, and the United States.

The Quad can also serve as a useful proving ground for energy and climate cooperation among developed and developing countries. It is in some respects a distilled version of IPEF, incorporating the region's largest developed economies and one of its two largest developing economies. While some approaches that work in a large developing country like India might be less appropriate for a small island developing state like Fiji, successes or failures in one context deserve consideration in other environments. Perhaps more important, India is where efforts to deploy clean energy can make the greatest difference to global emissions.

Many have proposed a Quad–South Korea climate partnership.²⁵⁴ Notwithstanding apparent U.S. reservations, including South Korea in the Quad or a Quad-based group would add importantly; it is a significant developed economy with advanced manufacturing centers, a major role in regional trade and supply chains, and impressive energy research and development capabilities. It is also a regional development donor. These strengths make South Korea a valuable member in almost any Indo-Pacific energy/climate grouping. Seoul has been ambivalent about the Quad, though its officials' participation in a March 2020 "Quad-Plus" conference call that also involved officials from New Zealand and Vietnam sparked speculation about its possible role in an enlarged association.²⁵⁵ Afterward, the group reportedly held additional discussions on topics beyond its initial COVID-19 focus.²⁵⁶

Nevertheless, while a larger group might have greater impact, expanding the Quad would pose substantive and political challenges. Substantively, as U.S. statements imply, the four existing members are still defining the Quad, its objectives, and its structures. Adding members could complicate this process. In the longer term, smaller groups ease discussion and sharpen focus while maximizing the influence of each member in group deliberations. For these and other reasons, officials in some or all current participating states might well prefer that the Quad remain small. One easy solution to this problem is to create a new name, e.g., the "Quad-Korea Energy Partnership."

Politics sharpens the large-small dilemma, in that perceptions of the Quad as a China-focused alignment raise the stakes for prospective new members, who could suffer Beijing's retaliation. This concern has been an important one in South Korea, where in addition to protecting deep economic ties with China, some leaders have sought China's support in working with North Korea.²⁵⁷ This concern is probably a leading factor for consideration among other governments too.²⁵⁸ These anxieties encourage governments to act in groups rather than individually—a tendency that could deter officials from pursuing deeper engagement in Quad activities alone, at least initially. Thus, it may be challenging for the Quad to add only one new member.

A common approach employed by multilateral organizations like the G7 is to invite a few additional participants to its summits or other meetings as observers or special guests. This allows for expanded dialogue and cooperation without requiring membership discussions and debates. Another option to expand the Quad's impact without increasing its membership would be to establish a regular Quad-ASEAN dialogue on energy and climate issues. In addition to facilitating cooperation, such an effort could help to assuage disquiet in ASEAN surrounding the Quad's orientation toward China.²⁵⁹ That said, some ASEAN members may oppose this, with or without Beijing's encouragement. Creating tangible incentives could be important; one idea would be to explore subregional electric grid integration, an approach that could add variable renewable power to national grids.²⁶⁰

Secretary of State Antony Blinken has pressed vigorously for closer U.S.-Japan-South Korea cooperation on energy and climate as well as security, supply chains, and other issues. He visited Tokyo and Seoul in March 2021, soon after his confirmation,²⁶¹ and has participated in at least five trilateral ministerial meetings since then, including three in the first seven months of 2022.²⁶² In addition to being close allies with shared perspectives on many issues, Japan and South Korea are among the U.S. Department of Energy's closest collaborators on energy technology issues.²⁶³ Among Indo-Pacific countries, the U.S., Japan, and South Korea are appropriately at the center of efforts to mobilize developed country governments to accelerate the energy transition domestically and in the region's developing economies.

Among Indo-Pacific countries other than China, which has impressive capabilities of its own, the United States, Japan, and South Korea are likely best able to research, develop, and build innovative new clean energy systems. Closer cooperation in basic research can leverage the three countries' relatively high spending on research as a share of GDP²⁶⁴ and existing governmental and academic collaboration. While more challenging due to intellectual property and other considerations, deeper engagement in applied research can help bring new technologies to market more quickly. Finding ways to manage economic competition among firms in the three countries and—where possible and appropriate—to facilitate cooperation among companies could also help the three governments work together to offer clean energy alternatives to developing countries that might otherwise procure these systems (or less clean ones) from China. The U.S. and Japan have already devoted significant attention to cooperation on technology and innovation across many sectors,²⁶⁵ as have the U.S. and South Korea.²⁶⁶

Working toward a broader framework to accelerate the energy transition in the Indo-Pacific region, the United States would do well to consider how to engage the European Union, America's individual

European allies, and Western Hemisphere nations that are at the eastern frontier of the Indo-Pacific region. Four of the latter are members of the former TPP, now recast as CPTPP: Canada, a close ally, as well as Chile, Mexico, and Peru. Within this wider context, the recent G7 Partnership for Global Investment and Infrastructure—a \$600 billion effort to counter China’s Belt and Road Initiative²⁶⁷—could be an organizing instrument to structure and/or convene a larger group.

Though it excludes India—a major weakness—APEC can still be useful in a wider strategy for a regional energy transition through its inclusion of China and Russia. While Washington, Beijing, and Moscow may be hard-pressed to agree in areas where their interests conflict, the group will provide ongoing opportunities for dialogue to the extent that the Biden administration and America’s two rivals want it. (The administration has objected to Russia’s participation in G20 meetings.²⁶⁸) Moreover, while often weak, APEC agreements are nearly comprehensive for the Asia-Pacific region and thus a valuable tool in setting baseline norms and standards.

Recommendations

To summarize, in building a clean energy framework in the Indo-Pacific region, the Biden administration should:

- Broaden the scope of the IPEF’s Clean Economy pillar to avoid excluding discussions of clean energy sources such as carbon capture, hydrogen, natural gas, and nuclear power.
- Extend the IPEF’s Connected Economy (trade) pillar to explore a possible clean energy trade agreement, to facilitate greater trade in commodities (including clean fuels as well as key minerals) and clean energy systems.
- Link IPEF more closely to U.S. development efforts in the Indo-Pacific region, perhaps by framing IPEF as a development partnership and incorporating development assistance within the existing four pillars.
- Engage deeply with the U.S. Congress, on a bipartisan basis, to seek support for IPEF as an important component of U.S. economic and political strategy in the region.
- Explore a clean energy or clean technology trade agreement within or outside IPEF.
- Pursue complementary frameworks that complement and strengthen IPEF. Within the region, some of the most promising complementary frameworks for clean energy development include U.S.-Japan–South Korea trilateral talks and “Quad-Plus” arrangements that incorporate South Korea, with its leading high-tech economy, and other interested governments.
- Strive to connect Indo-Pacific frameworks to other frameworks including U.S. allies and partners, e.g., the Group of Seven (G7) and the European Union.

7. Conclusion

Though the United States faces diverse challenges in the Indo-Pacific region, competition with China and, to a lesser extent, with Russia, is chief among them. How the United States pursues this geopolitical competition will be consequential in addressing other challenges, including strengthening U.S. competitiveness in a large and rapidly growing region and combating climate change. Thoughtful strategy can integrate approaches to these and other U.S. goals.

Intensifying geopolitical competition appears likely to thwart significant new international (i.e., universal) agreements to reduce greenhouse gas emissions. Acknowledging this and recognizing that global emissions reductions will ultimately result from rapid deployment of clean energy systems, the United States can perhaps most effectively combat climate change by working with its allies and close partners to develop cost-effective new clean energy technologies, drive down the costs of existing clean energy systems, and minimize bureaucratic, regulatory, and other barriers to collaboration in research, trade, and investment. In short, Washington's task is to build the largest possible space with the least possible internal friction for clean energy research, development, and deployment. The Indo-Pacific region is an excellent place to launch such an effort, which can also serve to advance U.S. political, economic, and security goals in this strategically critical region.

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