

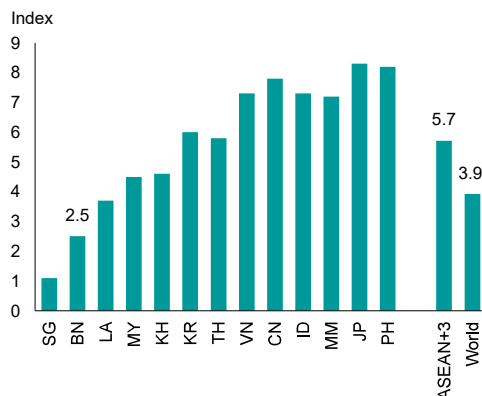
Annex 3. Climate Change Mitigation Challenges in Brunei – An Overview⁸¹

Background

1. Brunei faces significant climate change challenges, given the continuing dependence on hydrocarbon resources. For the past several decades, fossil fuels have been a key source of energy in Brunei, an important source of export earnings and fiscal revenue for the nation, as well as a main driver of inward FDI. However, the energy sector is also the largest polluting sector in Brunei. Fossil fuels are used for power generation by energy industries, accounting for 54.6 percent of total greenhouse gas (GHG) emissions. This is followed by power generation for public utilities (21.5 percent), transportation (8.9 percent), as well as from fugitive emissions (8.6 percent).⁸² While Brunei’s natural disaster risk is generally low—ranked the second lowest in the region and far below the world average—the continuing dependence on fossil fuels implies that the risks associated with the global shift towards to a more sustainable, low-carbon economy can be significant for Brunei (Figure A3.1).

2. Even though Brunei’s share of global carbon footprint is relatively small, the country has committed to an ambitious climate action agenda. Recognizing the urgency of addressing climate challenges, Brunei has set forth strategies aimed at reducing GHG emissions while bolstering overall climate-resilience nationwide. The Brunei National Climate Change Policy (BNCCP), launched on 25 July 2020, outlines the principles, values and strategies needed to pave the way for low carbon and climate-resilient pathways for sustainable national development. The strategies cover climate mitigation and adaptation measures, as well as strategies to raise awareness through education.

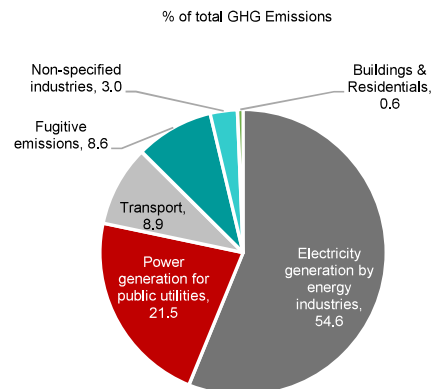
Figure A3.1 Natural Hazard & Exposure Risk (Selected Economies), 2024



Source: The INFORM Risk Index 2024 by the European Commission; AMRO staff calculations

Note: The INFORM Risk Index identifies countries at high risk of humanitarian crisis that are more likely to require international assistance. The index contains three dimensions of risk: Hazards & Exposures, Vulnerability and Lack of Coping Capacity. ASEAN+3 and World average is simple average of countries in respective groups. BN = Brunei, CN = China, ID = Indonesia, JP = Japan, KH = Cambodia, KR = Korea, LA = Lao PDR, MM = Myanmar, MY = Malaysia, PH = The Philippines, SG = Singapore, TH = Thailand, VN = Vietnam

Figure A3.2 Brunei: GHG Emissions by Source, 2020



Source: IMF Country Report No. 23/347, Brunei Darussalam Selected Issues; IMF/EDGAR/FAO/UNFCCC

⁸¹ Prepared by Sungtaek Kwon, Senior Economist.

⁸² Fugitive emissions refer to unintended or accidental releases of gases, vapors, or particulate matter into the atmosphere from industrial activities or processes (such as upstream oil and gas operations, and downstream refining operations). These emissions are often unintended and can occur during the production, transportation, or storage processes.

3. Over the longer term, the challenge is to accelerate the transformation of the economy towards a less hydrocarbon-dependent economy and foster sustainable growth. Such urgency is premised on the notion that the demand for fossil fuels is expected to undergo a structural decline, reflecting the shift in consumer and business behavior towards low-carbon markets and products. As a result, renewable energy transition and low-carbon investments are bound to accelerate. Brunei, where the O&G sector and hydrocarbon revenues almost entirely support the economy, will lose a significant portion of its potential growth, calling for proactive and strategic approaches to economic diversification.⁸³

4. This selected issue seeks to provide an overview of Brunei’s climate change challenges focusing on recent climate mitigation developments, with some suggestions for policy. The analysis uses international (comparative) data, focusing on recent global trends with respect to the key contributors to implementing Brunei’s climate mitigation strategies. These are in the area of electric vehicles (EV) and renewable energy as well as bridging technologies (notably carbon capture, utilization and storage). In addition, the opportunities from international climate financing to advance Brunei’s climate agenda are also explored. This is followed by some policy discussions.

Selected Key Climate Mitigation Strategies – Overview of Recent Developments

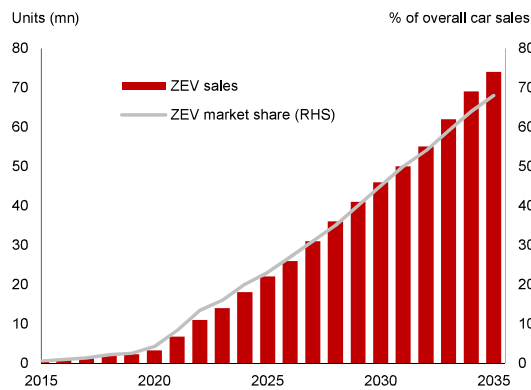
Electric Vehicles (EV)

5. The zero-emissions electric vehicles (ZEV) market remains in its infancy in Brunei. Amid a global paradigm shift to future cars, world automotive manufacturing has been rapidly moving away from traditional internal combustion engine vehicles (ICEV) and hybrid electric vehicles (HEV) to ZEV, including battery-electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV). On the demand side, ZEV sales have been growing exponentially due to falling costs, improving technology and government support. Looking ahead, all the major car markets are planning to reduce or eliminate the sale of ICEV by 2030s. According to the *EV-volumes.com* (an EV world sale database), ZEV is forecast to account for 16 percent of overall car sales across the world in 2023 and 68 percent in 2035, respectively (Figure A3.3). As of 2022, the leading countries with the highest share of EV sales are Norway, where EV made up 80 percent of passenger vehicle sales, followed by Iceland (41 percent), Sweden (32 percent), the Netherlands (24 percent), China (22 percent), and the U.S. (6 percent), according to the World Resources Institute.⁸⁴ In terms of EV ownership per capita, European countries, the U.S., China and Korea take up the top 10 spots owing to highly lucrative government incentives to promote EV sales, including tax policies incentivizing EVs over gasoline-powered vehicles and active investments in rolling out charging network infrastructures (Figure A3.4). However, Brunei is only in its infant stages in terms of domestic ZEV sales such that there are just 19 EVs registered in the country as of August 2022.

⁸³ The International Agency (IEA, September 2023) has projected for the first time that fossil fuel consumption will peak before 2030 and fall into permanent decline as climate policies take effect.

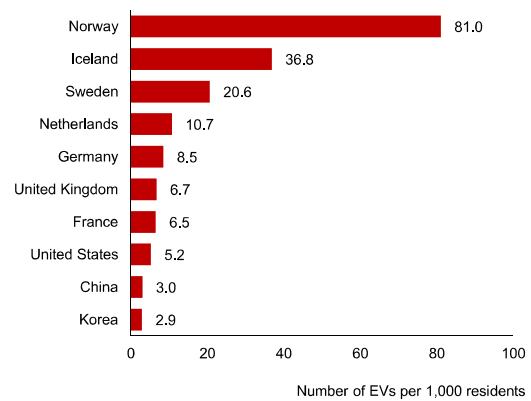
⁸⁴ According to the Bloomberg NEF EV outlook 2023, in H1 2023, EV reached 33 percent of total vehicle sales in China, followed by Germany (35 percent) and Norway (90 percent). In particular, EV sales are expected to hit a record 9 percent of total new passenger vehicle sales in the U.S. in 2023 (up from 7.3 percent in 2022), according to Atlas Public Policy.

Figure A3.3. Global ZEV Sales



Source: EV volumes.com; AMRO staff calculations

Figure A3.4. Top 10 with EVs per capita



Source: Statista; Chart by Canary Media

6. Major hurdles to EV adoption are the lack of charging infrastructure as well as the absence of EV purchase and maintenance incentives. First, there are currently only a few EV charging stations in Brunei, making it a challenge for consumers to own an EV if they do not have a home charger. According to the BloombergNEF, China, Europe, the U.S., Japan and Korea have rolled out public EV charging infrastructure, which helped to incentivize the adoption of EV, with positive prospects over the next few decades.⁸⁵ Second, given that fuel prices are largely subsidized in Brunei, the current high price of EVs may not be perceived as attractive, viewed solely in terms of costs. Third, the government has been promoting EV ownership as part of the ‘*Wawasan Brunei 2035*’. Since January 2021, it is noted that additional vendors have brought in EV into Brunei to provide more choices for consumers. According to the industry, however, the financial and administrative support for EV ownership has been largely muted. In contrast, Singapore has introduced notable measures and made policy changes to reduce the cost of buying and owning EV, as compared to ICEV, to support the transition and adoption of EV, including EV Early Adoption Incentive (EEAI), Enhanced Vehicular Emissions Scheme (VES), Additional Registration Fee (ARF) floor reduction, Revision of road tax framework for EV, etc.

Renewable Energy

7. While the rest of the world continues to switch away from fossil fuels to generate power, there is potential for Brunei to catch up in the deployment of renewable energy sources. According to the Statista (Figure A3.5), fossil fuels still remain the greatest source of electricity generation worldwide.⁸⁶ Amid a global shift to green economy, world power generation has been rapidly moving away from fossil fuels to renewables, given that it has the potential to greatly reduce the amount of GHG emissions.⁸⁷ Renewable energy technology for large-scale deployment has already been proven—in terms of performance, durability and economic feasibility. Encouragingly, the share of renewables in global electricity has shown a more pronounced year-on-year growth in recent years, following increased efforts by governments to combat global warming, as well as lower costs.⁸⁸ Even at the corporate level,

⁸⁵ Each country will have its own optimal mix of home, workplace and public chargers.

⁸⁶ In 2022, coal accounted for roughly 35.8 percent of the global power mix, followed by natural gas (22 percent share).

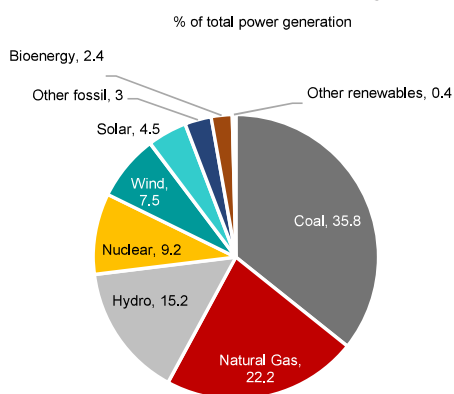
⁸⁷ According to the International Energy Agency (IEA), annual renewable energy generation of the U.S. in 2019 exceeded coal power generation for the first time since 1885. Furthermore, the share of renewable energy generation in OECD countries reached 33 percent in H1 2021, including Denmark which recorded 77 percent, Canada (71 percent), Germany (43 percent), France (25 percent), and Japan (22 percent), respectively. Globally, more than 80 percent of newly installed power generation facilities in 2021 were renewable energy facilities.

⁸⁸ Even at the corporate level, the number of global enterprises joining RE100⁸⁸ a global initiative of over 400 globally influential corporates committed to 100 percent renewable electricity, is rapidly increasing.

the number of global enterprises joining RE100 is rapidly increasing (see Appendix Box 1). In Brunei, however, only 0.01 percent of Brunei’s total power supply was generated using renewables in 2021, with negligible growth over the past six years (2015 to 2021) (Figure A3.6)

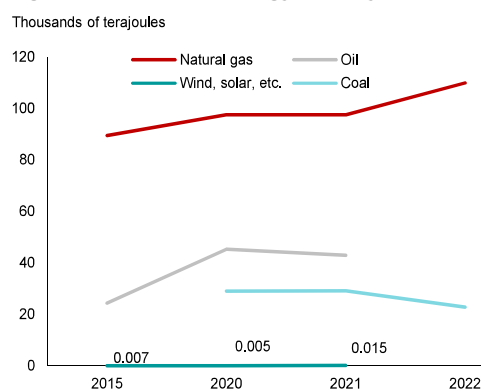
8. With the launch of the BNCCP, the government has set up an ambitious target to meet 30 percent of its overall power generation mix with renewable energy by 2035, mostly driven by the national solar energy target to generate 200 megawatts by 2025. While this is indeed encouraging, given that solar power accounts for 100 percent of renewable energy capacity in Brunei, the capacity utilization rate of solar power stood at only 4 percent in 2021, according to the International Renewable Energy Agency (IRENA). In contrast, the corresponding rate for fossil fuel power plants is 41 percent although the bulk of it is from gas, the cleanest form of fossil fuel. Furthermore, a small proportion (1 percent) of solar power generation is typically used for industrial purposes, and most are for household use. This underscores the challenge in deploying renewable energy in Brunei, particularly in the power sector.

Figure A3.5. World Power Generation by Source, 2022



Source: Statista

Figure A3.6. Total Energy Supply in Brunei



Source: International Energy Agency (IEA)

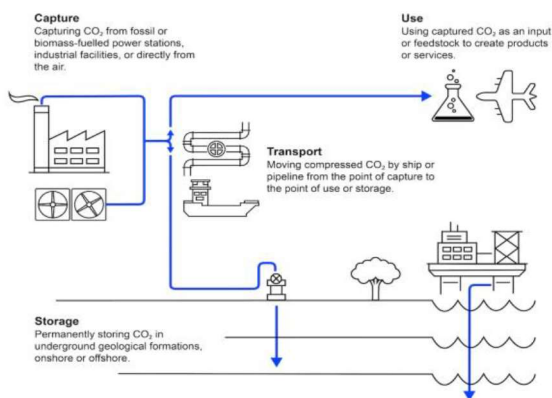
Mitigation Technologies—Carbon Capture, Utilization and Storage (CCUS)

9. In the energy sector’s 2050 net-zero pathways, the country aims to undertake resource optimization (such as improvement in generation, transformation, and process efficiency), while leveraging on mitigation technology as part of the commitment towards achieving carbon neutrality. Leveraging on mitigation technology would serve as a bridge towards achieving a lower carbon intensity particularly for hard-to-abate industries, notably in the power generation sector. Considering that hydrocarbon resources will continue to remain important in meeting the energy demand during the transition, leveraging on green technology—such as CCUS—can help reduce the risk of stranded (fossil-fuel based) assets, while safeguarding economic growth during the country’s energy transition.

10. Against this backdrop, Brunei has the potential to scale up deployment of CCUS technology, which enables industrial and power facilities to operate with substantially reduced emissions. As shown in Figure A3.7, CCUS is one of the few scalable solutions available for decarbonizing heavy industries and power plants. CCUS involves the capture of CO₂ from large point sources, including power generation or industrial facilities. If the CO₂ is not being used on-site, the captured CO₂ is compressed and transported by pipeline, ship,

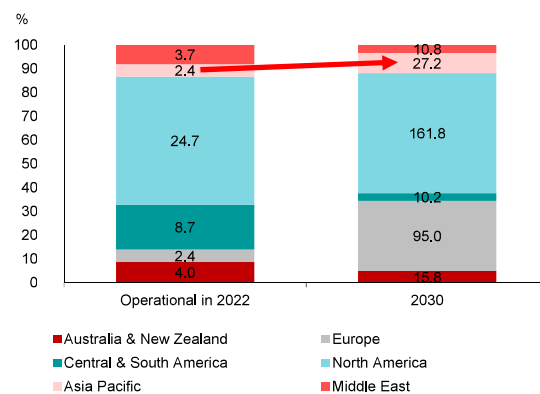
rail or truck to be used in a range of applications, or injected into deep geological formations, including depleted oil and gas reservoirs or saline formations, which trap the CO₂ for permanent storage. According to the IEA, CCUS deployment has been behind expectations in the past, but stronger investment incentives and climate targets are providing new impetus for CCUS growth, with over 500 projects in various stages of development across the CCUS value chain. In the region, Indonesia finalized its legal and regulatory framework for CCUS in March 2023, making it the first country in the region to establish a framework for CCUS activities. Vietnam also approved the National Energy Masterplan (NEMP) in August 2023 to aim for Vietnam’s CCUS capacity in industries and power plants of about 1 million metric tons per year (mt/year) by 2040 and 3-6 million mt/year by 2050. As a result, the IEA predicts that the Asia-Pacific region will show the steepest growth in the CCUS capture capacity after Europe (Figure A3.8).

Figure A3.7. CCUS Chain Overview



Source: Illustration by IEA

Figure A3.8. Operational & Planned Capture Capacity (MtCO₂/year) by region

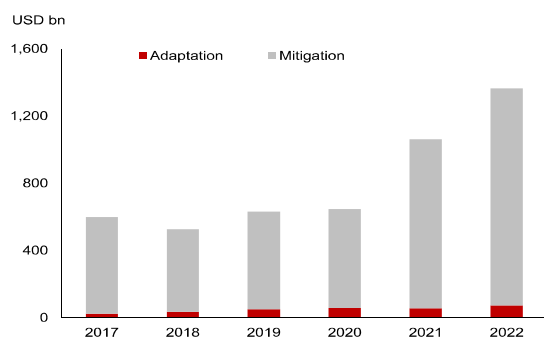


Source: IEA CCUS Projects Explore, AMRO staff calculations

Opportunities from International Financing to Advance Brunei’s Climate Agenda

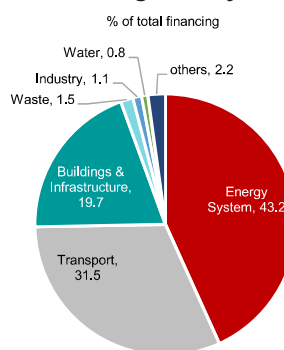
11. In the area of international finance and cooperation, there are opportunities that Brunei can explore, including possible bilateral, regional and multilateral climate financing mechanisms in meeting the NDC target, in addition to domestic financing. According to the UN and World Bank, international climate funds play a critical role as one of the three pillars of climate financing (along with the public and private funding and climate-related instruments such as carbon credits and climate insurance) in support of efforts to mitigate GHG emissions and adapt to the impacts of climate change. According to the Climate Policy Initiative (CPI, November 2023), global climate finance flows reached USD1.4 trillion in 2022, more than doubled the 2020 level of US665 billion, of which international finance accounts for 15 percent, or USD212 billion.

Figure A3.9. Volume of Global Climate Financing



Source: Climate Policy Initiative (CPI, Nov. 2023)

Figure A3.10. Share of Global Financing for Climate Mitigation by Sector



Source: Climate Policy Initiative (CPI, Nov. 2023); AMRO staff calculations

12. Global climate finance continues to be channeled primarily towards climate mitigation strategies, an avenue which Brunei can tap. According to the CPI, climate mitigation finance accounted for 91 percent of the total climate financing (USD1.4 trillion) in 2022, mostly towards renewable energy generation and low-carbon transport. The financial resources, together with technical advisory that typically comes with international climate financing can be leveraged to scale up the deployment of renewables, green technologies and low-carbon mobility solutions in Brunei. The country can potentially access various international climate financing and technical assistance programs, including the international organizations’ financial mechanism funds and bilateral financial sources by major countries (see Appendix 7).

Policy Discussions and Suggested Recommendations

13. To incentivize greater EV adoption, the government can consider easing the concerns amongst consumers by first addressing the infrastructure and financing constraints. EV can be a viable transportation option for Brunei, as travelling pattern is primarily of short distance, and relatively inexpensive when it comes to the cost of electricity charging. To facilitate greater EV adoption, priority can be focused on establishing a network of fast-charging stations for EV, since the primary concern of prospective EV owners is the availability of such infrastructure. One practical solution is to utilize existing gas stations as much as possible. In addition, the authorities can consider designing the ‘EV Early Adoption Incentive (EEAI)’ scheme, where covers, amongst others, a purchase subsidy, additional registration fee (ARF) rebate, tax breaks, lower electricity tariffs and priority parking. Authorities can consider working with vendors and insurance providers to lower the retail purchase prices, repair costs and insurance premiums for EV. The cost can be met by rationalizing fuel subsidy spending and reallocating them to fund the scheme. The authorities can take the lead in this initiative by promoting the use of EV amongst government officials and/or across government agencies and/or public service providers. This approach would be of significance given that EV adoption by the public sector can be seen to spur consumer confidence, helping to accelerate the achievement of national targets.

14. In the area of renewable energy, Brunei could benefit from greater Public-Private Partnership (P3) in mobilizing renewable energy development projects in the country. While the O&G industry will continue to play a crucial role in meeting the growing energy demand and ensuring economic growth, it is important to take a pragmatic and market-driven approach to the energy transition that ensures both energy affordability and security, while meeting emissions goals. In this context, Brunei could benefit from greater private sector

participation through P3, such as in advancing its national solar energy target to 200 megawatts by 2025 and meet 30 percent of its overall power generation mix with renewables by 2035.

15. On the technology front, priority should be given to foster and promote the deployment of green technologies. In particular, CCUS can play a critical role in reducing emissions along the supply chain for natural gas which will continue to play an important role in the country's energy transition. Its deployment could unlock new economic opportunities such as those associated with low carbon fertilizer production. Worldwide, CCUS capacity is expected to grow rapidly from 45.9 MtCO₂ per year in 2022 to 320.9 in 2030 (IEA CCUS Projects Explore). In the region, seven potential projects have been identified and are in their early development stages (in Indonesia, Malaysia, Singapore and Timor-Leste). The establishment of the Asia CCUS Network in June 2021, with the objective of facilitating collaboration and the deployment of CCUS, is another significant milestone and opportunity to advance CCUS in the region. Going forward, Brunei has the potential to be a CCUS hub in the region. The IEA evaluates Brunei as one of the CCUS hub candidates in the region, along with Indonesia, Malaysia, Thailand, Singapore and Vietnam. The MOU between Shell Eastern Petroleum and Brunei Shell Petroleum (BSP) to explore the feasibility of carbon transport and storage options for Brunei and Singapore is a good start, potentially forming a part of the CCUS hub in the region.

16. In the area of international cooperation in climate financing, technology exchange and capacity building, the government can leverage on bilateral and global cooperation mechanisms within the framework of UNFCCC. The ASEAN Centre for Climate Change (ACCC)⁸⁹ in Brunei stands as a pivotal knowledge hub, crucial for driving forward regional and global cooperation efforts. By leveraging on such cooperation mechanisms, Brunei can take advantage of the available climate financing schemes and access to climate finance data,⁹⁰ technology and technical assistance crucial for understanding investment gaps and effective solutions. This approach will facilitate the development of a climate financing scheme that is tailored to address diverse objectives and strategies in Brunei.

Box A3.1. RE100

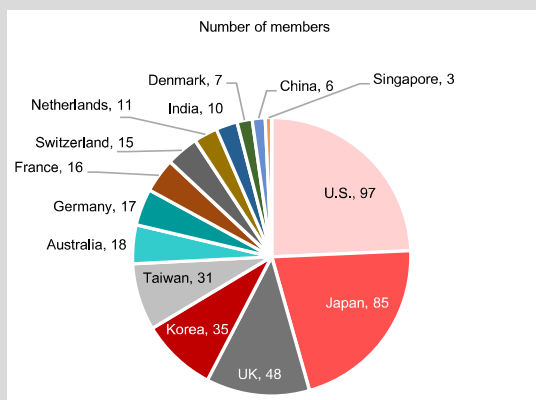
RE100 is the global corporate renewable energy initiative bringing together hundreds of globally influential and ambitious businesses committed to 100 percent renewable electricity. In the era of global climate crisis, if companies do not reduce GHG, it will become difficult for them to survive in global export competition. More consumers around the world are beginning to question the social responsibility of companies that emit large amounts of GHG. Global investors are also including companies' performance in responding to the climate crisis, including expansion of renewable energy use, as an important factor in their investment decisions. This trend is rapidly spreading. As of November 2023, 422 RE100 enterprises have made a commitment to go "100% renewable" (Figure A3.1.1), widely across all industries (Figures A3.1.1, A3.1.2). In the region, there are 129 members registered – only in Japan, Korea, China and Singapore. In particular, some RE100 member companies such as Apple have begun requiring suppliers and vendors in their supply chains to supply

⁸⁹ Handover Ceremony of the Signed Establishment Agreement of the ASEAN Centre for Climate Change (ACCC) to Secretary-General of ASEAN as Depositary of EA ACCC was held on 23 August 2023 in Vientiane at the sideline of the 17th ASEAN Ministerial Meeting on the Environment. In addition, the 43rd ASEAN Summit in Jakarta on 5th September 2023 welcomed the progress made towards the establishment of ACCC in Brunei to facilitate regional cooperation and coordination on climate change initiatives among ASEAN Member States with relevant national governments, regional, and international organizations, and provide policy recommendations.

⁹⁰ Governments need to build consensus on a new, standardized, and centralized approach for tracking climate finance data (CPI, November 2023).

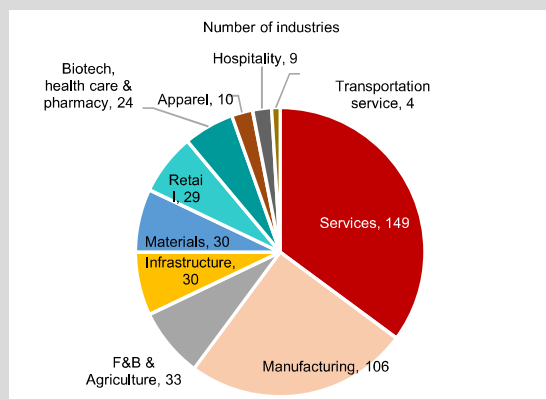
components produced using renewable electricity. To further accelerate change towards a net zero future, RE100 has recently revised its guidance on corporate renewable electricity procurement, which defines ‘what counts as renewable electricity for the purpose of participation in the RE100 campaign’. As of 1 January 2024, members should observe a 15-year date limit on commissioning or repowering when purchasing renewable electricity to cover 85 percent of their total annual electricity demand. As a result, this change will stimulate the construction of new and additional renewable capacity by directly increasing members' demand for new projects.

Figure A3.1.1. RE100 Members by Country, November 2023



Source: Climate Group RE100

Figure A3.1.2. RE100 Members by Industry



Source: World Resources Institute CAIT Climate Data & Enerdata

References

- ADB, April 2023. “Asian Development Outlook”.
- ASEAN Center for Energy, July 2019. “Brunei Has Potential To Go Big With Renewable Energy,” Borneo Bulletin.
- BloombergNEF, June 2023. “Electric Vehicle Outlook 2023,”.
- Brunei Darussalam Nationally Determined Contribution (NDC) 2020.
- Climate Group, 2022. “RE100 2022 Annual Disclosure report,”.
- Climate Policy Initiative, November 2023. “Global Landscape of Climate Finance 2023,”.
- IEA, April 2021. “CCUS around the world in 2021,” IEA, Paris
<https://www.iea.org/reports/ccus-around-the-world-in-2021>, License: CC BY 4.0
- IEA, June 2023. “Renewable Energy Market Update: Outlook for 2023 and 2024,”
- IMF, October 2023. “2023 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Brunei Darussalam,” IMF Country Report No. 23/346
- IRENA, August 2023. “Energy Profile in Brunei Darussalam,”.
- Ministry of Finance and Economy, Brunei Darussalam, 2020. “Towards a Dynamic and Sustainable Economy: Economic Blueprint for Brunei Darussalam,”
- Statista, September 2023. “Global electricity mix 2022, by energy source,” Statista Research Department.
- World Bank Group, 2021. “World Bank Group Climate Change Action Plan 2021–2025: Supporting Green, Resilient, and Inclusive Development,” © World Bank, Washington, DC. <http://hdl.handle.net/10986/35799> License: CC BY 3.0 IGO.

World Resources Institute, September 2023. “These Countries Are Adopting Electric Vehicles the Fastest, by Joel Jaeger”