AN ACTIONABLE RESEARCH AGENDA FOR INCLUSIVE LOW-CARBON TRANSITIONS FOR SUSTAINABLE DEVELOPMENT IN THE GLOBAL SOUTH

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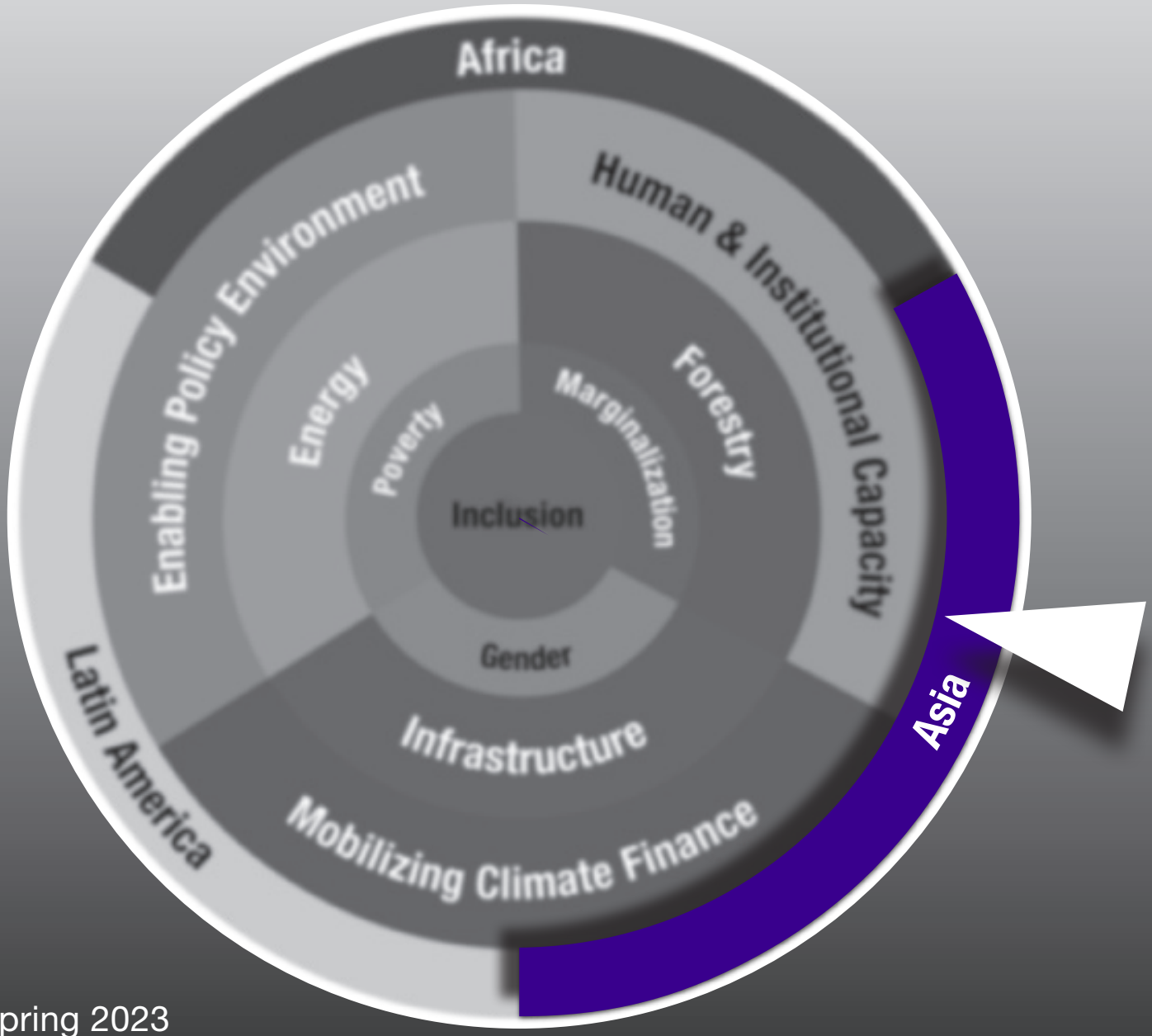

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Preface

All countries now face enormous challenges posed by climate change. The consequences of continued greenhouse gas emissions are dire, particularly for countries in the Global South that are both more affected and more vulnerable to climate change at the same time as they have less capacity to adapt (AfDB, 2022). The realization that a low-carbon transition needs to be implemented in countries in the Global South is well established and is also reflected in most countries' ratification of the Paris Agreement and in their Nationally Determined Contributions. In effect, most countries in the Global South are now confronted with the fastest and most dramatic transformation of their economies that they have ever experienced – or at least they would need to be.

The low-carbon transition in the Global South needs to be guided by research since such a transition is an inherently very knowledge-intensive process. This is why the Sustainable Inclusive Economies (SIE) Division of the International Development Research Centre (IDRC) has identified this area as particularly interesting to support. This report is commissioned by SIE as part of a bigger initiative to develop an actionable research agenda that IDRC can support to achieve a low-carbon transition with gender equity in the Global South.

This Regional Policy Review for Asia is part of the Research Agenda for Low Carbon Transition and Gender Equity in the Global South series of papers. The consortium that is working on this series of papers is global and consists of 60 researchers from a multitude of universities and institutions. This particular paper has been written by Pham Khanh Nam, Tran My Minh Chau and Quang Nguyen from the University of Economics, Ho Chi Minh City. The EfD Global Hub staff supporting the authors were Daniel Slunge and Daniel Hernandez.

This Regional Policy Review for Asia is one of the three regional papers covering the experiences and political ambitions with respect to low-carbon transition in Africa, Asia and Latin America. The focus is on the opportunities and challenges that the regions will face in the years to come to achieve a low-carbon transition (LCT). Although the chapters present a regional perspective, they are supported by in-depth analyzes of a sample of countries in each region. We hope to receive constructive comments on this draft paper from IDRC, our networks and external scholars and practitioners. We will then revise the paper for validation by policy makers and senior civil servants in the Global South. Based on the reviews and validations we plan to prepare final versions of both the paper and the accompanying High-Level Research Agenda by March 2023. The ambition is that these papers will be useful both for donors and research institutions in supporting an even greater contribution by research to a much needed low-carbon transition with gender equity in the Global South in this crucial Decade of Action.

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Gunnar Köhlin
Director, Environment for Development

Regional Policy Review - Asia

1.1 Executive Summary

In the last three decades, Asia has experienced drastic impacts of climate changes, including large increases in temperature, ocean warming and acidification, and abnormal extreme precipitation patterns. The region is also extremely prone to natural disasters, especially hydrological ones, with a strong increase in frequency, making it the most disaster-struck region worldwide. Climate change has disproportionate impacts on men and women in the region. Women are more likely to be affected by climate change due to existing social institutions and norms that hinder their access to resource and economic opportunity.

Asia is also the top GHG-emitting region worldwide, accounting for over half of the annual global amount in the last decade. Emissions vary among countries. The three top emitters, China, India and Indonesia rank first, third and eighth respectively in terms of total emissions worldwide. Their sum in emissions is almost three times that of the US and well surpasses the OECD. To the contrary, countries such as Nepal and Bhutan have remained carbon neutral and pledge to keep that status.

Asian countries are proactive in their LCT commitments. Most of them updated and strengthened their NDCs continuously. Their action plans cover multiple sectors and pay attention to gender inequality as well as the inclusion of youth and indigenous people. However, the ambitions of top emitters should be questioned. In the most recent Climate Action Tracker assessment, China, India and Indonesia are rated 'highly insufficient" for their targets and policies toward the Paris Agreement 1.5°C limit. Strengthened ambitions and more aggressive approaches to tackle CO^2 emissions from these countries are crucial for global climate agendas to achieve their goals.

Across the selected countries, some patterns in the choice of LCT&GE policy instruments can be seen. Carbon taxes, fossil fuel taxes and fossil fuels subsidies reform are facing aggressive oppositions from fossil fuel companies and political players whose interests may be violated, and from those concerned that they will have negative impacts on economic growth. Even in India, a country that is quite aggressive in imposing taxes on coal, the tax is still lower than optimal rate and there exists political pressure to axe the tax. ETS gains more favor from the selected countries; however, except for China which has put it into practice, the instrument is still under consideration in India and Southeast Asian countries, and there is no clear signal for the application of this instrument in other regions.

Renewable energy is one of the favorite choices of both fossil fuel intensive economies (e.g., India, China and Vietnam) as well as imported energy-dependent countries (e.g, Philippines and Armenia). Preference toward renewable energy comes from not only the fact that it can be a low-carbon substitute for fossil fuels, but also how it improves domestic energy security. However, there are some obstacles to renewable energy expansion in Asia such as high cost of renewable energy absorption, the underdeveloped national grid, and diminishing investment capacity.

Other LCT policy instruments are being practiced at different levels. Given their rich ecological capital, countries like Vietnam, China, India, Indonesia and Philippines are operating and refining their payment schemes for environmental services. Meanwhile, the application of environmental/emissions standards, which has been popular in developed countries, gains slow progress in Asian developing countries, except for China.

Lacking finance for climate actions is one of the biggest constraints to low-carbon transition in Asia. Huge gaps exist between the countries' financial needs and available sources. Finance provided by developed countries is still the main source for low-income countries such as Nepal, Bhutan and for landlocked Central Asian countries such as Armenia and Uzbekistan and, therefore, directly determine the progress of their climate actions. Domestic finance remains an important source of climate finance, especially adaptation finance in developing countries that have achieved middle-income status. The domestic source includes green bank, green bond, private investment and public expenditure. However, available domestic funding sources only met a small portion of the financial need to achieve NDCs' targets. Capacity development in the form of greening the banking system is needed to boost green investments.

Despite the growing attention to the gender aspect in LCT commitment among Asian developing countries, there is an urgent need to improve the way these problems are incorporated into climate policies and finance. In practice, gender impacts of LCT policy instruments are rarely mentioned or even evaluated. Although gender issues are more likely emphasized in projects financed by international sources, the proportions of fund allocated to projects with

gender being a major consideration are only 26% and 41% of total mitigation and adaptation commitments respectively.

This review calls for research addressing major constraints for LCT & GE in developing Asia. Dealing with low political will and opposition toward climate actions or specific policy instruments requires raising public awareness and support as well as having effective alternatives that can harmonize political incentives. Improved estimations of cost and damage coupled with efficient dissemination to the public audience will be greatly helpful in this regard. With respect to the energy transition, road maps to marketize this sector help reduce power concentration and political oppositions while enhancing its efficiency.

Besides, capacity building and technology transfer are crucial enabling factors for developing countries to take up actions, given limited capacity and resources. Insights on how to adapt effective measures in curbing emissions and fighting climate change in a developing country context are of great importance to Asia. In the light of recent interest in market-based instruments in developing Asia, there is an urgent need for research to support the design and implementation of carbon taxes and ETS.

Research is also needed to develop the monitoring and evaluation mechanism of policy gender mainstreaming. In addition, the gender impacts of LCT-related policy instruments should be a key element of impact analysis when policy evaluations are being done to ensure that the increasing consideration of gender equality in the countries' climate visions are soon translated into reality.

Regarding climate finance, the large funding gap in Asia calls for new understandings on innovative funding, together with capacity building and technology transfer, particularly in promoting green loans and green bonds. For countries with FDI attraction advantages, low-carbon FDI investments can be a source of finance that makes up for limited domestic finance. Besides, careful assessments of financial needs are required to enhance funding effectiveness in these countries. Finally, given the modest consideration of gender in climate funding, research to promote gender targeting in climate finance is highly valued.

The shift towards a low-carbon economy can greatly benefit from digital transformation and other technological advancements. Developing countries in Asia, such as China, India, and those in the ASEAN region, have a unique opportunity to accelerate their digital transformation and use it to achieve sustainable development goals. In the transition to a low-carbon economy, it is critical to seek creative solutions that can effectively address the challenges encountered in policymaking. This requires further research to identify innovative approaches capable of tackling the complex issues involved in this transformation. By leveraging technology and other advancements, policymakers can develop sustainable solutions that benefit both the environment and society.

As mentioned in the financing section, the physical and transition risks need to be addressed to boost climate financing in developing Asia. As in the case of carbon pricing, new understandings are needed to promote green financing in the region, given the current limited capacity of banks and financial institutions as well as the ambiguity and weak regulation enforcement of corporate compliances

This review also raises a need for data that serve the analysis of LCT & GE in developing Asia. More systematic and accessible data on the ongoing implementation of instruments such as fuel taxes, subsidies (or the removal thereof) and the allocation of revenues from them will greatly benefit the analysis to improve current policies and establish new instruments such as carbon tax or emissions trading systems. On the gender aspect, data availability and limited gendered impact evaluations have been an important hurdle to make implications for inclusive policies. Research to promote domestic climate financing can make good use of a publicly accessible climate finance database.

1.2 Regional overview

Asia spans over 30% of the Earth's land surface and is home to 60% of the global population. The region has been experiencing significant economic growth, contributing to one-third of the global GDP (Asian Development Bank, 2020a, 97). Asia is highly susceptible to natural disasters, making it the most disaster-prone region in the world (Asian Disaster Reduction Center, 2022). However, Asia is currently responsible for over half of the world's greenhouse gas (GHG) emissions, with top emitters such as China and India. The combination of rapid economic growth, high climate change impacts, and natural hazards makes the region a crucial focus for inclusive Low-Carbon Transitions (LCT) in the Global South. Given Asia's significant share in global emissions, it is essential to explore innovative solutions to address the region's contribution to climate change while promoting sustainable development.

Given the significant disparities in economic development and the diverse impact of climate change across different regions, we have taken a systematic approach to select a range of Asian countries to review, including China, India, Indonesia, the Philippines, Vietnam, Bhutan, Nepal,

Armenia, and Uzbekistan. This review aims to identify the opportunities and challenges these countries are likely to encounter as they strive to transition to a low-carbon economy in the coming years.

1.3 Country profiles

China

China, the world's most populous nation, is an upper-middle-income country in East Asia with a vast total area of 9.597 million km^2. Over the past four decades, China's economy, which supports over 1.4 billion people, has grown remarkably, making it the second-largest economy in terms of nominal GDP, valued at US $19.9 trillion in 2022. While China is a global leader in goods manufacturing and exporting, with exports valued at over US $3.5 trillion in 2021, it is also the world's largest emitter of greenhouse gases, responsible for 12.06 Gt CO2e in 2019. Furthermore, the country is highly vulnerable to climate-related disasters such as flooding, droughts, and tropical cyclones, but it also has a strong capacity to cope with such events[1].

India

India, the second-most populous country in the world with a population of 1.36 billion, is ranked fifth in terms of nominal GDP, which was valued at US $3.53 trillion in 2022. The country is situated between the Indian Ocean and the Himalayas mountains and has a total area of 3.287 million km^2. Over 83% of India's nominal GDP is generated by industry and services[2]. Despite contributing only one-sixth of GDP, agriculture employs over 40% of the country's labor force[3]. India is also experiencing the effects of climate change, such as extreme heat, droughts, and rising sea levels[4].

Indonesia

Indonesia is the largest archipelagic state globally, comprising over 17,500 islands with over 81,000 kilometers of coastline. The country boasts the largest economy in Southeast Asia and ranks 17th globally. With a yearly economic growth of approximately 5%, Indonesia is the second-fastest growing economy in the G-20 group, after China. However, due to the high population density in coastal areas, the country is highly vulnerable to climate change-related risks, such as floods, droughts, landslides, and rising sea levels.

The Philippines

The Philippines is a lower-middle income economy and an archipelago comprising about 7,107 islands. It has the third-largest economy in the ASEAN region, and it is also the third fastest-growing after Thailand and Indonesia. The country's GDP per capita is estimated at US $3,623 in 2022. Given its geographical location, the Philippines is regularly exposed to tropical cyclones such as Bopha in 2012, Haiyan in 2013, and Mangkhut in 2018. The country experiences an average of 20 typhoons every year.

Vietnam

Vietnam is a fast-growing economy in Southeast Asia. After a comprehensive economic reform starting in 1986, the country has attained a GDP growth rate of 5% annually to become a lower-middle income country. Vietnam is Southeast Asia's third-largest emitter of greenhouse gases, with carbon emissions increasing by about 10% annually. With a 3,260-km coastline, Vietnam was among the ten countries most affected by extreme weather events from 1999-2018. It is particularly vulnerable to sea-level rise and saltwater intrusion due to its extensive coastline and low-lying geography (Eckstein et al., 2019, 9).

Bhutan

Bhutan, a landlocked country on the southern slopes of the eastern Himalayas, relies heavily on agriculture and forestry as the main sectors of its economy, supporting nearly two-thirds of its population. While the country is expected to graduate from its Least Developed Country (LDC) status in 2023, it remains highly vulnerable to climate change due to its fragile mountainous terrain and limited adaptive capacity. Bhutan is also known for its commitment to environmental conservation and sustainability, with more than 60% of its land area under forest cover and a constitutional mandate to maintain at least 60% of its land area under forest cover for all time.

Nepal

Nepal, situated between China and India, is a landlocked country with a total area of 147,156 km2 and a population of 28 million in 2019, with more than 80% residing in rural areas. Despite efforts to improve its economy, Nepal remains one of the world's poorest countries and is projected

[1] https://climateknowledgeportal.worldbank.org/country/china/vulnerability
[2] https://data.worldbank.org/country/IN
[3] https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=IN
[4] https://www.worldbank.org/en/news/feature/2013/06/19/india-climate-change-impacts

to graduate from LDC status and become a lower-middle-income country by 2026. Agriculture is a crucial sector in Nepal, providing employment for approximately two-thirds of the population and contributing a quarter of the GDP. However, Nepal faces significant challenges, including high poverty rates, inequality, and inadequate infrastructure such as water supply and solid waste management, which increases its vulnerability to the impacts of climate change and natural disasters.

Armenia

Armenia, a landlocked country in Western Asia, relies heavily on its agricultural sector, which employs over 40% of its population and contributes about 20% of its GDP. Despite its recent economic growth, the country still faces high poverty and unemployment rates. In addition, Armenia is vulnerable to natural disasters such as earthquakes and landslides, which are likely to become more frequent and intense due to climate change. While its greenhouse gas emissions are relatively low compared to other countries, Armenia is committed to reducing its carbon footprint through initiatives such as adopting the Paris Agreement and developing renewable energy sources.

Uzbekistan

Uzbekistan is a landlocked country in Central Asia with a total area of 447,400 km2 and a population of 34.2 million. The country's economy has been growing at an average rate of 6.2% per year since 2010 with over 80% of its GDP attributed to industry and services. Uzbekistan is vulnerable to climate change due to its extreme continental weather and vast stretches of semi-desert and desert areas, with a high risk of disasters such as water shortages, desertification, drought, flood, and landslides.

1.4 Environmental and social challenges ahead (situation at the regional and national level)

1.4.1 Climate change and low-carbon transition

Since the 1980s, the atmospheric temperature in Asia has continuously increased (Figure 1). The year 2020 was the warmest on the continent's record, with the mean temperature being 1.39 degrees Celsius above the 1981-2010 average (NOAA National Centers for Environmental information, 2022; World Meteorological Organization, 2021). Large increases in extreme temperatures in West and Central Asia, the heat waves in eastern China (Xia et al., 2016), and the overall extreme warmth observed in 2016 and 2018 in Asia are among the growing evidence of climate warming occurring in Asia. Ocean warming (Bindoff et al., 2019) and acidification (Japan Meteorological Agency, 2018) and rising sea levels (Ranasinghe et al., 2021) have been other climate threats faced by the region over the past few decades. The annual average rate of sea level rise between 1993 to 2018 in some areas of the region, such as the Indo-Pacific (3.65mm) and Northwest Pacific (3.53mmm), was even higher than the global average (3.25mm). The glacier mass in high-mountain Asia has been receding at an accelerating rate. Except for Western Tien Shan and Pamir Alai, between 2019 and 2020, other glaciers underwent higher mass losses than the annual mean mass loss of the global reference (World Meteorological Organization, 2021). Asia has also experienced extreme precipitation patterns, both in terms of amount and timing. While precipitation was observed to decrease in West and Central Asia, several heavy rainfall events were observed in South Asia, Southeast and East Asia (Seneviratne et al., 2021). Changes in precipitation increase the likelihood of flood and drought occurrences in these regions.

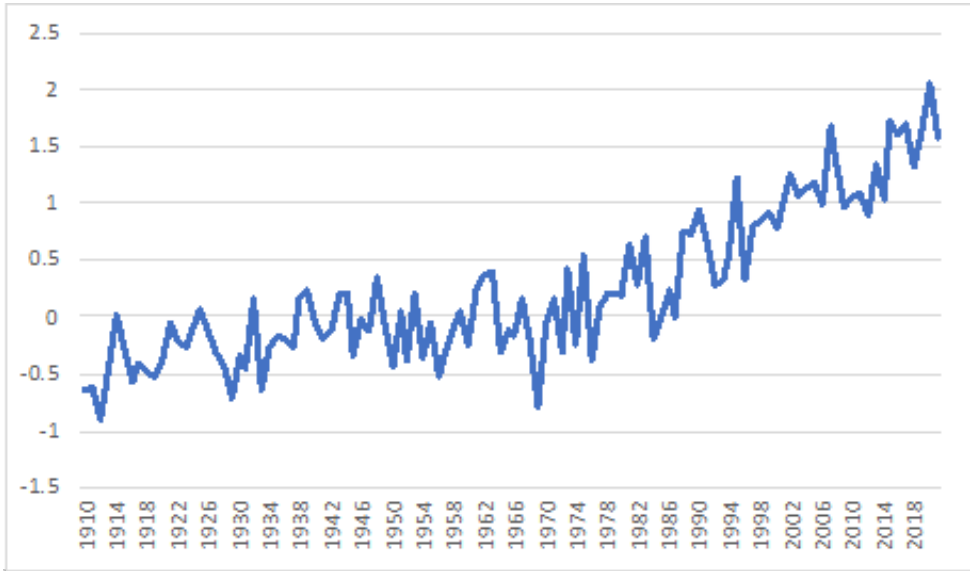


Figure 1 Annual Surface Level Temperature Anomalies in Asia (1910 – 2022) (Source: NOOA)

Asia remains the most disaster-prone region in the world. In 2020, the region was hit by 163 national disaster events, accounting for 41% of such events occurring worldwide[5]. In conjunction with the rising temperature since 1980s, Asia experienced an increasing number of natural disaster occurrences, which became more significant with more severe damage since 2000 (Figure 2 and Figure 3). The number of disaster events occurring in Asia between 1990 and 2000 was 1,337, which is even larger than the total number of such events occurring in the previous 20 years combined (1,222 events). The number of natural disasters striking Asia increased between 2010 and 2020 to 1,710. The average annual estimated economic loss also increased from US $64.9 billion between 1990 to 2000 to US $83.7 billion during the 2010-2020 time period. Storms and floods are the most common disasters occurring in Asia, and these events occurred more frequently between 2010 to 2020 than they did in the time period between 1990 to 2000. During the same time periods, the total number of flood events increased from 415 to 734, while the total number of storms increased from 389 to 488. Four countries in Southeast Asia (Myanmar, Philippines, Vietnam and Thailand) and three countries in South Asia (Pakistan, Bangladesh and Nepal) were among the ten countries most affected by extreme weather events worldwide during the period between 1999 to 2018 (Eckstein et al., 2019).

[5] Data from Centre for Research on the Epidemiology of Disasters (CRED) – Emergency Events Database (EM-DAT): https://public.emdat.be/

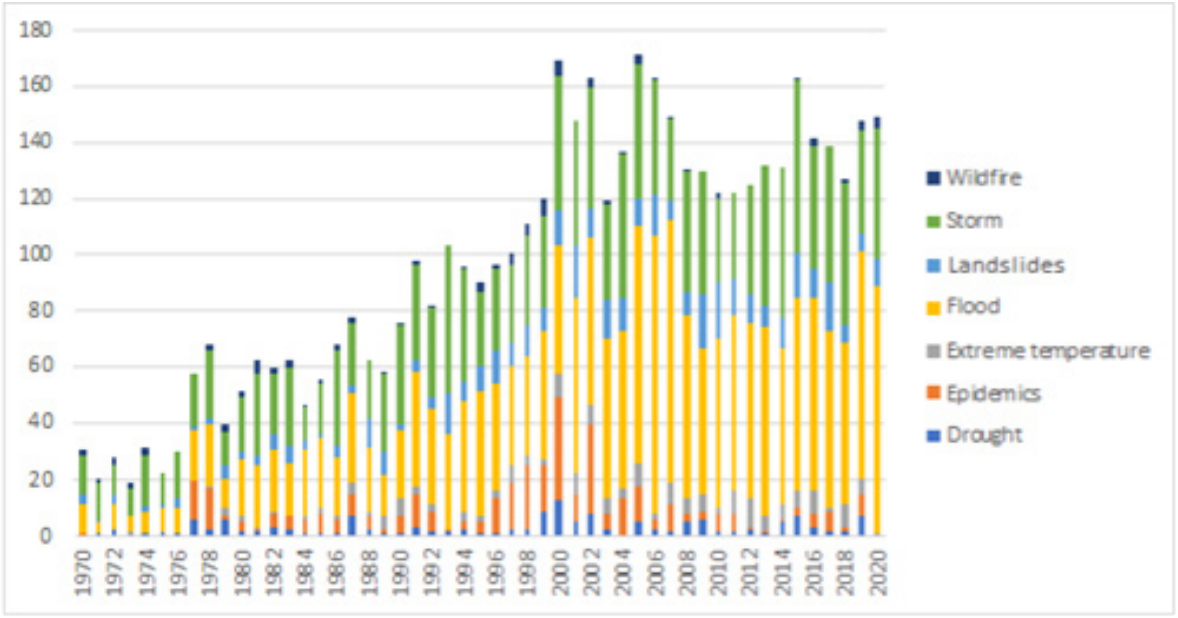


Figure 2. Natural disasters in Asia, 1970-2020: Frequency (Source: EM-DAT)

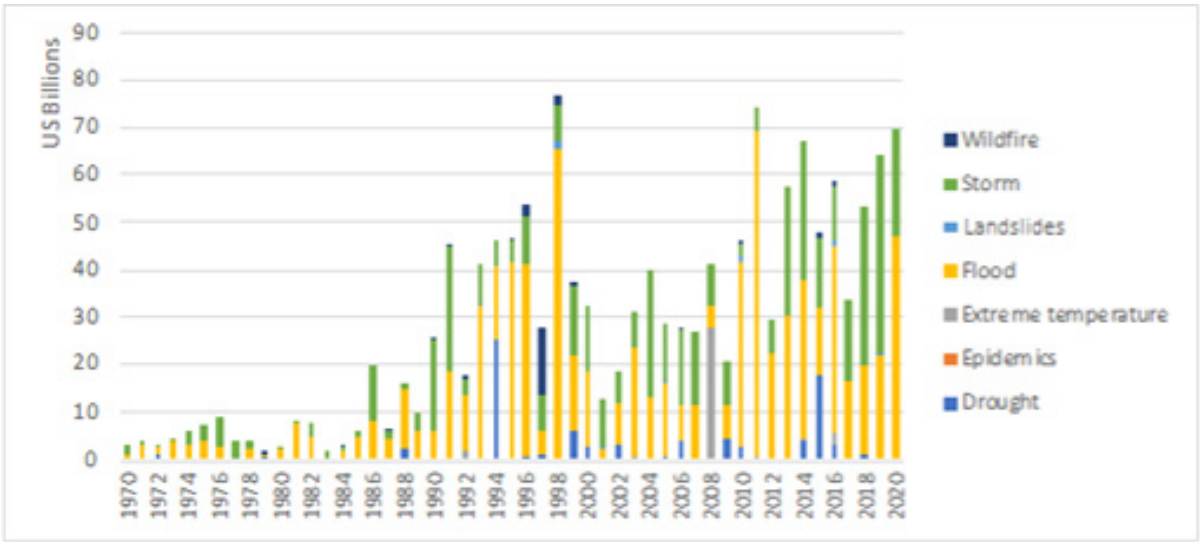


Figure 3. Natural disasters in Asia, 1970-2020: Total damage (adjusted USD) (Source: EM-DAT)

There is growing evidence of the gender-differentiated impacts of climate change. The feminization of agriculture (one of the most vulnerable sectors to climate change) in Asian countries such as India (Pattnaik et al., 2018) and China (SCIO, 2015) implies that women's livelihoods are more likely to be under the threat of climate change impacts (Moriggi, 2017). In rural and mountainous areas, women are more likely to engage in activities such as crop harvesting, and water and fuel collection, which become increasingly challenging in the context of climate change (Tamang and Udas, 2021). When a climate shock disrupts food cultivation or water supply, women and girls are more affected since they are more likely to have their consumption reduced (WHO, 2014). Datar et al. (2013) shows that girls are more likely to be malnourished than boys after natural disasters in India. Social norms and lack of access to resources hinder women's capacity to cope with and adapt to climate change (Choithani, 2020; Ferdous and Mallick, 2019). Since an increase in natural disasters is associated with an additional decline in women's social and economic capital relative to men's, as

climate change diminishes their opportunities to equalize economic and social position with men (Eastin, 2018).

The frequency of extreme heat waves is expected to increase in South Asia. South, Southeast and East Asia are expected to experience more intensified heavy precipitation. Warming oceans, ocean acidification, and glacier mass shrinkage continue climate challenges faced by Asian countries. The climate change impacts are not even across countries since they depend on countries' vulnerabilities and capacities to adapt. The latest evaluations from ND-GAIN[6] (Figure 4) show that among the selected countries, Bhutan is the most vulnerable to climate change impacts, but the country is also ready to take on adaptation actions. Meanwhile, India and Nepal are more vulnerable with lower adaptation capacities. China has the highest readiness index although the country is relatively less vulnerable compared to other selected countries.

Asia contributed 41.2 % to the global GHG emissions over the 1990 to 2018 time period. The annual amount of GHG emitted by the region has accounted for over half of the annual global amounts since 2013 (ClimateWatch). China became the world's largest GHG emissions contributor since 2005 (Figure 4), with the country's share in the global GHG emissions equaling 23.9 % in 2018. India has become the region's second largest GHG emissions contributor since 1995, and the third global largest GHG emission contributor since 2006[7]. The sum of these two countries' emissions has exceeded the Organization for Economic Co-operation and Development (OECD) group since the mid-2010s. In contrast to OECD countries, the GHG emissions released by China and India followed an increasing trend, although the growth rate slowed down over the past eight years (Figure 5). Armenia[8], Bhutan, Indonesia, Nepal, Philippines, Uzbekistan and Vietnam also followed the upward trend between 1990 to 2018 (Figure 6). Bhutan has only become a non-zero GHG emissions economy since 2011, but the country still maintains the lowest level of GHG emissions in the region. Among the selected countries, Nepal had the highest average GHG emissions annual growth rate (6.2%) in recent years (2010-2018), followed by the Philippines (4.5%).

See page 11 for:
Figure 4
Figure 5
Figure 6

Among the selected countries, Uzbekistan has the most carbon-intensive economy. Although the energy sector is responsible for 89.4% of the total national GHG emissions[9], up until 2019, only 3.25% of total energy consumption in Uzbekistan came from renewable sources[10], which is much lower than renewable energy consumption in India (8.96%), the Philippines (10.54%), China (14.86%) and Vietnam (15.22%) (Ritchie & Roser, 2020). Uzbekistan also had high levels of CO2 emissions per capita of 7.04 tCO2e (only lower than China) and the highest level of CO2 emissions per USD1 million GDP (4606.65 tCO2e), which is five times higher than China's (842.46 tCO2e).

With a centuries-old tradition of treasuring the environment, Bhutan had been successful in maintaining its zero CO2 emissions economy up until 2010. Although the country's annual average net GHG emissions was positive between 2011-2018, Bhutan remains the country with the lowest level of carbon emissions per capita (1.53 tCO2), and the lowest level of carbon emissions per GDP (472.4 tCO2 per US $1 million) in the region. Bhutan has committed to remaining a carbon-neutral country and to pursuing low-carbon, climate-resilient development pathways (National Environment Commission, 2019).

Since 2000, China has increased its efforts to curb CO2 emissions (W. Yang et al., 2019) . The country is the global leader in renewable capacity investment with 30% of the global investment worldwide (REN21, 2022 Chapter 5). China is also the host of the "Low-Carbon City Pilot Policy" which requires selected pilot cities to develop action plans that encourage low-carbon industry, low-carbon lifestyles and consumption. The policy was expanded to 87 cities in 2017 from the first eight cities in 2010 (W. Yang et al., 2019). The initiative proved to reduce CO2 emissions in the pilot cities where industries depend on natural resource endowments) (Huo et al., 2022).

1.4.2 Gender Equality and inclusiveness

Despite significant advancements in some areas, gender inequality is still widespread in Asia, particularly in South Asia, compared to more developed regions of the Western world. Table 1 provides an overview of the global gender gap

6 Notre Dame Global Adaptation Initiative (ND-GAIN): https://gain.nd.edu/our-work/country-index/matrix/

7 ClimateWatch - Historical GHG Emissions: https://www.climatewatchdata.org/ghg-emissions

8 Except for a significant plummet in the 1990s due to the collapse of the Soviet Union which caused a severe energy crisis and structural changes in the economy, Armenia's GHG emissions have increased since 2002.

9 https://olc.worldbank.org/content/greenhouse-gas-emissions-factsheet-uzbekistan

10 https://ourworldindata.org/energy-mix

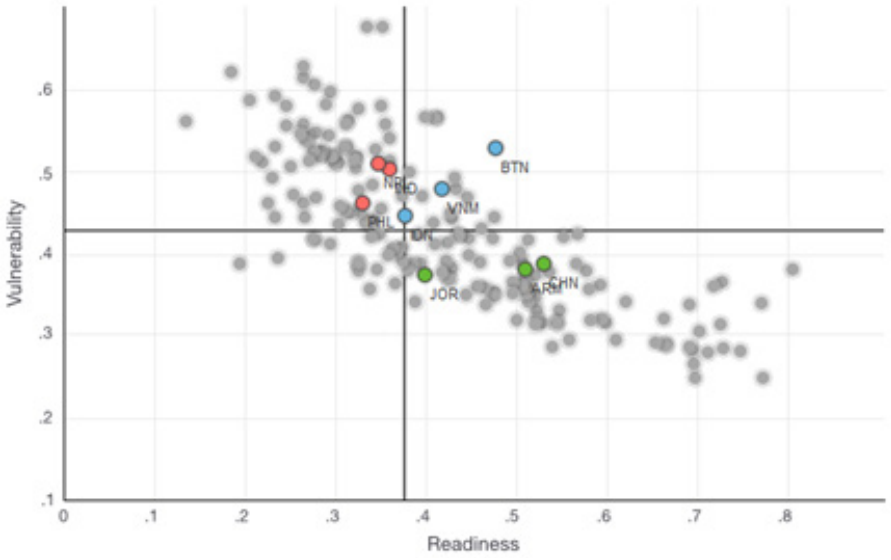


Figure 4. ND-GAIN Matrix on Readiness and Vulnerability, Asia (2019) (Source: ND-GAIN)

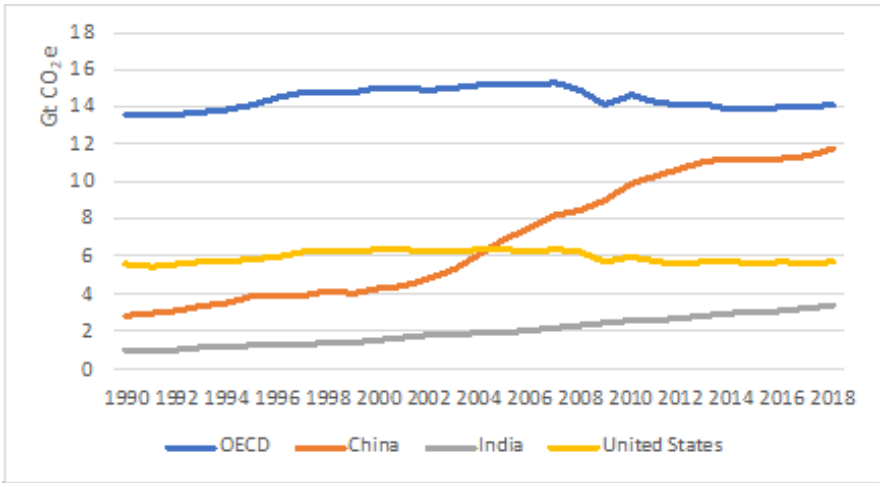


Figure 5. Historical GHG emissions in China, India, United States and OECD, 1990-2018 (Source: ClimateWatch; Adapted from CAIT; Total including LUCF)

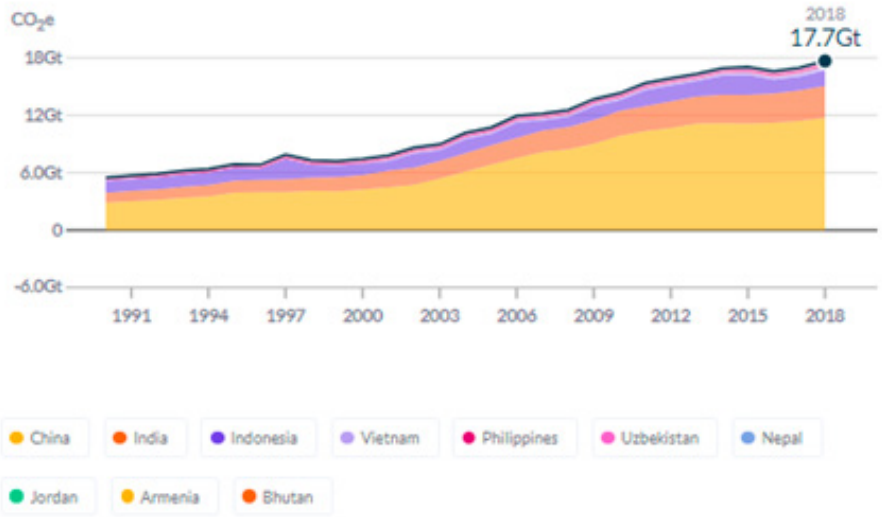
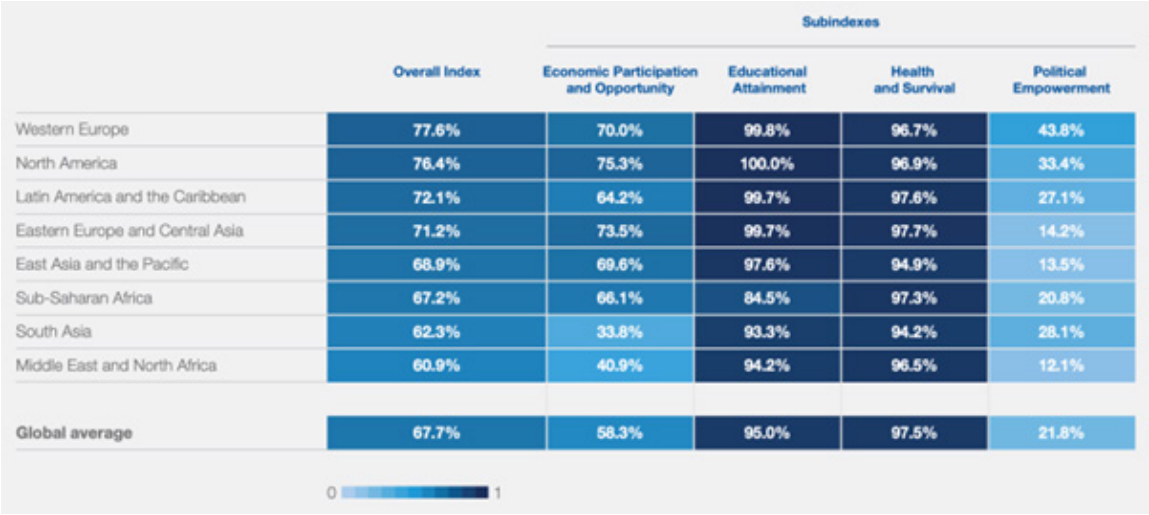


Figure 6. Historical GHG emissions in selected countries, 1990-2018 (ClimateWatch; Adapted from CAIT; Total including LUCF)

Table 1. Global gender gap index by region and subindex (Source: World Economic Forum, 2021)



	Overall Index	Subindexes: Economic Participation and Opportunity	Educational Attainment	Health and Survival	Political Empowerment
Western Europe	77.6%	70.0%	99.8%	96.7%	43.8%
North America	76.4%	75.3%	100.0%	96.9%	33.4%
Latin America and the Caribbean	72.1%	64.2%	99.7%	97.6%	27.1%
Eastern Europe and Central Asia	71.2%	73.5%	99.7%	97.7%	14.2%
East Asia and the Pacific	68.9%	69.6%	97.6%	94.9%	13.5%
Sub-Saharan Africa	67.2%	66.1%	84.5%	97.3%	20.8%
South Asia	62.3%	33.8%	93.3%	94.2%	28.1%
Middle East and North Africa	60.9%	40.9%	94.2%	96.5%	12.1%
Global average	67.7%	58.3%	95.0%	97.5%	21.8%

0 1

Table 2 shows the gender gap index for the selected countries. In terms of work opportunities, the Philippines (gender gap index of 79.5) and Vietnam (gender gap index of 76.5) have made remarkable progress towards gender parity among the selected countries. In contrast, Bhutan and India still experience significant inequality, with respective gap indices of 55.6 and 32.6. The table also highlights that the gender gap in educational opportunities is mostly closed in the selected countries, with minor variations. However, progress in narrowing the political empowerment gap has been slow.

index by region and subindex created by the World Economic Forum (WEF) [11]. According to this table, although there has been progress in narrowing the gender gap in education and healthcare, women in many parts of Asia continue to face numerous challenges in terms of economic opportunities and political empowerment. South Asian countries have only closed 33.8% of the gap in economic participation and opportunity. Meanwhile Central Asian nations, grouped with Eastern European countries, have eliminated just 14.2% of the gender gap in political empowerment.

Table 2 . Gender gaps in the selected countries (Source: World Economic Forum, Global Gender Gap Index, 2021; and World Bank, Gender Statistics)

	China	Bhutan	India	Nepal	Indonesia	Philippines	Vietnam	Armenia	Uz-be-kistan
Gender gap in work opportunities (score 0-100)	70.1	55.6	32.6	63	64.7	79.5	76.5	65.5	-
Gender gap in political empowerment (score 0-100)	11.8	8.2	27.6	24.1	16.4	36.2	11.3	9.1	-
Gender gap in edu-cational opportunities (score 0-100)	97.3	95.4	96.2	89.5	97	99.9	98.2	99.8	-

Table A1 in the Appendix provides a more detailed breakdown of the gender gap index for countries. It reveals that women's participation in the political system remains low. Even Nepal, a country with a relatively high percentage of women in parliament and ministerial positions, has modest figures at 32.7% and 13.6%, respectively. Vietnam and Armenia have the largest gender gaps in political leadership, with women almost absent from ministerial positions. In terms of resource access, the available data reveals that India has the largest gender gap in land ownership, with 71.7% of women not owning land compared to 49.6% of men. Although the gender gap in land ownership is lower in other countries, women still face higher rates of landlessness. Additionally, men in most of the selected countries have better access to financial services and are more likely to obtain loans from institutions, except for the Philippines. The gender gap in educational opportunities is relatively small in the selected countries compared to the gap in other areas, with relatively low variations across countries. While the gender gap in education is nearly closed at every level of education, there are still significant disparities in literacy rates in Bhutan (76.1),

[11] The Gender Gap Index score can be interpreted as the percentage of the gender gap that has been closed, which means that the lower the score is, the wider the gender disparity is.

India (79.9), and Nepal (76).

There have been some initiatives to address the gender equity issue in Asia. UN Women Asia and the Pacific[12]has played an important role in improving women's political and social status, protecting them from all kinds of violence and strengthening their influence and contribution in many aspects of life. The Safe and Fair Project is a 25-million-euro investment implemented through a partnership between ILO and UN Women with the overriding objective of ensuring that labor migration is safe and fair for all women in the Association of Southeast Asian Nations (UN Women, 2019). In Indonesia, the Peace Villages is a women-led initiative to promote peaceful and resilient communities implemented under the UN Women's regional program "Empowered Women, Peaceful Communities". The purpose of this project was to respond to an increase in violent extremist attacks by preventing radicalization and recruitment by violent extremist organizations (UN Women, 2020, 100). The Magna Carta of the Philippines (2008), Mongolia's Law on the Promotion of Gender Equality (2011) and Domestic Violence Prevention Act of Bhutan (2013) are examples of the commitment of Asian countries to integrate gender issues into their legislative reforms.

Gender norms and cultural practices are salient barriers for gender equality. The preference for boys persisting in East and South Asia results in more household resources being invested in boys than in girls (Jayachandran and Pande, 2017; World Bank, 2012). A study by Cooray and Potrafke (2011) found that the primary factors determining gender inequality in education worldwide are cultural and religious rather than specific political institutions. Regarding economic activities, gender norms related to domestic responsibilities force women to spend more time on housework and care giving, thus, impeding their chances to equalize income with men (Chari et al., 2017; Perez-Alvarez and Favara, 2020) The traditional perception of women's roles in Vietnam and China discourages women from participating in politics (OECD, 2014).

Apart from gender inequality, income disparity is another challenge in Asia. In the period between 1993-2019, although the income gap decreased at the regional level, the region still performed worse than Western European countries in closing the income gap. The income gap increased in countries with high economic growth such as China and India. In China, the top 1% earned 8% of national income in 1990, and the figure increased to 14% in 2019, while in India the corresponding figures are 11% in 1990 and 21% in 2019 (L. Yang, 2020).

The youth in the Asia-Pacific region comprises 55% of the world's youth population (660 million young persons aged 15 to 24) in 2020. Finding a job is among the major challenges faced by many young people in the region. In the Asia-Pacific region, the unemployment rate of youth in 2020 was 3.6 times higher than that of adults (Table 3). High youth unemployment rates and youth-adult disparities in unemployment rates indicate a widespread prevalence of unsuccessful school-to-work transitions. A possible explanation for this may be the inequitable access to relevant and high-quality education and barriers faced by youth in entering and remaining in employment (UNESCAP, 2012). Among the selected countries, Bhutan, India, Indonesia, the Philippines, and Vietnam have higher youth-adult disparities in unemployment rates than at the regional levels (Table 3). This gap is narrower in Armenia, partly due to widespread unemployment amongst the entire population.

Table 3. The unemployment rate of youth in 2020 (Source: International Labor Organization[13])

Unemployment rate (%)	Youth (15-24)	Adult (25+)	Youth-adult disparity
Asia – the Pacific	14.6	4.1	3.6
Uzbekistan	15.4	5.7	2.7
China	11.9	4.2	2.8
Bhutan	14.0	2.4	5.8
India	24.9	5.6	4.4
Nepal	8.1	3.5	2.3
Indonesia	14.5	2.3	6.3
Philippines	7.1	1.7	4.2
Vietnam	7.3	1.7	4.3
Armenia	36.6	19.6	1.9

1.4.3 Recovery from the COVID-19 pandemic

1.4.3.1 Economic impact of the pandemic

There was an increase in Asia and the Pacific's share of global GDP (current USD), from 26.3% in 2000 to 34.9% in 2019 (Asian Development Bank, 2020a, 97). In the years 2018 and 2019, GDP growth in the Asia and Pacific regions shifted downwards, from 5.1% in 2018 to 4.4% in 2019 (ILO Regional Office for Asia and the Pacific, 2020, 9).

[12] https://asiapacific.unwomen.org/en

[13] https://ilostat.ilo.org/

Until the Covid-19 pandemic, employment rates in the Asia and Pacific regions followed a steady upward trend, with annual employment growth rates of 0.7-0.9%. The employment-to population ratio in Asia and the Pacific in 2019 was 57.9%, which was close to par with the ratio at the global level (57.6%). The variation in employment-to-population ratios among the sub-region is wide; Southeast Asia has the highest employment-to-population ratio in the region, at 66.1% in 2019, followed by East Asia (64.7%), the Pacific Islands (59.9%) and South Asia (48.2%) (ILO Regional Office for Asia and the Pacific, 2020, 2).

Income inequality in Asia and the Pacific decreased in the time period between1993 to 2019. The top 1% income share decreased from 19% in 1993 to 17% in 2019. The gap between the top 10% and the middle 40% income shares continuously narrowed in the same time period. In particular, the top 10% and middle 40% share incomes in 2005 were 36% and 52%, respectively. By 2019, the top 10% income share in Asia decreased to 49%, while the middle 40% increased to 40% (L. Yang, 2020, 2).

The percentage of people living in extreme poverty (based on the US $1.90 per day level at the 2011 purchasing power parity) in developing Asia and the Pacific fell significantly from 33.5% in 2002 to 6.9% in 2015. Moreover, in the time period between 2002 and 2015, extreme poverty rates also fell in every sub-region of developing Asia and the Pacific, especially in Central and Western Asia (from 29.3% to 5.8%), East Asia (from 31.6% to 0.7%), the Pacific (from 46.1% to 24.8%), South Asia (from 39.7% to 13.2%), and Southeast Asia (from 24.8% to 5.4%) (Asian Development Bank, 2020a, 4).

As a result of the COVID-19 pandemic, the Asia-Pacific region's GDP dropped 1.3% in 2020, which is the first negative economic growth rate seen in the region for decades (International Monetary Fund. Asia and Pacific Dept, 2021, 8). Compared to the pre-pandemic period, the employment rate in 2020 decreased by 3.25%, from 1.845 billion people to 1.907 billion people. This implies an expected jobs gap of 62 million across the region due to the effects of the COVID-19 crisis. In addition, the employment-to-population ratios among the sub-regions also decreased in 2020. The ratio in Southeast Asia and the Pacific was 63.5%, followed by East Asia (63.2%), and South Asia (44.6%) (ILO, 2022, 67).

An estimate conducted by the Asian Development Bank (2021c) indicates that the COVID-19 pandemic pushed around 75 million to 80 million extra people into extreme poverty in 2020 across developing Asia. The simulation results also indicate that disruption in economic activity due to the COVID-19 pandemic increased the proportion of people living below the extreme poverty line (US $1.9 per day) by roughly 2 percentage points in 2020, compared to a scenario without COVID-19. At the same time, the proportion of people living on more than US $1.90 but less than US $ 3.20 per day also increased by about 2.4 percentage points (Asian Development Bank, 2021c, 16).

Indicators show that the COVID-19 pandemic has disproportionately hit both women and youth, especially in the labor market. From 2019 to 2020, on average, the women's labor force participation rate decreased by 1.4%, while this figure for men was 0.8%. A possible explanation for this might be that working women in Asia and the Pacific are mainly concentrated in most of the heavily impacted sectors, such as manufacturing (textiles and clothing), education, public administration, wholesale and retail trade, and health and social services (Asian Development Bank, 2021c, 19). The youth (aged 15-24) in the region were also adversely impacted by the pandemic, with a 10.3% decline in employment in 2020, compared to 2.4% for adults (ILO, 2022, 69).

Table 4 presents economic growth projections for the Asia and Pacific regions and its sub-regions in 2021 and 2022. The Chinese economy is expected to grow by 9.8% year on year in the first three quarters of 2021, with growth in industry at 10.6%, outpacing that of services at 9.5%. In India, GDP could rebound with 20.1% growth in Q1 and 8.4% in Q2 of fiscal year 2021, driven by growth in private consumption at 8.6% and in investment at 17.2%. The Philippines saw GDP rebound by 12.0% in Q2 and 7.1% in Q3 of 2021. The Armenian economy grew by 4.9% in the first half of 2021, and fiscal policy, including increased capital expenditure, is expected to continue to spur growth in 2022 (Asian Development Bank, 2021e, 8).

Table 4. The economic growth projections for 2021 and 2022 (Source: Asian Development Bank, 2021a)

Region	Growth rate in 2021 (%)	Growth rate in 2022 (%)
Asia and the Pacific	7.0	5.3
East Asia	7.5	5.0
South Asia	8.6	7.0
Southeast Asia	3.0	5.1
Central Asia	4.7	4.4
The Pacific	0.6	4.7

1.4.3.2 Impact on carbon emissions and policy implementation

Currently, official data on emissions reductions in the region and countries are not available. Despite the

importance of CO2 emissions, monitoring systems do not exist that monitor global emissions in real time. However, air quality parameters in some Asian countries were recorded as follows: In China, satellite data demonstrated that there was a significant reduction of NO2 (the third most important greenhouse gas after CO2 and CH4) in urban centers during the lockdown. When China slowly reduced restrictions, NO2 emissions increased. The same pattern was observed in Metro Manila, the Philippines and Delhi, India (Asian Development Bank, 2021b, 2).

According to the forecasts of the International Energy Agency, in 2021 CO2 emissions would rebound in the regions with the largest increase since the carbon-intensive economic recovery from the global financial crisis more than a decade ago. Most notably, China's emissions are projected to rebound and grow by almost 600 MtCO2 in 2021 due to greater coal use in the power sector. At the same time, CO2 emissions in India in 2021 are expected to rebound to almost 200 MtCO2 higher than 2020, leaving emissions 1.4% above 2019 levels. A rebound in coal demand above 2019 levels drove the emissions increase in India, with the expected rise in coal-fired electricity generation in 2021 likely being three times greater than the increase in generation from renewable energy (IEA, 2021, 12).

To assure that economic recovery is aligned with the low-carbon transition target, many countries released a stimulus package with a commitment of "green recovery". However, calculations from OECD(2021c) indicated that environmentally positive spending accounted for only 17% of total recovery spending and 2% of all Covid-19 related spending. According to the Global Recovery Observatory[14], the recovery package of Vietnam, Indonesia and the Philippines is non-green spending. China and India are more committed to "green recovery" through the percentage of green spending of the two countries, 8.4% and 3.2% respectively, which is much lower than the world average.

1.5 Visions for an Inclusive Low-Carbon Transition (LCT & GE)

1.5.1 Regional trends for LCT & GE

Asian countries have shown a strong commitment to addressing climate change, with a high rate of policy innovation and a focus on low-carbon economic development since the mid-2010s (see, e.g., Asian Development Bank & Asian Development Bank Institute, 2013, p. xii). Many of their action plans include both mitigation and adaptation strategies and take into account the impact of climate change on vulnerable groups, including women and other marginalized populations. While some countries have been criticized for not being ambitious enough in their commitments, there is a clear need for international support in the form of finance, technology, and capacity development, particularly for developing countries in Asia, as conditional targets can be significantly more challenging to achieve than unconditional ones.

Implementation of low-carbon transition (LCT) visions varies across countries, with some making considerable progress in improving energy efficiency and lowering transport emissions, but few have established market-based tools. In developing Asian countries such as China, India, and Thailand, LCT policies have been developed in synergy with other development goals such as energy security, industrial competitiveness, and resource sustainability, rather than solely focusing on climate change considerations. However, international support in the form of finance, technology, and capacity development is necessary for many developing Asian countries to achieve their conditional targets, which are often significantly more ambitious than their unconditional ones (Asian Development Bank and Asian Development Bank Institute, 2013, 111).

1.5.2 National LCT & GE visions, strategies, and programs

1.5.2.1 International commitments for decarbonization - Analysis of NDCs, conditional and unconditional commitments and long-term strategies.

Asia has been quite proactive in its LCT commitments. Up to April 2022, about three-fourths of Asian countries have updated their first NDC or submitted the second one. Except for the Philippines and India, the countries selected for this review submitted their Intended Nationally Determined Contribution (INDC) and their first NDC between 2015 and 2017. From September 2020 to right before COP26, they either updated their first NDC or handed in the second one. The Philippines submitted its first NDC in April 2021 (but have not yet submitted the second one). Meanwhile, after the 2016 NDC, India has not made any further commitments (see Table 5). In addition, most revised and second NDCs

[14] https://recovery.smithschool.ox.ac.uk/tracking/

submitted were somewhat more ambitious than their first versions, with strengthened or added GHG emission targets. Bhutan's second NDC repeated the commitment that the country will remain carbon neutral.

More than half of Asian countries set conditional targets in their NDCs, including many of those selected for this review such as Vietnam, Indonesia, the Philippines, India, Nepal and Armenia. Bhutan's and Uzbekistan's NDCs have partially conditional targets (based on an unspecified mix of domestic and international sources of finance). To some extent, this reflects the need for support, usually in terms of finance, capacity building and technology transfer from high-income countries since the conditional improvements are quite large.

The NDCs appear rather comprehensive, covering a wide range of sectors such as energy, agriculture and land use, industry, transportation, and waste. In addition to this, with a focus on inclusiveness, many of the selected countries considered gender equality (e.g., Vietnam, Indonesia, India, Bhutan and Nepal), youth (all except Vietnam) and indigenous people (Vietnam, the Philippines, Nepal and Armenia) in their commitments.

Most of the selected countries are willing to participate in international market mechanisms, which was mentioned in Article 6 of the Paris Agreement (Table 5). While China did not mention this aspect, it has completed a rather impressive pilot program, and established a giant national emissions trading market.

Countries are at different levels in their progress to Net-Zero Targets, which can be tracked using tools such as the Net-Zero Tracker from ClimateWatch[15]. With better progression, China, Bhutan and Nepal have been preparing legislation toward these targets. Vietnam and India have only pledged for Net-Zero, while no commitments were made by Indonesia, the Philippines, Uzbekistan and Armenia.

In their NDCs, countries often have an adaptation component which reflects their priorities, implementation and support needs, plans and actions. Except for China and Bhutan, other selected countries have established rather clear adaptation priorities. Barriers for adaptation were mentioned by most countries, except for the Philippines, Bhutan and Armenia. Only Vietnam, Indonesia and India mentioned their financial needs for adaptation. Indonesia did not provide an estimate for their financial needs but reported the 2018 mitigation and adaptation budgets, which were US $14.02 billion and US $227.4 million respectively. Indian financial needs for adaptation was estimated at US $206 billion (at 2014-2015 price level) for the period of 2015 to 2030. The corresponding estimate for Vietnam was US $70-US $115 billion between 2021 and 2030. Finally, in this component, only Vietnam and China presented their achievements.

[15] Net-Zero Tracker (https://www.climatewatchdata.org/net-zero-tracker)

(1) Country	(2) 2nd NDC submitted	(3) 2nd NDC submitted before COP26	(4) GHG reduction target type	(5) Increased ambition on 2nd NDC	(6) Sectors covered in mitigation strategy	(7) Conditionality of Targets on NDCs	(8) Financial conditionality	(9) Conditionality on capacity building or technology transfer
Vietnam	Yes	Yes	Baseline scenario target	Yes	Energy, Agriculture, LULUCF, Waste, Industrial processes (IP)	Unconditional and conditional targets	Yes	Yes
Indonesia	Yes	Yes	Baseline scenario target	No	Energy, Waste, Industrial Processes and Product Use, Agriculture, FOLU	Unconditional and conditional targets	Yes	Yes
Philippines	No	N/A	Baseline scenario target	N/A	Agriculture, Waste, Industry, Transport, Energy	Unconditional and conditional targets	Yes	Yes
China	Yes	Yes	Intensity target; Trajectory target	Yes	Agriculture, Energy, Industry, LULUCF/Forestry, Transport	Unconditional targets only	No	No
Bhutan	Yes	Yes	Fixed level target	No	Energy, Industrial Processes and Product Use, Agriculture Forestry and Other Land Use (AFOLU), Waste	Partially conditional	Yes/possible	No
Nepal	Yes	Yes	N/A	Yes	Energy, Industry, Agriculture, Forestry and Land Use, Waste	Unconditional and conditional targets	Yes	Yes
Uzbekistan	Yes	Yes	Intensity target	Yes	Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU), Waste	Partially conditional	Yes	Yes
Armenia	Yes	Yes	Base year target	Yes	Energy, Industrial Processes and Product Use, Agriculture, Waste, Forestry, Other Land Use	Conditional NDC only	Yes	Yes
India	No	N/A	Reductions in GHG intensity	N/A	Energy, Industry, Transportation, Agriculture, Forestry, Waste	Conditional NDC only	Yes	Yes

Country	(10) NDC Targets conditional on ambition levels of commitments from other countries	(11) Intention to participate in international carbon market mechanisms from NDC	(12) Status of Net-Zero Target	(13) Adaptation priorities included	(14) Adaptation barriers mentioned	(15) Financial needs mentioned	(16) Adaptation achievements mentioned	(17) Loss-and-Damage mentioned on NDCs	(18) Gender mentioned on NDCs	(19) Youth mentioned on NDCs	(20) Indigenous and local communities mentioned on NDCs
Vietnam	No	Yes / Possible	In political pledge	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Indonesia	No	Yes / Possible	No document submitted	Yes	Yes	Yes	No	No	Yes	Yes	No
Philippines	No	Yes / Possible	No document submitted	Yes	No	No	No	Yes	Yes	Yes	Yes
China	No	Not specified	In policy document	Not specified	Yes	No	Yes	No	Yes	Yes	No
Bhutan	No	Yes / Possible	In policy document	Not specified	No	No	No	No	Yes	Yes	No
Nepal	No	Yes / Possible	In policy document	Yes	No	No	No	Yes	Yes	Yes	Yes
Uzbekistan	No	Not specified	No document submitted	Yes	Yes	No	No	No	Yes	Yes	Yes
Armenia	No	Yes / Possible	No document submitted	Yes	No	No	No	No	Yes	Yes	Yes

Table 6. Unconditional and conditional targets of selected countries (Sources: countries' NDCs)

Country	Unconditional target	Conditional target
Vietnam	-9% compared to the base line	-28% compared to the base line
Indonesia	-29% compared to the base line	-41% compared to the base line
Philippines	-2.71% compared to the base line	-75% compared to the base line
India	None	-33% to -35% compared to the base year
Nepal	clean energy generation: 5,000MW	clean energy generation: 10,000MW
Armenia	None	-40% compared to the base year

Note: Unconditional/conditional targets: Some governments' NDCs are conditional on what other countries commit to or on international financing, while others have made unconditional NDCs.

1.5.2.2 Negotiations at COP26.

COP26 brought about the Glasgow Climate Pact that aims at limiting the rise in the global average temperature to 1.5°C. However, many countries would need to strengthen their commitments significantly ahead of COP27. China and India, the world's top emitters, should increase their ambitions as these new targets are still within their reach under the current policy without the need for additional mitigation efforts (Climate Action Tracker, 2021). Similarly, with a slight improvement in updated reduction target, Vietnam would still easily achieve the new reduction level with its current policy. As the Paris Agreement provides that successive NDCs will show progress over previous ones, Indonesia also needs to strengthen its ambition ahead COP27 after keeping most of its commitments unchanged in the updated NDC.

Among the selected countries, it appears that Nepal has made commitments that are closer to the Paris Agreement's 1.5°C temperature limit. Nepal's climate targets and actions are considered 'almost sufficient' by Climate Action Tracker (CAT). The country's current policies are 1.5°C compatible when compared to its fair-share contribution. The Philippines' and Bhutan's NDCs are rated "2°C compatible" which is close to but not fully consistent with the Paris Agreement's 1.5°C limit. Thanks to its substantial forest area, Bhutan's NDC target of remaining carbon neutral satisfies the requirements of maintaining carbon neutrality, including LULUCF. The Philippines' rating is based on the impressive pledge of reducing 75% emissions compared to the base line. The fulfillment of its NDC target depends strongly on its enforcement of important policies such as the coal moratorium. Among the remaining selected countries, CAT rates China and Indonesia as "highly insufficient" and Vietnam as "critically insufficient".

Coal phase-down

Asia is a critical region in the phase-down of coal. In 2020, China was the top global coal producer and consumer, with 87,638 Terajoules consumed, and 3764 Mt produced, followed by India, with 16,531 Terajoules consumed, and 760 Mt produced. Indonesia is the third biggest coal producer, with 564 Mt produced in the same year (International Energy Agency, 2021b). These three countries would have to make the biggest efforts to meet the goal to move away from coal by 2040.

Among the selected countries, Bhutan, Nepal, Armenia, and Uzbekistan are less reliant on coal. Biomass was the primary source in Bhutan's 2014 energy supply mix, accounting for 36%, followed by electricity (28%), petroleum products (21%), and coal (15%) (Government of Bhutan, Ministry of Economic Affairs, Department of Renewable Energy, 2016, 2). In 2015, the energy generation mix in Nepal included various sources such as biomass (78%), petro-products (12%), coal (4%), grid electricity (3%), and modern renewable energies (3%) (Poudyal et al., 2019, 3). In Armenia, energy sources include natural gas, electricity, oil products, and renewables; however, natural gas is the dominant source, which accounts for 63% of the energy mix (International Energy Agency, 2021a, 5).

Methane reduction

Since China, India and Indonesia are the top three countries in the region that produce significant methane emissions, these countries should undoubtedly come up with policies as well as actions to reduce their methane emissions. At COP26, China and the US committed to collaborate to reduce methane emissions. In particular, the two governments will cooperate to enhance the monitoring, management and research of methane emissions in the 2020s.[16] Armenia, Indonesia, Nepal, the Philippines and Vietnam all participated in the Global Methane Pledge, an initiative launched by the US, the

[16] https://www.state.gov/u-s-china-joint-glasgow-declaration-on-enhancing-climate-action-in-the-2020s/

European Union, and other countries in November 2021[17]. The pledge aims to reduce at least 30% of global methane emissions compared to the 2020 level by 2030.

Fossil fuel subsidies

For decades, countries in Asia have considered fossil fuel subsidies as a key component to securing social safety nets (Asian Development Bank, 2016, 31). The International Energy Agency's 2020 data on fossil fuel subsidies of some selected countries are shown in Table 7. While the subsidization levels of China, India, Indonesia and Vietnam were rather low in 2020, they were extremely high in Uzbekistan with an average subsidization rate of 44%.

Table 7. Fossil fuel subsidies in selected countries (Source: International Energy Agency, Fossil Fuel Subsidies Database[18])

Country	Average subsidization rate (%)	Subsidy per capita (USD/person)	Total subsidy as share of GDP (%)
China	3%	18	0.2%
India	9%	17	0.9%
Indonesia	15%	25	0.6%
Uzbekistan	44%	112	6.6%
Vietnam	1%	3	0.1%

Note: The IEA measures fossil fuel consumption subsidies using a price-gap approach. This compares final end-user prices with reference prices, which correspond to the full cost of supply, or, where appropriate, the international market price, adjusted for the costs of transportation and distribution. The estimates cover subsidies to fossil fuels consumed by end-users.

Arresting deforestation

Land Use, Land-Use Change and Forestry (LULUCF) are important components in countries' mitigation and adaptation strategies. An assessment of the forces driving deforestation and forest degradation based on previous analyses of tree cover loss (Curtis et al., 2018) show that during the 2001-2015 deforestation in Southeast Asia (accounting for about 1.6 million hectares) wildfires and forestry production, especially in Russia, China and South Asia, were the main contributing factors for forest losses in Asia (see Figure 7). However, there has been evidence of afforestation in Asia since 1990. Figure 8 shows annual changes in forest areas in selected countries using data from FAO's Forest Resources Assessment[19]. Among the selected countries, China appears to be the one with highest afforestation effort during the same period, followed by India and Vietnam, while Indonesia had net loss in terms of forest area.

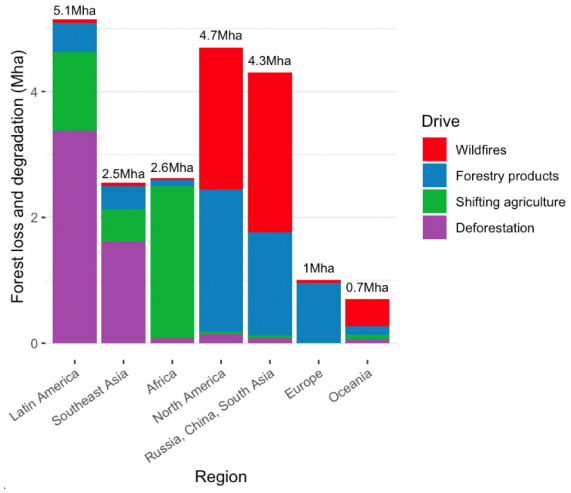


Figure 7. Forest loss and driving forces (Source: adapted from Curtis et al., 2018)

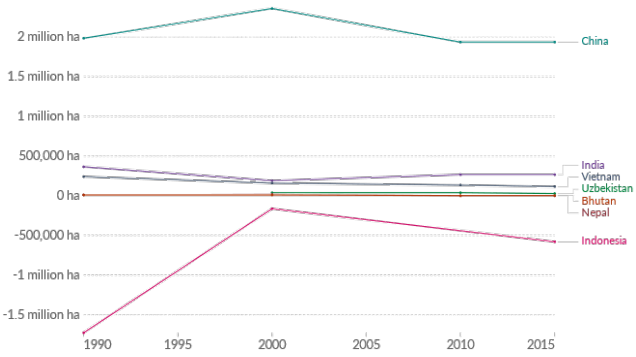


Figure 8. Annual change in forest area (Source: UN Food and Agriculture Organization, Forest Resources Assessment)

Electric vehicles

Asian countries have observed a remarkable growth in transportation emissions with significant contributions from large emitters such as China, India and Indonesia, despite still staying far below the levels in developed countries (e.g., the

17 https://www.globalmethanepledge.org/#pledges
18 https://fra-data.fao.org/WO/assessment/fra2020
19 https://fra-data.fao.org/WO/assessment/fra2020

OECD) (see Figure 9). Total emissions from this sector have increased over three times in the East Asia and Pacific region between 1990 and 2018, surpassing the level of the Europe and Central Asia regions. Progress in the electrification of transportation varies among countries. China has come far in this aspect with skyrocketing electric car stocks since the mid 2010's, reaching 4.5 million in 2020 (78% of which were battery EVs and 22% hybrid EVs), well above that of Europe, the US and Japan (see Figure 10). By the end of 2021, 2.6% of the Chinese car fleet were EVs, of which over 80% were

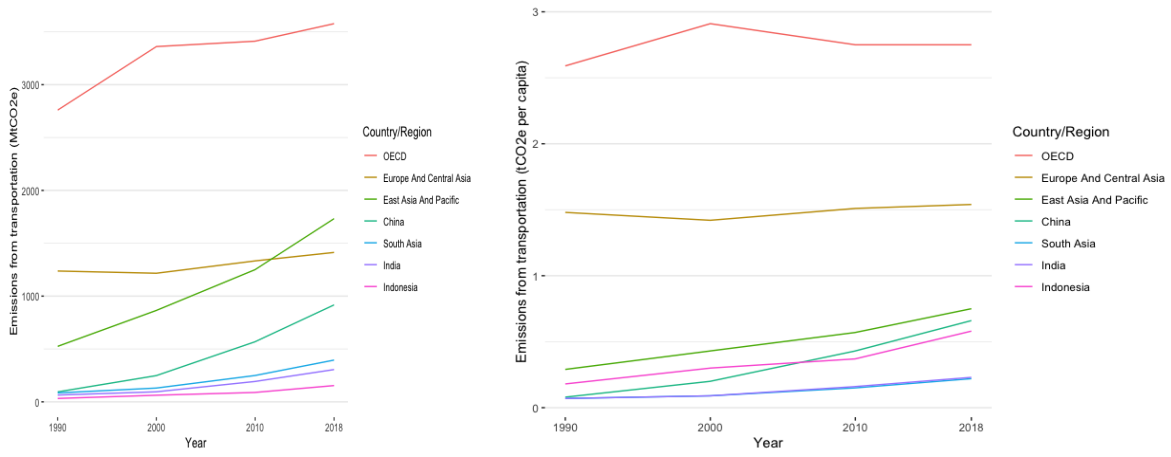


Figure 9. Emissions from transportation (Source: CAIT)

battery EVs[20]. Other Asian developing countries are still in the early stages of promoting electric vehicles.

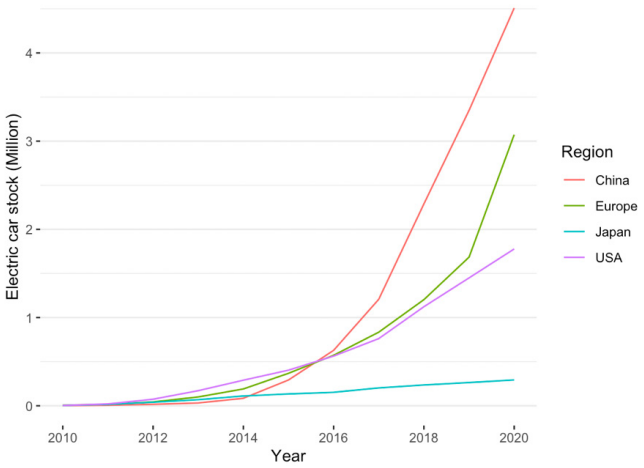


Figure 10. Electric car stock in China, Europe, USA and Japan (Source: IEA Global EV Data Explorer)

Adaptation

Countries build their National Adaptation Plans (NAP) to enhance their resilience to climate change impacts. Among the selected countries, as of the time of writing this report, Armenia, Nepal, Vietnam and the Philippines have already established their NAPs. Bhutan, Indonesia and Uzbekistan are in their NAP processes. In 2008, India introduced its sector and region-specific adaptation and mitigation strategies, namely the National Action Plan for Climate Change (NAPCC), and introduced the State Action Plan on Climate Change which contains state-specific adaptation measures. China released a National Strategy for Climate Change Adaptation in 2022[21]. Most published NAPs appear

[20] https://autonews.gasgoo.com/china_news/70019540.html

[21] https://www.fas.usda.gov/data/china-prc-national-strategy-climate-adaption-offers-more-same-agriculture

comprehensive, covering a wide variety of sectors such as agriculture, water and energy security, ecosystems and biodiversity, urban planning and transport, and other socio-economic sectors (see Table 8).

Table 8. Sectors covered in the selected countries' NAP and similar documents (Source: Countries' NAP and similar documents)

Armenia	Natural ecosystems; human health; water resources management; agriculture; energy; human settlements and infrastructure; and tourism
Country	Sectors covered in NAP and similar documents
Nepal	Agriculture and food security; forest and biodiversity; water; energy, rural and urban settlements, industry, transport and physical infrastructure, tourism, natural and cultural heritage; health and sanitation; disaster risk reduction and management; gender equality and social inclusion
Vietnam	Agriculture; disaster prevention; environment and biodiversity; water resource; infrastructure development; health and socio-economic sector
The Philippines	Food and water security, ecological and environmental stability, human security, climate-smart industries and services sustainable energy
India	Energy, including promoting renewable energy and improving efficiency, sustainable habitat and urban planning, water resource, sustaining the ecosystem and its services, agriculture, technologies and research

1.5.2.3 National laws and policies for the LCT & GE

Many developing countries in Asia have integrated low-carbon targets into their legislation systems. A notable example of laws facilitating LCT policy instruments is the constitution of Bhutan. With a particular focus on conservation, Bhutan mandated that at least 60% of the total land must be preserved under forest cover (National Assembly of Bhutan, 2008, 12). Constitutionalizing this means that onward policies and development plans of this country must be aligned with this target, facilitating the establishment of instruments for LCT. Another example is the 2005 Renewable Energy Law of China. It laid the foundations for key policies such as the national renewable energy targets that guide the whole planning system, a mandatory connection and purchase policy that requires grid companies to purchase from renewable electricity generators in their jurisdiction, a national feed-in tariff system, and arrangements for cost-sharing and funding of renewable energy incentives (Schuman and Lin, 2012). The law proved its effectiveness with increasing renewable energy investment, consumption and patent filings in recent years (Heggelund, 2021). In the Philippines, the 2009 Climate Change Act is an important law that helps mainstream climate change into decision making (e.g., disaster risk mitigation, development planning and poverty alleviation). The Act established several important principles such as the precautionary principle and common but differentiated responsibilities. The Act also put in charge a Climate Change Commission for the task of building a Framework Strategy on Climate Change and the National Climate Change Action Plan which guide the whole planning system (Asian Development Bank, 2020b, 156–68). However, the gender aspect should receive more attention in the making of such laws. Among the examples above, only the 2009 Climate Change Act of the Philippines addressed gender inequality and poverty.

Some policy documents proved particularly important in developing low-carbon policies. Bhutan's 2019 Climate Change Policy (Government of Bhutan, National Environment Commission, 2019) is a comprehensive document laying out an inclusive LCT plan. By addressing GHG emissions from industrial, transport, waste and agricultural sectors, the plan reflects the country's efforts to remain carbon-neutral despite the LULUCF sink. The policy also paid attention to building resilience to climate change, ensuring the means of implementation (finance, technology, capacity building and awareness) and integrating gender issues in all climate change actions. Another case is the Philippines' National Climate Change Action Plan 2011–2028 (Government of the Philippines, Climate Change Commission, 2011). This comprehensive plan addressed various issues, such as food security, water sufficiency, ecosystem and environmental stability, human security, climate-smart industries and services, sustainable energy, and capacity development. Private finance was encouraged through the improvement of the public finance mechanism (PFM) and the promotion of research on innovative financing schemes. The plan also emphasized the mainstreaming of gender in research, policy making and capacity development.

In the context of developing Asia, the making and implementation of LCT & GE policy instruments inevitably face many roadblocks. Resource limitations will obstruct the implementation of LCT & GE policy instruments, especially when the financial need for LCT is increasing rapidly in the region (Treco, Stephens, and Marten, 2018, 28). Political conflict has always been a major roadblock. As an example, Indonesia has considered implementing a carbon tax on fossil fuel combustion since 2009 and expects to apply it from April 2022. But a growing number of businessmen holding top positions in political parties and the government have been opposing such a tax (Dyarto and Setyawan, 2021, 1485). There are also limitations on capacity. For example, banks in the immature financial systems of Vietnam are facing

great difficulties in green financing, being unable to carry out adequate risk assessment and evaluation of new technology (T. C. Nguyen, Chuc, and Dang, 2018, 17).

1.5.2.4 Political economy of the LCT

In most selected countries, there have been few changes in the political regimes which have had significant impacts on their climate visions. Except for Armenia, which has been in a political crisis since 2018, the remaining countries have enjoyed a long period of political stability. As mentioned in section 2.2.1, their NDCs generally show progress in their climate agenda with increasingly strengthened commitments.

Nonetheless, many domestic forces are lobbying against LCT or specific measures to mitigate emissions. Business communities (and probably consumers) in many global south countries will oppose carbon taxes due to the extra costs, especially those in carbon-intensive industries, as in the case of Indonesia mentioned in the last section. Particularly, state-owned enterprises will be strong lobbyists against policies, such as the reduction of fossil fuel subsidies (Asian Development Bank, 2016, 6–8). Indonesia has been the largest coal exporter since 2005, with the coal industry contributing to nearly 3% of the country's GDP. A recent analysis estimated that closing all coal mines in Indonesia would reduce wages by US $6.11 billion (1.6% of the 2016 base), consisting of both layoffs in closed mines and by their suppliers (International Labour Organization, 2022, 16). Even governments might hesitate to impose a carbon tax themselves due to concerns over economic growth. Recently, the Philippines government explicitly mentioned concerns about security and competitiveness when explaining why the country was not ready for a carbon tax[22].

Corruption is at rather high levels in developing Asian countries. Table 9 shows the Corruption Perception Index (CPI) of selected countries, which ranks governments by how corrupt they are as perceived by experts and businessmen. In 2021, the Asia-Pacific region had an average CPI of 45 which was second only to the Western Europe and EU regions. However, taking countries with high rankings, such as New Zealand, Singapore, Australia, Hong Kong and Japan will lower the average score for this region considerably. For the selected countries, CPI 2021 shows a mixed picture of the situation, in which Bhutan and Armenia were countries with cleaner governments, while those of Uzbekistan, the Philippines and Nepal are considered highly corrupt.

Table 9. Corruption Perception Index (CPI) 2021 of selected countries (Source: Transparency International, Corruption Perception Index[23])

Country	Corruption Perception Index (CPI) 2021[1]	CPI ranking 2021
Vietnam	39/100	87/180
Indonesia	38/100	96/180
Philippines	33/100	117/180
China	45/100	66/180
Bhutan	68/100	25/180
Nepal	33/100	117/180
Uzbekistan	28/100	140/180
India	40/100	85/180
Armenia	58/100	49/180

[1] The results are given on a scale of 0 (highly corrupt) to 100 (very clean).

1.5.3 Assessment of gender inclusiveness in LCT visions

The way in which gender equity is incorporated into the LCT vision varies among the selected countries. However, some common trends can be observed from their commitments. Table 10 shows whether the gender aspect is considered in different climate actions and priorities of the NDCs[24]. First, this issue is considered in the adaptation component more often than in mitigation, which suggests a potential research gap. Evidence has suggested various significant contributions of women to climate change mitigation such as participation in policy making (Mavisakalyan and Tarverdi, 2019) and biodiversity conservation (Agarwal, 2009). Second, women

[22] https://www.pna.gov.ph/articles/1133078

[23] https://www.transparency.org/en/cpi/2021

[24] This approach can be found in the analysis of Huyer et al. (2016, 10–12).

tend to be recognized as the more vulnerable group and sometimes suffer from the uneven fulfilment of substantive human rights. Third, the most popular consideration is to mainstream gender equity into policy decision making and to identify women as agents of change or promoting their empowerment. Indonesia, Nepal and Bhutan mentioned plans to develop women's capacity in their NDCs.

Table 10. Reference to gender inequality in NDCs (Source: countries' NDCs)

Country	Vietnam	Indonesia	Philippines	China	Bhutan	Nepal	Uzbekistan	India	Armenia
Adaptation	yes				yes	yes	yes		
Gender mainstreaming		yes			yes	yes	yes		yes
Vulnerability	yes				yes				
Mitigation					yes				
Capacity development		yes			yes	yes			
Resilience		yes							
Human rights	yes				yes				
Decision making		yes				yes	yes		yes
Agents of change		yes	yes	yes	yes	yes	yes	yes	yes
Finance									

Besides gender inequality, some countries also mentioned youth and indigenous people in their visions for LCT. Youth was mentioned in most NDCs except Vietnam's. The Philippines, Nepal, Vietnam and Armenia also paid attention to indigenous people and local communities in their NDCs.

It has not been very long since gender equity entered into the climate agenda, so evidence for the differentiated effects of LCT policies on the two genders might not be abundant. In Indonesia, the Kerosene-to-Liquefied Petroleum Conversion Program is an effort to reduce dependence and subsidies on kerosene. Compared to LPG, kerosene creates three times more carbon monoxide emissions and 30% more particulate matter (PM) per unit of energy (Thoday et al., 2018). This program benefits women both in terms of health and time spent on cooking (Bharati, Qian, and Yun, 2018).

1.5.4 Challenges and opportunities of the LCT & GE vision

In Asia, there have been many promising initiatives for LCT & GE. For example, the ADB Carbon Market Program (Asian Development Bank, 2010a) aims to enhance developing countries' preparedness to participate in new carbon markets[25]. Given the willingness to participate in international carbon markets expressed in recent NDCs, this initiative plays an important role in promoting market mechanisms in LCT. Another example is the Climate Action for Jobs Initiative, which focuses on ensuring employment and welfare of people during the LCT. This initiative pays a good deal of attention to the Asia-Pacific region, where a potential of about 14 million net green jobs could be created by 2030 (International Labour Organization, 2019, 14).

Among the roadblocks for LCT and GE, resource limitation is a critical challenge. Global South countries in Asia need significant support in terms of finance and technologies. Besides, academic evidence on the issue of climate change and its impact on sustainability is needed to increase public awareness. Second, many Asian developing countries have limited capacity in applying existing technologies, research and innovation, management, policy enforcement and financing. Third, despite a growing trend of climate commitments and actions, low political will and conflicts of interest remain a huge roadblock in each country, complicating the dynamics of the regional LCT discourse.

1.6 Policy instruments for LCT & GE

1.6.1 Introduction - Regional trends

An increasing number of policy instruments has been promoted by developing Asian countries to comply with their growing commitments of emissions reductions. There is a new wave of interest in carbon pricing, a market-based mechanism to internalize the social cost of emissions. An appropriate price on carbon would curb emissions and induce the switch to clean technologies and renewable energy sources. However, the use of carbon pricing mechanisms has been limited. In developing Asia, instruments such as carbon tax and emissions trading systems have been mainly adopted by a few countries such as China and Indonesia. The ASEAN

[25] Asian Development Bank: Carbon Market Program (https://ercst.org/wp-content/uploads/2021/02/ADB-Article-6-Roundtable_27Nov2020-compressed.pdf)

region has shown strong ambitions, with countries such as Vietnam, the Philippines, and Thailand currently considering bringing these measures into effect.

Apart from these instruments, there are energy/fuel taxes (such as excise taxes) and fossil fuel subsidy reforms which can affect GHG emissions, although these instruments are not implemented with the explicit objective of GHG emissions reductions. A general trend in the selected countries was a decline of fossil fuel subsidies in 2015-2018. Many fossil fuel subsidy reforms took place during that period, perhaps due to the drop of world oil prices during this period (IEA, 2017). The trend was disrupted by the Covid-19 pandemic which had diverse impacts on the fossil fuel subsidy payments in the observed countries. Subsidies for fossil fuels are normally associated with fuel prices and are used as a tool to maintain the targeted inflation whenever there is a fuel price shock. Fossil fuel subsidies reform and fuel taxes in countries such as Vietnam and Indonesia are also politically driven. Scenario analyses show that Asian countries have a huge potential to reduce CO2 emissions by 2025 by eliminating fossil fuel subsidies or/and increasing fuel taxes and earmarking the revenue for renewable energy expansion. However, the feasibility of such policies is still questionable especially in the context of the Covid-19 pandemic recovery.

Renewable energy promotion is an important instrument that is becoming popular among Asian countries. Renewable energy has grown rapidly in China, India and Vietnam. However, an underdeveloped national grid, high cost of renewable energy absorption and declining investment capacity have restricted the expansion of renewable energy in Asia. Environmental standards are also applied to manage GHG emissions. However, except for China, the application of such instruments is only slowly making progress in other countries. Another instrument applied by Asian countries to tackle environmental issues is payment for environmental services (PES) schemes[26]. Countries with rich natural capital are all proactive to promote such schemes; however, these projects tend to be small-scale except for Vietnam's National PES program.

1.6.2 Tax on carbon emissions

1.6.2.1 Taxes and fees

Carbon taxes are attractive instruments to achieve target emissions reductions. However, they have not gained popularity since they were first proposed in the early 1970s. Various reasons have been cited for this lack of prevalence, including aggressive opposition from fossil fuel companies, concerns over competitiveness, employment and distributional effects, and a general aversion to carbon taxes, especially in comparison with emissions trading systems (Somanathan et al., 2014, 1159; Umit and Schaffer, 2020).

Like other regions, the implementation of carbon taxes in Asia was pioneered by high-income countries. The first Asian country introducing a carbon tax was Japan, which imposed a rate of JPY289/tCO2 (US $2.65) from 2012 and earmarked all the revenue for environmental issues. This tax rate was expected to bring about a 26% reduction in carbon emissions by 2030 and 80% in GHG emissions by 2050. It was nonetheless still significantly lower than those recommended by UNFCCC and IMF (Gokhale, 2021). Singapore introduced its carbon tax in 2019 at SGD5/tCO2 (USD3.72) through the Carbon Pricing Act No. 23 of 2018. In the Singaporean taxing scheme, facilities emitting 2,000 tCO2e/year or higher must report their emissions annually, while those who report at or above 25,000 tCO2e/year must pay carbon tax (Asian Development Bank, 2021d, 18). The latter has been considered more ambitious. While there has been no plan for carbon tax reform in Japan, Singapore is aiming to raise the tax rate to SGD10-15/tCO2 (USD7.43-11.15) by 2030.

China and India, the two top emitters, have not administered carbon taxes. The Chinese government appears to favor an ETS over a carbon tax as it has recently established the world's largest carbon market (discussed later). However, evidence is mixed on which of the two mechanisms would be more efficient in the context of China (Hu et al., 2020; Jia and Lin, 2020). In India, carbon tax also seems to be disfavored by the government. Debates often focus on the tax's negative impact on GDP growth and income distribution, but evidence implies that such concerns might be exaggerated (Ojha, Pohit, and Ghosh, 2020). With a coal cess currently in place (discussed later), it inevitably takes the Indian government extra efforts to persuade people to pay more tax on carbon emissions, despite the growing evidence of its efficiency (see, e.g., Azad & Chakraborty, 2020; Gupta et al., 2019).

[26] For example, in Vietnam, according to Decision 380 issued in 2009, agencies including hydropower plants, water suppliers, and ecotourism companies who used the watershed forestlands in Lam Dong province had to pay the local authorities prices determined by the government. The local authorities then paid households who managed the forestlands (To et al.,2012).

Among developing Asian countries, Indonesia has made the most progress in establishing a carbon tax. First mentioned in a discussion of the Ministry of Finance in 2009, a carbon tax was officially introduced in Law No. 7/2021 on Harmonization of Tax Regulation. The plan is to initially impose a carbon tax on coal-fired power plants, starting in April 2022. However, due to various difficulties, the implementation of this carbon tax has been deferred to July 2022. The carbon tax will be determined based on the market prices, with a minimum rate of IDR75 per kilogram of CO2e (about US $5.2/tCO2e) (Asian Development Bank, 2021d, 19).

In other ASEAN countries, carbon taxes are under consideration. There has been a general agreement on the potential of this policy for sustainable national and regional development and even a proposition of an ASEAN-wide carbon tax (ASEAN Secretariat, 2021, 75). However, one should expect that the implementation and effects of carbon tax will vary among the ASEAN member states due to heterogeneity in their socio-economic context (Nurdianto and Resosudarmo, 2016). In Vietnam, the recent revision of the Law on Environmental Protection put emphasis on the uses of economic tools. A relatively low but increasing carbon price could be effective for the country's emissions reduction goals, even though this would not be politically easy to establish (Do and Burke, 2021). In the Philippines, as mentioned above, a carbon tax is often disfavored due to competitiveness and security concerns. In the case of the Philippines, studies show that policies inducing changes in the efficiency and mix of energy might have a lower medium-term impact on the economy than a carbon tax (Cabalu et al., 2015), and the carbon tax could be used as an instrument to finance renewable energy development (Mondal et al., 2018).

There has been almost no intention to introduce a carbon tax in Nepal, Bhutan, Uzbekistan and Armenia. Uzbekistan stated in their revised NDC that they were open to its adoption, but no further plans were made.

1.6.2.2 Tradable emission permits

In Asia, carbon markets have been introduced in Japan, Korea, China, and Kazakhstan. They are also under consideration in countries such as Vietnam, Indonesia, Thailand, Malaysia and Pakistan. Japan set the first examples of an ETS in Asia with the Tokyo Cap-and-Trade Program and the Saitama ETS. The former was initiated in 2010 while the latter followed in 2011. Both are local markets (the two are linked and participated in by companies in Saitama and metropolitan Tokyo respectively) that cover 20% of the emissions from the energy and construction sectors.

In 2013, China started pilots for its own ETS, which proved efficient and led to the establishment of its national ETS – the world's largest carbon market. Chinese ETS pilots began in 2013 in Shenzhen and then spread to six other regions, which represent one-fourth of the country's GDP. The pilots were based on a cap-and-trade model, covering multiple sectors. Emissions allowances are allocated, by assignment or auction, to emitters and can be traded among them in the secondary market. Most of the pilot regions covered only CO2 and all of them required third-party validations of reported emissions from the emitters (Z. Zhang, 2020). The pilots' results in terms of emissions and pollution alleviation were rather positive (Jia and Lin, 2020; Yan et al., 2020). The estimate from Wen et al. (2021) shows a 12.8% reduction in the pilot regions' total industrial CO2 emissions (about 1,165.72 MtCO2) from 2011 to 2015. Evidence from Cui et al. (2021) shows that the pilots helped reduce 16.7% of total emissions and 9.7% of emission intensity (emissions per unit of output value).

These positive results led to the announcement of China's national ETS in 2017, which came into effect on February 1st, 2021, and immediately became the largest ETS worldwide by volume of emissions. This market covers around 30% of China's emissions (about four billion MtCO2)[27]. Initially, the national ETS covered only the power sector, but will soon expand to the construction, oil, and chemicals industries. It will also soon integrate all the pilot ETS, which are still operating in parallel.

The implementation of the ETS in China appears effective in curbing emissions, but not without trade-offs, especially in the short run. The ETS was estimated to cost China 0.19-1.44% of its GDP (Lin and Jia, 2019). The emissions reduction calculated in Wen et al. (2021) comes with a loss of US $863 billion (RMB5,608 billion) in the value of industrial output. The ETS pilots also appeared to increase risks in covered sectors, but this was coupled by a change in investment structure toward a higher proportion of long-term investments (Kai Li et al., 2022).

In Southeast Asia, although ETS has not been put into practice yet, considerable progress in planning has been

[27] Carbon Pricing Dashboard, China national ETS

made in Vietnam, Indonesia and the Philippines. In Vietnam, after being legalized in the revised Law on Environmental Protection, an ETS is being designed by the Ministry of Natural Resources and Environment (MONRE) and the Ministry of Finance (MOF).[28] The ETS, which will allow for carbon credits and domestic and international offsets, will be piloted by 2025 and is expected to officially be in operation by 2027 (Asian Development Bank, 2021d, 19–20; ICAP, 2020). In Indonesia, the government passed the "Regulation on Environmental Economic Instruments" in 2017, providing a basis for an ETS. A voluntary emissions trading pilot for the power sector was run from April to August 2021, covering 26 state-owned and private coal-fired power plants. Participants could trade the emissions allowance units, as well as offset credits from renewable energy generation. The pilot program will be continued with new phases before the establishment of an official one in 2024 (ICAP, 2022b). In the Philippines, emissions trading systems have been discussed in congress at various points. Since 2020, the House Committee on Climate Change of the Philippines House of Representatives has been considering House Bill (HB) No. 2184 - the Low-Carbon Economy Act, which aims to establish a domestic GHG emissions cap-and-trade system covering sectors with (a) the highest greenhouse gas emissions; and (b) the most cost-effective opportunities to reduce emissions (ICAP, 2022a).

In India, a national carbon market is being planned. The country is actively involved with the international carbon market Clean Development Mechanism (CDM) under the Kyoto Protocol. In this mechanism, developed countries pay developing ones to adopt lower-polluting technologies than they otherwise would. Emissions reductions achieved by CDM projects would be converted to Certified Emission Reductions (CERs). Together with China, India hosted a large number of CDM projects and produced about 16% of over 1 billion CERs issued (World Bank, 2010). In its current plan, India will develop some Perform Achieve and Trade (PAT) schemes in which reduction in energy consumption can be converted into Energy Saving Certificates (ESCerts), which can be traded. Such schemes will lay the groundwork to introduce a voluntary carbon market (VCM) in India (Bureau of Energy Efficiency, 2021).

Not much has been reported on the planning process of ETS in Vietnam, Indonesia, the Philippines and India, but these countries are likely to vary in readiness for this instrument. With respect to technical factors, experience from a brief pilot of a voluntary scheme in 2021 gives Indonesia an edge, while exposure to the international carbon market is to India's advantage. In terms of policy readiness, the three Southeast Asian countries have been more active in strengthening their climate commitments and introducing new legislation supporting ETS. Except for the Philippines, the three remaining countries are participants in the Partnership for Market Readiness. This initiative provides its members with funding and technical supports to design and implement carbon pricing policies that could play an important role in enhancing the necessary institutions for ETS. Little can be said about the readiness for ETS in the remaining selected countries.

1.6.3 Fuel-based tax

1.6.3.1 Taxes: Coal cess and other charges added to fuel cost

Fuel taxes can be instrumental in incentivizing energy savings, and they do not cause direct rebound effects in the same way as energy efficient technology does (Linares and Labandeira, 2010). IMF (2019) shows that a specific coal tax can achieve 65% to 68% of the reduction in CO2 emissions that a broad carbon tax of US $75 per tonne would do in Nepal and Indonesia in 2030, while it can be over 80% as effective as a broad carbon tax in coal-intensive economies like Philippines, Vietnam, India and China. IMF (2019) also indicates that although electricity output tax and road fuel tax can reduce CO2 emissions in Asian countries, the reduction is very modest compared to the reduction induced by a broad carbon tax. Apart from environmental purposes, welfare distribution is also often considered in reforming fuel taxes (IMF, 2021b). In this section we review the impact of fuels taxes on CO2 emissions, welfare distribution and their implications in the contexts of India, Vietnam and China.

India referenced coal cess[29] and an increase in taxes on petrol and diesel as climate action toolkits in the Intended Nationally Determined Contribution (INDC) (Republic of India, 2015). India introduced a cess on domestically produced and imported coal and coal derivatives (lignite and peat) in 2010, which was revised three times with an increasing rate from Rs 50 to Rs 400 per tonne. The cess is claimed to

[28] The MONRE and the MOF oversee the design of a domestic emissions trading scheme and a crediting mechanism. The MONRE is responsible for establishing an emissions market, approving a periodic and annual GHG emissions limit for the country, and distributing emissions quotas to emitters.

[29] A cess is an excise duty on coal and coal derivatives levied by the government to generate resources for activities in the area of clean energy.

be an implicit carbon tax whose rate can be comparable to the average international carbon tax rate (Ojha, Pohit, and Ghosh, 2020). Simultaneously, the National Clean Energy Fund (NCEF) was set up and financed by the revenue from the coal cess. While there are limited direct measures of the amount of GHG reduced by the current coal cess rate, some studies find that a more aggressive coal cess can lead to further GHG emissions reductions. Parry et al. (2017) show that increasing the coal cess by INR150 per tonne each year from 2017 to 2030 would reduce CO2 emissions by 12% and prevent 270,000 deaths due to air pollution over the same period. A more aggressive tax (twice the mentioned increase) on coal can result in 75% greater environmental effectiveness. In addition, an increase of coal tax by 10-15% can help India achieve 40% electricity generation from non-fossil fuel based energy resources by 2030 if the tax revenue is spent on renewable energy (Pradhan and Ghosh, 2022). In terms of distributional impact, Parry et al. (2017) find that coal cess is mildly progressive, i.e. it imposes more burdens on households at the highest consumption decile (0.18 percent of consumption) than households at the bottom of the consumption decile (0.14 percent of consumption). This is consistent with the findings of Datta (2010) which show that all fuel taxes, except for taxes on kerosene, are progressive. Nonetheless, as a result of a India's coal industry lobby, a group of politicians in India have actively sought cess waivers to finance pollution-curbing equipment (Varadhan and Ahmed, 2019). In addition, although revenue from coal cess is supposed to finance clean energy related projects, in practice, during the 2016 – 2018 period, only 24% of coal cess revenue was transferred to NCEEF (Department of Expenditure, 2018).

In 2018, Vietnam's Ministry of Finance proposed an increase of 50% and 33.3% in tax rates on coal and petroleum, respectively, to balance the state revenue that fell short due to a decrease in import taxes on oil and petroleum products (Das, 2018). It is estimated that a 33.3% tax increase on petroleum products alone might result in a decrease of 10.4% in CO2 emissions and 5.31% in non-CO2 emissions. However, these reductions are still lower than the reductions achieved by an increase of 50% in a tax rate on coal (11.18% in CO2 emissions and 9.44% in non-CO2 emissions, respectively) (Nong et al., 2019). In addition, an increase in tax on coal was found to be less harmful to economic growth than an increase in taxes on petroleum products. However, only the proposed increase in tax rates on petroleum and diesel was approved and enforced in 2019, which shows the Vietnamese government's reluctance to phase out coal as a resolution to the GHG emissions (Climate Transparency, 2020; Dorband, Jakob, and Steckel, 2020). In response to the fuel price hikes and a spike in demand for fuels, the government decided to reduce the environmental protection tax on oil and petroleum products by 50%, which means that the tax rate is lower than the one before the adjustment in 2018 (MOIT, 2022). Thus, economic growth and price control, not emissions reductions, are often the primary goal of taxes on fuels in Vietnam.

In some cases, fuel taxes are used to prevent overconsumption when fuel prices fall substantially. China increased the consumption tax on gasoline three times in the 2014-2015 period to control gasoline consumption when the international price of crude oil dropped sharply (Zhao et al., 2018). The increase in consumption tax is estimated to reduce CO2 emissions by 0.1%, given the share of gasoline emissions is 7.5%.

1.6.3.2 Fossil Fuel Subsidies reforms (both for fuel and equipment)

Fossil fuel subsidies in the selected countries mainly target end-users except for Indonesia, where 62% of government support is directed to firms. Supports for petroleum account for a large share of total fossil fuel subsidy payments in Armenia, Bhutan, China, Indonesia, and India, while fossil fuel supports in Vietnam are mainly for coal, and the support in Uzbekistan is mainly for natural gas. Fossil fuel subsidies reforms have been globally considered as one of the cost efficient policies to encourage energy efficient consumption, especially fossil fuel consumption, and as a result, reducing CO2 emissions (Burniaux and Chateau, 2014). This section provides an overview on the fossil fuel subsidies reforms undertaken in China and Indonesia and some analysis of the potential impacts of fossil fuel subsidies on removal of CO2 emissions and welfare distribution.

China remained the largest provider of fossil fuel support among selected countries, followed by India and Indonesia. By 2016, China implemented several fossil fuel subsidy reforms, especially the supports for coal and petroleum which might lead to a substantial decline in the subsidy payments for these fuel in 2016 (subsidy payment for coal and petroleum decreased by 33.6% and 42.1% respectively in

2016[30]). Although there is no direct measure on the impacts of the implemented reforms on GHG emissions of China, the potential impacts of removing fossil fuel subsidies have been estimated. An earlier study conducted by Hong, Liang, and Di, (2013) indicates that removal of all energy subsidies would reduce the consumption of coal, oil, natural gas and electricity by 17.74, 13.47, 3.64 and 15.82 million tonnes of coal equivalent (tce). Other estimates conducted by (Ke Li and Lin, 2015) show that the removing of all fossil fuel subsidies would reduce energy consumption and emissions by 3.77% and 2.85%, respectively. In the most recent study, Kuehl et al. (2021) find that by removing all supports for fossil fuels by 2025, China can achieve a reduction of 160 Mt CO2 emissions by 2030.

According to the calculation of OECD[31], Indonesia was the second largest provider of fossil fuel subsidy payments among the selected countries until in 2015. Prior to 2015, the country implemented several reforms such as reducing electricity subsidies for industrial sectors in 2014, eliminating gasoline subsidies and setting the fixed subsidy payment for diesel, and stopping subsidies to 12 groups of electricity consumers in 2015, which results in a significant drop in the subsidy payments (Ministry of Finance, 2019). In 2017, in the effort to redistribute the support in favor of the poor, Indonesia also restricted the subsidy for 900VA electricity to poor and vulnerable groups only. A removal of all fossil fuel subsidies is projected to reduce final energy consumption by 10% and CO2 emissions by 9% in 2030 relative to the BAU (Asian Development Bank, 2015). The removal of all subsidies is projected to have slightly stronger effects on households in the urban areas; however, the skilled self-employed group in the rural areas is the most affected if there is no compensation from the government. Government compensation is necessary to offset the welfare loss from the removal and is most efficient when cash transfers were targeted only at households in the bottom 40% of income distribution (Asian Development Bank, 2015). However, history shows that the subsidies reforms in Indonesia were mainly driven by political and macroeconomic reasons rather than environmental purposes (Chelminsky, 2018). A substantial amount of the recovery budget allocated to the fossil fuel sector during the Covid-19 pandemic (accounting for 96% of the budget committed to support the energy sector) (OECD, 2022b) is an example of the government's priority in formulating policies for fossil fuel subsidies.

The fossil fuel subsidies in India have been criticized for favoring the rich, i.e. the subsidy benefits received by household at the top decile of wealth distribution is seven times higher than the benefits enjoyed by households at the bottom decile (Anand et al., 2013). The leakage in subsidized kerosene, which is the fuel largely used by the poor, is also large (54%) (Acharya and Sadath, 2017). Acknowledging the leakage of fuel price subsidies through the public distribution system, in 2011 India initiated the switch from price subsidies to direct cash transfers. This reform is expected to benefit the targeted groups (such as women, low-income households) (S. V. Sharma, 2013).

1.6.4 Emissions pricing and market experiences

1.6.4.1 Challenges in pricing carbon: assumed regressive effects, diffused benefits, and concentrated costs. Public displeasure around increased prices

Carbon pricing, despite being a compelling instrument for LCT, faces many challenges in planning and implementation in developing Asia. Many of these countries rely heavily on fossil fuels for economic activities and government revenues, which makes a higher price on carbon unattractive (Doda et al., 2022). Studies often suggest a short-term loss of GDP depending on the scenarios (see, e.g., Jia & Lin, 2020; and Lin & Jia, 2019 for the case of China; Nong et al., 2020 for the case of Vietnam; and Ojha et al., 2020 for the case of India). Concerns over this trade-off can be huge obstacles for carbon pricing in developing countries.

Such political hurdles grow larger when carbon-intensive industries join in and lobby against the policy because of economic growth and competitiveness. In the Philippines, the Department of Energy argued that imposing a carbon tax might not always be the best and most preferred choice considering the country was ranked top on the most expensive energy rates in the region. As a result, a carbon tax in the power sector would make the sector uncompetitive and prohibit sector growth (The Philippine News Agency, 2021). This demonstrates a situation of diffused benefits and concentrated costs, where the beneficiaries of a policy are too scattered to support it, and industry interests quickly gather to oppose it. The review of Doda et al. (2022) provides a comprehensive list of such opposed political forces for countries in East and

[30] The Fossil Fuel Subsidy Tracker: https://fossilfuelsubsidytracker.org/country/

[31] The Fossil Fuel Subsidy Tracker: https://fossilfuelsubsidytracker.org/country/

South Asia including some selected for this review such as India, Malaysia, Indonesia, the Philippines, Uzbekistan and Vietnam.

People and enterprises may also resist carbon pricing to avoid additional costs in their consumption and production activities. Strong opposition and protests occurred in Western developed countries such as France, Australia and the US (Maestre-Andrés, Drews, and van den Bergh, 2019; Mehleb, Kallis, and Zografos, 2021). Although such situations have been rarer in developing Asia, recent hardships such as the COVID-19 pandemic may add potential resistance.

Concerns over the distributional effect of carbon pricing is another barrier. The policy may be regressive and affect lower-income households more than other groups when a larger share of their incomes is used for energy-intensive goods and services. However, evidence implies that such a regressive effect is not likely in most poor countries (Dorband et al., 2019; Steckel et al., 2021). The analysis of Steckel et al. (2021) for developing Asia found that the distributional effect can be highly heterogenous, but it is likely progressive.

1.6.4.2 Discussing politics around taxing (non-carbon) fuels – intersection of industry and government

Subsidy reforms in Indonesia often faced opposition and protests from the middle income class, especially motorbike owners who enjoy considerable benefits from subsidized fuels. It is worth noting that their reaction is often manipulated by political parties to maintain the fuel subsidies. Vested interests in industries that benefit most from subsidized fuels – such as the state-owned oil company Pertamina, the Indonesian oil-trading lobby, vehicle manufacturers and distributors and freight and public transport remain opposed or ambivalent towards reforms and have lobbied intensively against them. The long history of fossil fuel subsidies has created the country's 'oil and gas mafia' which creates another barrier to fuel subsidy reforms (Chelminsky, 2018).

The coexistence of ambitious renewable energy policies and continued investments in fossil fuels are significant features of China's energy politics, which is formed by the fragmented nature of policy making institutions. Historically, each energy sector was governed by a distinct ministry. The effort to centralize energy sector governance brought independent agencies under the umbrella of the NDRC. Nonetheless, conflicting interests continue to coexist within the various branches of the central government as well as the state-owned oil and coal companies. Energy policy making and enforcement are also affected by local governments which have maintained huge economic growth incentives since the fiscal and administrative decentralization in 1980s. Since local officials can only receive rewards from short-term growth, they have little incentive to promote environmental protection policies (Nahm, 2019).

Although coal contributes a large share of CO2 emissions that threaten the environment and cause serious health problem, Vietnam is reluctant to impose an environmental tax on coal for energy security reasons. Since the cheap hydro power sources have mostly been exploited, Vietnam depends on coal to maintain electricity tariffs which are set below the cost recovery rate. The slow progress on electricity reform hinders the use of cleaner fuels to replace coal as it hampers the upgrade of the national grid, and consequently restricts the integration potential of renewable electricity to the national grid. The strong incumbent resistance to the transition and the promotion of domestic energy enterprises are often linked to incumbent vested interests and personal benefits (Dorband, Jakob, and Steckel, 2020).

1.6.5 Other instruments

1.6.5.1 Renewable energy subsidies

Support for renewable energy is mainstream in Asian countries. China remains the largest investor in renewable energy, accounting for 27.5% of total global investment. Vietnam ranked 3rd in terms of additional renewable energy capacity (REN21, 2021). The growth of renewable electricity at the globally fastest rate contributed to India's success in achieving 40% of its power capacity from non-fossil fuels-almost nine years ahead of its commitment made at COP 21-Paris Summit (Birol and Amitabh, 2022). Supports for renewable energy in Asian countries are often in the form of fiscal incentives such as tax reductions and accelerated depreciation, and non-fiscal incentives such as feed-in-tariff (FIT) systems (which was utilized by seven of 10 of the selected countries).

For those countries in which the energy supply is heavily dependent on fossil fuel imports such as the Philippines and Armenia, the benefit of investments in renewable energy is twofold: (i) reducing CO2 emissions; and (ii) ensuring energy security (Peimani and Taghizadeh-Hesary, 2020; Shadrina, 2020).

There is evidence of the potential impact of a switch from fossil fuel subsidies to supports for renewable energy on CO2 emissions reduction in Asia. A simulation model developed by Kuehl et al. (2021) shows that if 30% of additional revenue saved from a removal of fossil fuel subsidies is spent on energy efficiency improvement and renewable energy expansion, Indonesia could reduce its CO2 emissions by 10.14%, which would be the largest percentage of emission reduction among 32 studied countries included in the model.

China's leadership in low-carbon energy technologies, especially in hydropower and solar power, is well-evidenced. In terms of hydropower, China firms are among the largest dam builders regarding the size of the projects, the investment amount, and the technologies. Regarding solar power, China has caught up with global leading innovators such as those in the US and Japan (Gosens, Gilmanova, and Lilliestam, 2021). Chinese investment has contributed to the expansion of hydropower in poor countries such as Myanmar, Cambodia and Laos (Huang, 2019). China has also indirectly contributed to the expansion of solar power in developing countries by making the price more affordable (Jackson, Lewis, and Zhang, 2021). However, there is limited evidence of the transfer of skills, know how, and expertise in hydropower projects (Urban, 2018) as well as in solar photovoltaic investment projects from Chinese firms to recipient countries (Jackson, Lewis, and Zhang, 2021). In some dam building projects such as Myitsone dam in Myanmar, Chinese investment was evaluated to be harmful to the local ecological system, and therefore, was suspended (Huang, 2019).

There are some obstacles to renewable energy expansion in Asian countries, such as the high cost of renewable energy absorption due to the seasonal variability of this source in India (Kanitkar, Thejesh, and Ranjan, 2021), the underdeveloped national grid in Vietnam (EIA, 2021) and declining capacity investment in China (REN21, 2021).

1.6.5.2 Technology standards and other quantitative instruments

Environmental/emissions standards can play an important role in managing GHG emissions. For example, in 2014, China introduced the ultra-low emissions (ULE) standards policy for renovating coal-fired power units to limit SO2, NOx and particulate matter (PM) emissions to 35, 50 and 10 mg m–3, respectively. The policy results in a reduction of SO2, NOx and PM emissions released by coal-fired power units by 65%, 60% and 72%, respectively, in the 2014-2017 period (Tang et al., 2019). The imposition of such strict regulations is rather slow in other countries such as India (Nazar et al., 2021), Vietnam and Indonesia (Gallagher et al., 2021).

In terms of emission standards for vehicles, China's stage 6 emissions standard, which is comparable to Euro 6 emissions standard, was proposed in 2016 and enforced in 2021. The standard is projected to reduce total vehicle emissions of HC, CO, NOX and PM2.5 in 2030 by approximately 39%, 57%, 59% and 79%, respectively, compared with 2013 levels (Tang et al., 2019). Similarly, in 2016, India decided to leapfrog to Bharat Stage VI standards which are equivalent to Euro VI standards from the Bharat Stage IV. The standards went into effect in April 2021 (Shao, 2020). Southeast Asian countries such as Vietnam and Indonesia still lag behind in applying new standards on vehicle emissions (Hirota and Kashima, 2020).

1.6.5.3 Payment for ecosystem services, forestry and land use

Payments for environmental services are growing in importance in the arsenal of policy tools encouraging transition to green growth. Countries such as Vietnam, China, India, Indonesia and the Philippines have been proactive in applying that tool for forestation and carbon reduction from deforestation (Asian Development Bank and Asian Development Bank Institute, 2013). Some programs were successful in promoting the inclusion of vulnerable groups and reducing poverty.

Vietnam became the first country in Asia to institutionalize a nationwide policy on Payments for Forest Environmental Services (PFES) in 2010, whereby the users of certain forest ecosystem services must compensate the agents responsible for supplying them. 3-5 million ha of forest areas are annually protected with support from the PFES budget. More than US $213 million has been generated through approximately 400 contracts signed with hydropower plants, water suppliers and tourism facilities. With annual revenues between US $50 to $60 million, PFES payments have provided additional capital investment for the forestry sector, accounting for about 25% of the sector's total capital (Vietnam Forest Protection and Development Fund, 2014).

The Sloping Land Conversion is the largest ecological restoration project in China and PES initiative in the developing world, with a total current investment of more than US $69 billion (Liu and Lan, 2015). By 2012, the program had achieved the afforestation of 9.7 million ha of cropland to forest and grassland (Song et al., 2014). It was estimated that in the first 10 years of implementation, the program managed to sequester 222 to 468 million tons of carbon (Persson et al., 2013). Song et al. (2014) found that the program had a positive effect on soil organic carbon accumulation, which helps mitigate climate change.

1.6.6 Intersectional Inclusiveness of these policy Instruments

1.6.6.1 Energy Access and Inclusiveness

Modern energy sources require capital-intensive distribution networks (e.g., grids, pipeline, bulk transport), which limits access for many rural and poor communities. Across developing Asia, 1.5 billion people lack clean cooking fuels (Table 11) and about 133 million people lack access to

electricity (Table 12)[32] (IEA, 2022). Together with poverty, this low accessibility affects men and women differently. First, in the absence of modern energy, women bear higher costs due to existing gender inequality and institutions such as gender roles and social norms (United Nations, 2018, 3). Numerous women and girls spend a large share of their time gathering wood fuels, exposing themselves to various risks (e.g., accidents, assault). In rural India (V. Sharma and Dash, 2022), China (Liu et al., 2020), Bhutan (Dendup and Arimura, 2019), Nepal (Paudel, Jeuland, and Lohani, 2021) and the ASEAN region (ASEAN and UN Women, 2021, 23), using dirty energy indoors leads to household air pollution, which is a huge health risk for people. With respect to this threat, women and children are affected disproportionately because of the longer time spent indoors and cooking (Foell et al., 2011). Inadequate access to energy, and time spent on cooking and other household chores also hindered women's chances for education and economic opportunities (UNDP, 2019). Second, better access to energy enhances women's ability to engage in income-generating activities. Time savings from cooking and doing chores using improved energy sources could imply higher participation in the labor market. Third, improved educational and earnings opportunities promote women's empowerment (Duflo, 2012), next to factors such as access to televisions, higher security, and more active participation in social life (IISD, 2016, 11).

Table 11. Access to Clean Cooking (Source: IEA, World Energy Outlook-2021, based on WHO Household Energy Database and IEA World Energy Balances 2021)

	Proportion of the population with access to electricity					Population without access (million)
	National			Urban	Rural	
	2000	2010	2020	2020	2020	2020
Developing Asia	67%	79%	97%	99%	95%	133
China	99%	>99%	>99%	>99%	>99%	<1
India	43%	68%	>99%	>99%	>99%	3
Indonesia	53%	67%	>99%	>99%	>99%	<1
Other Southeast Asia	65%	79%	92%	98%	86%	33
Other Developing Asian Countries	38%	58%	82%	90%	77%	97
Other Asia	11%	30%	64%	89%	55%	20

Table 12. Electricity Access in Developing Asia (Source: IEA, World Energy Outlook-2021)

	Proportion of the population with access to clean cooking			Population lacking access (million)	Population relying on traditional use of biomass (million)
	2000	2010	2020	2020	2020
Developing Asia	30%	43%	62%	1516	1349
China	43%	54%	66%	484	387
India	22%	35%	65%	491	459
Indonesia	6%	42%	82%	48	43
Other Southeast Asia	34%	48%	59%	162	153
Other Developing Asia	19%	27%	39%	332	307
Other Asia	10%	21%	34%	36	34

1.6.6.2 Impact of Policy Instruments on Inclusiveness (in General)

Policies promoting clean and renewable energy sources attract much attention on their gendered impact. Due to the relationship between access to clean energy sources and women's wellbeing, these policies appear promising. During the period of 2000-2020, the proportion of the population with access to clean energy for cooking doubled in developing Asia, from 30% to 62% (Table 11), and most people here gained access to electricity (Table 12). Alongside with these achievements, there has been evidence on improved women's productivity and empowerment. In Indonesia, Bharati et al. (2018) found that the subsidy from an LPG Program helps women save time, helps them increase their participation in the labor force and strengthens their decision-making power in the household. A similar observation was made in the case of a rural electrification program in Bangladesh (Barkat et al., 2002). In India, a solar power system enabled children to study longer in the evening and shortened cooking times (Millinger, Mårlind, and Ahlgren, 2012). In Bhutan, rural electrification enabled access to television, which promoted women' empowerment in the role of an information medium (Asian Development Bank, 2010b). A switch from traditional energy structures (e.g., biomass and coal) to improved ones (e.g., solar energy cookers, biogas digesters and energy saving stoves) helped women in Northwest China shorten their cooking time by half, save a considerable amount of money, of which over 90% was used to buy clothes and cosmetics products, to travel, and lower their health risks from indoor air pollution (Ding et al., 2014).

However, with respect to the health effect, while many

[32] See a more detailed breakdown of tables 3-11 and 3-12, please refer to tables A2 and A3 in the Appendix.

studies present information or anecdotal evidence of the damage from burning solid fuels or document the presence of household air pollution when burning solid fuels, they rarely assess the impact of clean energy cooking projects. Zhang and Smith (2007) confirmed that the pollution level in households using solid fuel generally exceed the country's standards. Huboyo et al. (2014) shows a similar result for Indonesia. But Bharati et al. (2018) found no clear evidence on the health effect of the LPG Program. Thoday et al. (2018) emphasized that addressing such effects was not an objective of the program.

Reviewing the studies examining the gendered impact of coal phase-out globally, Walk et al. (2021) found that most of the literature is focused on countries in the Global North. Results from the review suggest that coal phase-out can have both negative and positive effects on women. Since men dominate employment in the coal industry, the phase-out results in a high male unemployment rate, forcing women to work to offset the income loss. This can be beneficial for women if they can get good job and then enhance their status, however, this also pushes some women to take precarious jobs. Some studies find that male unemployment causes an increase in domestic violence incidents. It is worth noting that the effect can vary, and depends on the socioeconomic condition of each country. The availability of such research in the context of Asian developing countries is very limited.

It is also useful to note the unintended gendered effect of some energy policies. For example, hydropower projects in Laos and Vietnam occasionally lead to land-grabbing and the displacement of rural laborers. In many cases, evidence showed that men are more likely to find new jobs than women due to gendered norms and access to opportunities (Hill et al., 2017). In India, hardship from land loss due to a large dam project induced alcoholism and domestic violence (Levien, 2017).

1.6.6.3 Inclusiveness in the Design and Implementation of LCT-related Policy Instruments

The two examples in the last section demonstrate that even policies that appear at first glance to be beneficial to women might have unwanted effects that deepen inequality. LCT-related policy instruments need careful gender considerations in their design. One example is that renewable energy projects often employ a larger proportion of male than female laborers. This is partly because jobs in this industry often involve manufacturing, construction, and engineering, which are deemed as male jobs. A report by the International Renewable Energy Agency (IRENA) (2019, 10) shows that, although its multi-disciplinary nature allows for a higher proportion of female employees than traditional energy businesses, the renewable energy industry still imposes persistent barriers to entry for women. Besides, unequal access to technologies and economics assets may hold back entrepreneurship by women in this industry (Resurrección and McMullen, 2019). Therefore, unless gender is carefully considered for inclusive purposes, women cannot reap full benefits from renewable energy development.

In many cases, the gender aspect has simply been ignored and the gender impacts of LCT-related policy instruments have not been emphasized in impact analysis when policy evaluations are being done. In Nepal, although women were recognized as a vulnerable group in the assessed adaptation projects, there was a lack of analysis on gender inequality; therefore, none of these projects identified gender equality as an objective (Rai, Chhetri, and Dhital, 2020). In Vietnam, Nguyen et al. (2020) found the lack of gendered impact evaluation for adaptation projects in Vietnam, even in those where gender issues were mainstreamed throughout the project circle. Therefore, progress on gender issues was not captured in most of the project reports.

In the context of developing Asia, the integration of gender into policy instruments has been quite inadequate. In Vietnam, in reviewing national policies for renewable energy, ISPONRE (2021, 87–89) found almost no explicit gender integration. Most policies are "gender-blind" except one mentioning the Women's Union for communication on saving energy. In addition, the report also found few guidelines on how to mainstream gender into policies and virtually no mechanism for monitoring and evaluation of such procedures. A review in Govindan et al. (2020) pointed out that only 4 of the 14 Indian electricity policies and 6 of the 23 Nepalese ones since around 2000 had included references to gender. However, this review also noticed a positive sign where recent policies tend to focus more on gender, which is in line with our observation of the increasing reference to gender in the countries' vision (e.g., NDCs). The evolution of electricity policymaking in Nepal appeared more gender-advanced by recognizing the disproportionate impacts on women and promoting the inclusion of women in formulating policies. Notably, in China's 14th Five-Year Plan for the energy sector, a whole article was devoted to women, children and the disabled

with many commitments[33] made to ensure their rights and interests, including those about establishing monitoring and evaluation mechanisms. Although it is still early to know how these promises are fulfilled, this integration of inclusiveness in such a high-level document laid the basis for more gender-balancing actions in China.

1.6.7 Knowledge and research gaps on policy instruments

Despite the recent interest in carbon pricing, further efforts are needed from Asian developing countries to design carbon taxing schemes or ETSs. With its favorable conditions such as large-scale markets and a command-and-control governance style, China spent a decade to officially bring into effect its national carbon market. In Indonesia, despite rapid progress, operational difficulties have delayed the implementing of carbon tax. With respect to a post-pandemic context and the urgency of the emissions reduction task, this suggests that countries with ambitious climate goals such as Vietnam, Indonesia, Philippines and Thailand can benefit immensely from external supports in terms of consultancy and facilitation. Further research in this area is crucial.

Literature evaluating the impacts of implemented reforms on fossil fuel subsidies or taxes is very scarce. One of the reasons is that these policies prioritize serving the macroeconomic goals such as stabilizing consumption prices (the government increases fuel taxes and/or reduction of subsidies when fuel prices drop and vice versa), increasing tax revenues or reducing energy poverty. Scenario analyses are often applied to estimate the efficiency of using taxes and subsidies reforms in reducing GHG emissions. However, since the feasibility of these scenarios is questionable, these analyses are rarely informative enough for policy formulations to curb GHG emissions while curtailing the negative impacts on macroeconomic targets.

There is little evidence on the substitution effect between fossil fuel and non-fossil fuel. Specifically, although there are discussions on the possible impacts of using tax revenues or savings from fossil fuel subsidies reforms to invest in renewable energy, in practice, information on how governments spend the revenue is rare, except for the case of Coal cess in India. However, there is no evaluation on the effects of such spending.

1.7 Alignment of climate finance with national policies

1.7.1 Introduction to climate finance instruments and mechanisms available

Finance sources for LCT in developing Asia comes from inside and outside the countries. International funding to developing countries consists of multilateral and bilateral sources and those from international private donors. Domestically, funding can come from the public budget and the domestic financial systems, such as credit, bond and capital markets. The OECD Development Assistance Committee (DAC) publishes data on the amount of official development assistance (ODA) committed by its members to climate change adaptation and mitigation projects in developing countries. The data are organized from both provider and recipient perspectives, of which the latter appears suitable for our analysis. Based on this report, between 2000 and 2019, the total multilateral funding commitment for developing Asia was US $85 billion, and the total bilateral commitment was US $134 billion (Table 13).

Tables A4 and A5 of the Appendix show more detailed breakdowns of Table 13 for selected countries. As shown in Table A4, India and China are the two largest recipients, receiving a total commitment of about US $19.2 billion and US $11.7 billion respectively (2019 constant-dollar value). Over 90% of multilateral funding to developing Asian countries was provided through multilateral development banks (MDB), such as the Asian Development Bank; the International Bank for Reconstruction and Development (IBRD), and the International Development Association (IDA), which are the two lending arms of the World Bank; and the European Investment Bank (EIB). Multilateral funds such as the Green Climate Fund (GCF), the Climate Investment Funds (CIF), the Global Environment Facility (GEF) and the International Fund for Agricultural Development (IFAD) each contribute about 1.8-3% of the total multilateral funding. Other funds such as the Adaptation Fund and Nordic Development Fund also play minor roles.

[33] A translated version can be found at: https://cset.georgetown.edu/wp-content/uploads/t0284_14th_Five_Year_Plan_EN.pdf

Table 13. Multilateral and bilateral sources of LCT funding – Commitment between 2000 and 2019 - 2019 USD million (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate)

Provider	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
Multilateral sources	11,687	19,194	3,615	4,664	3,525	263	2,351	3,311	610	85,265
Key providers										
ADB	4,559	4,943	836	1,548	1,456	166	782	1,002	137	24,891
IBRD	5,521	6,615	451	1,883	1,526	-	-	502	94	21,087
IDA	-	1,350	1,885	-	-	5.2	911	589	90	13,878
EIB	916	2,982	785	4	-	-	221	114	28	6,154
Bilateral sources	8,494	36,890	9,767	13,365	8,690	231	1,444	2,874	1,018	134,130
Key providers										
Japan	3,023	27,065	5,621	7,087	7,407	85	87	2,696	141	74,350
Germany	2,975	7,278	1,951	2,007	226	0.1	203	13	701	23,211
France	1,596	1,758	809	1,896	235	-	.5	28	99	10,301
EU Inst.	91	55	157	40	147	67	79	101	26	5,862
US	49	146	130	755	180	-	152	1	15	3,878

International climate funding inflows in developing Asia grew steadily over the last two decades, from US $5 billion to US $ 32 billion (2019 constant-dollar value) (Table 14). Among the selected countries, India saw the most impressive growth, from over US $800 million in 2009 to US $6 billion in 2019, once reaching US $10.5 billion in 2018. Energy and transportation are the two main sectors targeted by international funding, receiving 31% and 23% of the total commitment respectively. Funding from abroad mostly comes in the form of debt instruments, accounting for 92% and 73% of multilateral and bilateral sources respectively, while 26% of the latter were grant funds.

Table 14. International sources of LCT funding by year - Commitment - 2019 USD thousand (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate)

Year	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
2009	513	817	541	1,042	62	39	46	4.4	65	5,305
2010	542	2,399	540	1,001	172	.5	100	257	142	8,373
2011	406	2,298	988	428	53	36	137	18	27	7,142
2012	307	3,258	1,042	187	572	6.8	150	110	92	9,190
2013	1,922	4,070	1,243	1,483	716	59	480	796	127	17,312
2014	1,498	6,287	1,405	616	1,072	8.7	362	1,117	234	19,583
2015	912	3,087	1,350	2,527	3,083	151	483	345	180	22,105
2016	2,197	5,933	2,789	504	188	58	153	134	165	23,495
2017	1,757	7,034	1,491	2,357	939	42	749	291	181	25,294
2018	2,408	10,519	455	2,840	1,165	8.7	375	919	94	30,867
2019	3,204	6,068	347	1,678	3,715	45	495	2,190	156	32,306

1.7.2 Regional trends

1.7.2.1 Gaps between planned and available funding (both domestic and international)

In 2010, developed countries committed to channel US $100 billion a year for climate action in developing countries by 2020 (OECD, 2015, 14). However, in 2019, the total climate finance provided by developed countries to developing countries was USD $79.6 billion, which fell short by US $20 billion as pledged. As Asia is the region receiving the largest share of total climate finance provided and mobilized by developed countries (about 43.5% in 2019) (OECD, 2021a, 9), Asian developing countries are more likely to face financial shortages for climate action when the developed countries fail to meet their commitment. Due to their dependence on international sources of finance, climate projects in these countries are sensitive to changes in international funding. For example, Nepal experienced the derailment of some internationally agreed upon projects due to the lack of required finance and the mismatch between the pledged and granted funds (Rai, Chhetri, and Dhital, 2020). Many climate projects in Armenia are co-funded by domestic and external sources; therefore when there is a drop in external funding, the total climate financing decreases (Sirunyan and Ward, 2020).

There is a huge gap between climate financing needs in the selected countries and available financing. For example, China needs an annual investment of US $1.4 trillion in the next decade to meet the country's emissions target while China's annual average green finance during 2017-2018 was US $320 billion, which means the investment needs to be scaled up by at least four times to meet the estimated green financing needs (Choi and Heller, 2021). Similarly, India's nationally determined contributions (NDC) suggests that the country needs US $2.5 trillion (at 2014-2015 prices) which is equivalent to approximately US $170 billion per year or 8% of India's GDP in 2014-2015. However, the most conservative estimate indicates that current tracked financing in India represents only 10% of the total requirement across sectors (power generation, energy efficiency, power transmission, sustainable transportation and other mitigation-related activities) (Sinha, Shreyans, and Padmanabhi, 2020). Indonesia also faces a similar shortage. It is estimated that the country requires US $322.86 billion to meet its NDC's targets. However, the state budget only met 34% of the funding needs during the 2016 – 2020 period (Asian Development Bank, 2022, 7).

Gaps in adaptation financing are also noticeable. According to Tall et al. (2021), the adaptation financing shortfall of East Asia and Pacific and South Asia are respectively US $ 6.5- US $11.9 billion and US $14.9 – US $16.5 billion. Specifically, in Vietnam, although the majority public climate expenditures are allocated to adaptation projects, the country would be able to cover only 30% the cost of adaptation which is estimated to reach 3-5% of GDP per year by 2030 (Y. T. Nguyen et al., 2020).

1.7.2.2 Ease of doing business and Foreign Direct Investment for the LCT

The World Bank's ease of doing business score is an applicable indicator to measure how attractive the economic environment of a country is for FDI inflows (International Finance Corporation and World Bank, 2013, 47). Among the selected countries, except for the case of Armenia, those countries that obtain higher rankings in the ease of doing business index are also FDI attractive countries. According to the World Investment Report, China, India, Indonesia and Vietnam were in the top 20 FDI recipients worldwide during the 2017 – 2020 period. China was the second largest global FDI recipient in 2020, followed by India (ranked 5th), Indonesia (ranked 17th) and Vietnam (ranked 19th) (UNCTAD, 2021, 4–5).

The amount of FDI inflows in the remaining selected countries such as the Philippines, Armenia, Nepal, Uzbekistan and Bhutan are rather modest compared to the above mentioned countries[34]. In the Philippines, the restrictions on foreign ownership, foreign equity, and foreigner employment hinder the FDI growth (Reyes, 2015). Meanwhile, geographical location is one of the biggest barriers to FDI inflows in landlocked countries such as Armenia (OECD, 2021b).

Whether the inflows of FDI have a positive or negative effect on the LCT is still ambiguous. As reported by ESCAP, between 2010 and 2019 in the Asia-Pacific region, the coal, oil and natural gas sectors attracted the major share of FDI, which grew from US $175 billion between 2010 and 2014 to US $301 billion during the 2015-2019 period (UNESCAP, 2021). However, the report also pointed out that investment in the renewable energy industry also grew quickly during the

[34] Most of them received lower than US $2 billion in FDI net inflows in 2020 except the Philippines at US $6.6 billion; data from World Bank, foreign direct investment, net inflows (BoP, current USD): https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?end=2020&locations=AM-BT-NP-UZ-JO&start=2000

same time period, from US $132 billion to US $210 billion. This sector is expected to surpass the coal, oil and natural gas sectors in terms of FDI in the coming years as countries adopt more active climate agendas.

One of the key hurdles to FDI inflows in developing Asia is restrictive regulations. Using an OECD's index, a report by ADB (2021a, 52–53) indicates that Asian countries often have higher levels of FDI regulatory restrictiveness. For FDI attracting countries such as China and India (with the inflows of US $149 billion and US $64 billion in 2020 respectively) , the adaptation of screening regimes may hinder the FDI inflow in coming years (UNCTAD, 2021, 112). China's new Regulation on the Unreliable Entity list establishes penalties on foreign entities that are considered dangerous to the country's sovereignty. Meanwhile, India requires that all investments from countries that it shares borders with have to obtain governmental approval first. The low level of technology and infrastructure can be another obstacle, especially for investment in renewable energy (Murshed, 2021; Murshed et al., 2022).

1.7.3 Domestic sources of funding: Institutional setup

1.7.3.1 Green Banks and commercial financing

In developing Asia, green banking is still a rather new concept, but its progress is encouraging. Central banks in several countries have devoted their efforts to issuing green banking guidelines such as China, Indonesia, Vietnam and Bangladesh.

China has made considerable progress in setting up a standardized, metrics-driven green credit system. The country started to ban bank lending to certain polluting activities in 2004. After that, the China Banking Regulatory Commission (CBRC) issued Green Credit Guidance in 2012, followed by a Green Credit Monitoring and Evaluation mechanism as well as a checklist of key performance indicators in 2014. In 2016, the People's Bank of China (PBOC) established the Guidelines for Establishing the Green Financial System to promote practices such as environmental disclosure and climate stress tests. By 2017, the total amount of green loans from 21 major banks in China was over US $1.2 trillion (RMB 8.2 trillion) (Ulrich Volz, 2018). This figure reached US $1.8 trillion (RMB11 trillion) by the end of 2020 (International Finance Corporation, 2021a).

In Indonesia, the financial services authority (OJK) started a roadmap for sustainable financing in 2014 and provided Green Lending Model Guidelines for Mini Hydro Power Plant Projects. Then in 2017, it issued a regulation (POJK 51/2017) on green lending, followed by a guideline in 2018. This regulation requires financial institutions to build their sustainable action plans and publish annual reports to evaluate their sustainability achievements (Setyowati, 2020). However, Indonesian green lending has been modest, about 1.4% in 2013 (Ulrich Volz, 2018). In Vietnam, to support the National Green Growth Strategy, the government issues a directive on promoting green credit growth and managing environmental and social risks in credit extension to require banks to consider factors such as the environment, resource utilization efficiency and human health in 2015. After that, in 2018, the State Bank of Vietnam introduced a Scheme on Green Bank Development in Vietnam with the purpose of raising environmental awareness and responsibility of the banking sector and redirecting capital into green projects, especially renewable energy (State Bank of Vietnam, 2018). During 2017-2020, the amount of green loans in 37 Vietnamese financial institutions grew at about 23%/year, making up 3.72% of total outstanding loans (International Finance Corporation, 2021b).

In other cases, progress appears slower. India introduced a Priority Sectors Lending program with a focus on renewable energy. According to the Reserve Bank of India (2021), outstanding green credit to the renewable sector was around US $4.8 billion, accounting for 7.9% of the outstanding green credit to the power generation sector as the end of March 2020. Countries like Armenia and Nepal also became members of associations that promote green credit such as the Sustainable Banking Network (SBN) and Network for Greening the Financial System (NGFS).

1.7.3.2 Green Bonds

Among selected countries, China and India were the first two that used green bonds as an instrument to capitalize climate projects. The two countries remain at the top in emerging market green bond issuers with the accumulative values of issued green bonds in 2021 reaching up to US $199.1 billion and US $18.8 billion, respectively (Table 15). Despite the large-scale green bonds issuance, the share of issued volumes that have some form of external reviews declined significantly in China (from 78% to 61% in 2020), especially the bonds issued onshore (Climate Bonds Initiative, 2021). India is more likely to target the certified bonds with five out of seven bonds in 2016 receiving external reviews (Climate Bonds Initiative, 2017). The major green bonds issuers in both India and China are corporate (International Finance Corporation and Amundi Asset Management, 2021). The largest share of issued green bonds in both China and India was earmarked for renewable energy and local low-carbon transport (Climate Bonds Initiative, 2017; 2022).

Following China and India, ASEAN countries started to

Table 15. Annual green bond issuance by some developing countries in Asia – million USD (Source: Climate Bonds Initiative https://www.climatebonds.net/market/data/)

	2014	2015	2016	2017	2018	2019	2020	2021
China	161.0	1,294.5	21,210.7	22,103.0	31,033.9	31,398.5	23,834.0	68,110.1
India	-	1,151.2	1,571.2	4,279.3	700.0	3,144.8	1,093.8	6,812.1
Thailand	-	-	-	-	213.0	738.6	762.7	811.9
Indonesia	-	-	-	-	2,125.0	750.0	2,741.5	771.7
Philippines	-	-	225.7	150.0	150.0	1,498.4	919.1	502.6
Pakistan	-	-	-	-	-	-	-	500.0
Vietnam	-	-	27.0	-	-	200.0	256.8	200.0
Malaysia	-	-	-	464.2	223.2	615.0	208.2	119.4
Kazakhstan	-	-	-	-	-	-	0.5	-

issue their green bonds. The first issuance of green bonds in Vietnam was back to 2016 with US $27 million worth of green bonds (denominated in VND) issued by two provinces, namely Ho Chi Minh city and Ba Ria – Vung Tau to finance water projects (Climate Bonds Initiative, 2020b). Since then, there has been no additional green bonds issued in Vietnam. Nonetheless, Vietnam is in the process of strengthening regulatory frameworks and institutional capacities to enable the issuance of sovereign green bonds domestically and internationally. The Philippines and Indonesia's green bonds grew much faster than Vietnam's. Indonesia and the Philippines were respectively the 5th and 7th largest emerging market green bond issuers during the 2012-2020 period. Similar to China and India, the major issuers in the Philippines are corporate, with issued green bonds mainly being earmarked for the energy sector, while a larger share of total volume of bonds issued in Indonesia by the government and government agencies were mainly earmarked for energy, waste and water sectors (Climate Bonds Initiative, 2020a; Asian Development Bank, 2022; International Finance Corporation and Amundi Asset Management, 2021).

Other countries show slower progress in making use of green bonds. Armenia and Uzbekistan have issued their first green bonds recently (2020 and 2021 respectively) and the green bond issuances in the two countries are internationally market oriented. The first green bond issuance of Armenia in 2020 was denominated in EUR with the volume of EUR 50 million (FMO, 2020), and the value of Sovereign SDGs bonds issued by Uzbekistan that are denominated in USD (US $ 635 million) is nearly three times higher than the national currency denominated ones (US $232 million equivalent) (UNDP, 2021). Green bonds have not been put into use in Nepal and Bhutan, although they have shown interest in green bonds.

The prospect of green bonds in the large emerging issuing markets, namely China, India, Indonesia and Philippines are promising. The evolution of the capital market and the gradual market acceptance of green bonds (Choi and Heller, 2021) as well as the country's policy commitments (International Finance Corporation and Amundi Asset Management, 2021) pave the way for the momentum regained in the green bond issuance in China. The structural reform in Indonesia which enables increasing green infrastructure spending also gives opportunities to attract further investments through green bond markets. The Philippines issued the country's first sustainable finance framework, which require banks to follow more sustainable principles and facilitate banks' participation in the green bond market. Green bonds in Central Asian countries such as Armenia and Uzbekistan also receive benefits from the commitment of European Union to climate action (International Finance Corporation and Amundi Asset Management, 2021).

1.7.3.3 Private sector

Private climate finance to Global South countries in Asia has not been systematically tracked. The OECD DAC data have information on funding from international private donors (Table 16). Total commitment for developing Asia was over US $400 million for the period of 2000-2019, received mainly by countries such as India (US $136 million), China (US $162 million) and Indonesia (US $27 million). Detailed and accurate data on funding from foreign and local private banks, via capital markets and firms' investments for sustainable purposes in this region are lacking (Asian Development Bank, 2018, 8; International Finance Corporation, 2011). A report of Asian Development Bank (Asian Development Bank, 2018, 13) estimated that the total private funding via MDBs

and other Development Finance Institutions (DFIs) in 2017 amounted to US $16.5 billion, of which a large part was for infrastructure development and, thus, was expected to have positive climate change impacts.

Table 16. Climate funding from international private donors - Commitment - 2019 USD thousand (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate)

Provider	China	India	Indonesia	Asia (region)
Bill & Melinda Gates Foundation	300 (0.2%)	12,103 (8.9%)	-	23,414 (5.6%)
Bloomberg Family Foundation	-	225 (0.2%)	-	225 (0.1%)
CIFF	52,169 (32.3%)	13,698 (10.1%)	1,582 (5.8%)	82,656 (19.9%)
Citi Foundation	312 (0.2%)	-	-	401 (0.1%)
David & Lucile Packard Foundation	22,442 (13.9%)	8,500 (6.2%)	15,211 (55.7%)	47,305 (11.4%)
Dutch Postcode Lottery	-	3,871 (2.8%)	-	8,084 (1.9%)
Ford Foundation	-	861 (0.6%)	707 (2.6%)	1,569 (0.4%)
Grameen Crédit Agricole Foundation	-	11,754 (8.6%)	-	27,793 (6.7%)
H&M Foundation	-	-	-	4,438 (1.1%)
IKEA Foundation	-	21,416 (15.7%)	7,780 (28.5%)	29,197 (7.0%)
John D. & Catherine T. MacArthur Foundation	15,508 (9.6%)	20,850 (15.3%)	-	42,883 (10.3%)
Margaret A. Cargill Foundation	-	84 (0.1%)	408 (1.5%)	7,596 (1.8%)
Oak Foundation	4,911 (3.0%)	7,398 (5.4%)	-	26,263 (6.3%)
People's Postcode Lottery	-	-	-	127 (0.0%)
Rockefeller Foundation	-	2,515 (1.8%)	-	9,268 (2.2%)
Swedish Postcode Lottery	-	-	-	1,480 (0.4%)
William & Flora Hewlett Foundation	65,862 (40.8%)	32,862 (24.1%)	1,633 (6.0%)	103,088 (24.8%)
Total	161,504 (100.0%)	136,137 (100.0%)	27,321 (100.0%)	415,787 (100.0%)

1.7.4 Bilateral agreements

A major part of funding for the LCT in developing Asia comes from bilateral agreements with high-income countries. Table 13 shows the OECD DAC data on bilateral funding for developing Asia. Between 2000 and 2019, the total bilateral funding commitment for developing Asia was US $134 billion, which was significantly higher than the amount for multilateral funding (US $85 billion). Japan is the largest funder, contributing over 55% of the total commitment, followed by Germany (17.3%), France (7.7%), EU institutions (4.4%) and the US (2.9%). Among the selected countries, India, Indonesia, Vietnam, the Philippines and China are the main recipients, with India receiving over 27.5% and Indonesia receiving 10% of the total commitment.

From the case of CDM in India, where developed countries pay developing ones to adopt less-polluting technologies than they otherwise would use, one can question the integrity of the bilateral source. There is a risk that the CDM mechanism will become a loophole for high-income countries, which could involve themselves in projects that are happening anyway and thus would not be offering any incentive for new emissions reductions. However, countries that do not host a great number of CDM projects, such as Vietnam, Indonesia and the Philippines (under 4% of the number of projects) (UNEP, 2022) have also received a fair share of bilateral funding, and research is needed to evaluate such risk.

1.7.5 Funding allocations for mitigation and adaptation

International financing for climate change mitigation has increased steadily since 2000, but adaptation funding only started in 2010 (see Figure 11). However, the two funding purposes appear to share a growing trend. At the end of 2019, total funding for mitigation in developing Asia was US $163 billion, while that for adaptation was US $73 billion.

Despite the importance of financing for National Adaptation Plans (NAPs), few countries have made estimates of the financial resources required for implementation. Of the selected countries, only Armenia, Nepal, Vietnam, and the Philippines have established their NAPs at the time of writing this report. Vietnam's NAP provides a brief account of potential financing sources (Government of Vietnam, 2020), while Nepal's NAP estimates that the implementation of its three programs and nine objectives will require US $160 million (Government of Nepal, 2021). Armenia provided little detail on financing.

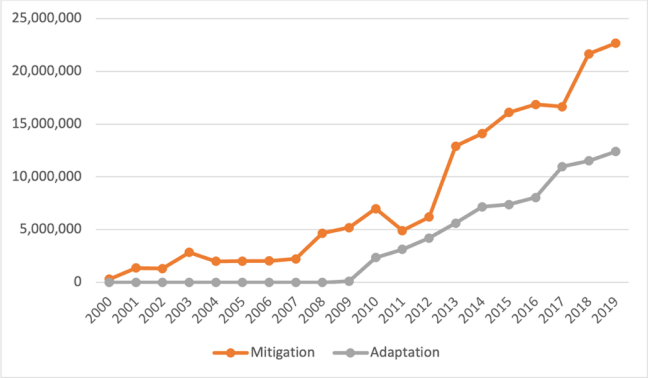


Figure 11. International funding for mitigation and adaptation - Commitment - 2019 USD thousand (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate

1.7.6 Inclusive finance and budgeting

To some extent, gender inequality has been considered in international climate financing. The OECD DAC data have the information of whether gender equality was a "principal" or a "significant" objective. The results are shown in Table 19. The amount of funding commitment regarding gender equality as a "principal" objective was very low, 1% in case of mitigation funding, and 2.2% in adaptation. Meanwhile, 25% of mitigation funding and 39% of adaptation marked this objective as "significant". As expected, finance for adaptation put more emphasis on the gender problem. However, the fact that over 60% of international climate funding between 2000 and 2019 did not integrate the gender aspect was a considerable shortcoming of the current financing scheme. Table 19 also shows that, among the selected countries, India, Nepal, Bhutan and the Philippines are those receiving more gender-targeted mitigation funding (26.8%, 47.1% and 73.3% of the total commitments that have gender being a principal or significant consideration respectively). Meanwhile, Nepal, Bhutan, Indonesia and India received more adaption funding with gender targeting (54.7%, 40.8%, 42.2% and 41.1% of the total commitments respectively).

1.7.6 Constraints and opportunities

LCT financing is on the rise, but it faces numerous challenges in Global South countries. Like the case of FDI analyzed above, regulatory restrictiveness as well as poor technology and infrastructure are likely to impede international funding for LCT. Limited capacity also restricts LCT finance. A survey by Volz et al. (2015) in Indonesia shows that both banks and enterprises, despite being somewhat interested in green lending and investment, do not prioritize them in their

operation. The banks lack the know-how and capacities to implement such procedures. Meanwhile, both sides appear hesitant to make the first move. Lacking capacity to carry out green finance is also the situation in Vietnam (T. C. Nguyen, Chuc, and Dang, 2018). Other barriers include unfavorable conditions such as adverse or unstable regulations and cumbersome paperwork, inadequate awareness and lacking requirements of environmental impacts and ESG disclosures (Ulrich Volz, 2018).

The lack of systematically tracked data makes it hard to nominate the most effective instrument for LCT funding in developing Asia. However, it appears that the answer varies from one country to another. In China, the huge reported volume of green loans mentioned above (USD $1.8 trillion by the end of 2020) (International Finance Corporation, 2021a) makes this instrument the climate financing champion in this East Asian country, well surpassing its amount of international inflows. In the ASEAN region, international funding still plays an important role, but green bonds have a huge potential to leverage climate funding (GGGI, 2021). It is likely that the remaining selected countries will continue to rely on international funding for the coming years.

1.7.8 Knowledge gaps and research priorities

Risk is a crucial factor in financing decisions, and climate financing is no exception. Two kinds of risks strongly impede flows of climate finance, namely physical and transition risks. Physical risk arises from the impact of unmitigated climate change on the value of financial assets (e.g., equity, bonds, loans) via threatening the physical assets behind them (e.g., plants, facilities). Loss can occur to both investors and insurers. Transition risk comes from the situation where a low-carbon transition lays damages on specific industries while benefiting others, which will be translated into adjustments in asset values. Fossil-fuel-related assets (i.e., carbon stranded assets) are gradually disfavored and decreasing in value. A transition can be orderly where those adjustments are fully appreciated and planned to spread over time, but it is likely not to be so because opposing political forces will distort mass awareness and opinion. Research is needed to analyze various aspects of these risks such as the transmission channel, magnitude of exposure and the interplay between them and different climate policy scenarios.

The lack of data on gender consideration in domestic climate funding casts doubt on the inclusiveness target. This is coupled with the lack of mechanisms to monitor and evaluate the mainstreaming of gender equality in policymaking. In addition, as climate financing in developing Asia is facing numerous challenges, gender equality might not be prioritized over factors such as efficiency and risk. How to incorporate the gender aspect into climate finance is a research gap that needs urgent attention.

1.8 Key inputs to the development of the LCT & GE research agenda

1.8.1 Key constraints and opportunities for an LCT & GE transition

In developing Asia, various constraints to LCT & GE can be addressed. Obstacles such as inadequate political will and low capacity and incentives to design and implement policy instruments will pose many challenges for the adoption of LCT policy instruments. For example, despite the appealing properties of carbon pricing, carbon taxes and ETS have been facing difficulties in gaining popularity in developing Asia. Those countries applying these mechanisms are either developed or upper middle-income ones (e.g., Japan, Singapore and China). Difficulties in launching carbon taxes in countries such as Indonesia and the Philippines come from strong political forces lobbying against them as well as concerns over economic growth and competitiveness. ETS in Vietnam, the Philippines and India will require a great deal of effort to plan and put into operation. With respect to the energy transition, political opposition impedes coal phase-outs while limited resource and capacity slow down the switch to renewable energy. In addition, climate funding is limited, and innovative funding mechanisms such as green loans and green bonds are still very much underdeveloped. Furthermore, factors such as the COVID-19 pandemic and the Ukraine war have caused major changes to the transition path, especially in energy sectors by shifting the government's priority to recovery and growth, which is not likely to be consistent with LCT.

Opportunities can be seen from the awareness of the Asian governments on the significance of climate change and the urgency of taking climate actions, increasing international supports and potential resources from the private sector. Most Asian countries have some measures in place to mainstream NDCs into national legal and development frameworks (UNESCAP, UNEP, and Greenwerk, 2020). As the climate disaster-prone region and the home of more than a half of the world's population, Asia was the main beneficiary of the climate financing provided by developed countries and continued to receive supports from multilateral and bilateral sources in the 2016-2019 period (OECD, 2020; 2021a). The private sector is also a potential financial contributor to low-carbon transitions in Asia. The private climate financing mobilized to Asia accounted for the largest share of global

private climate financing during the 2016-2018 period (OECD, 2022a). Renewable energy is an example of how the participation of the private sector can translate to accelerating transition in the energy sector, and the growth of bond markets shows a potential instrument for Asian countries to finance for their climate actions.

1.8.2 Key knowledge gaps and research needs to enable an LCT & GE transition

Research needs to address those constraints for LCT&GE mentioned above. Dealing with low political will and opposition toward climate actions and policy instruments requires raising public awareness and support as well as having effective alternatives that can harmonize political incentives. High quality damage and cost estimates coupled with efficient dissemination to the public audience will be greatly helpful in this regard. With respect to the energy transition, road maps to marketize this sector help reduce power concentration and political opposition while enhancing its efficiency.

Besides, capacity building and technology transfer are crucial enabling factors for developing countries to take up action, given the limited capacity and available resources. Insights on how to adapt effective measures in curbing emissions and fighting climate change to a developing country context are of great importance. In light of recent interest in market-based instruments in developing Asia, there is an urgent need for research to support the design and implementation of carbon taxes and ETS.

Despite receiving greater attention and consideration in climate commitments, gender has not been adequately integrated into policy. Research is needed to develop the monitoring and evaluation mechanisms of policy gender mainstreaming. In addition, the gender impacts of LCT-related policy instruments should be a key element of impact analysis when policy evaluations are being done to ensure that increasing consideration of gender equality in the countries' climate visions are soon translated into reality.

Regarding climate finance, the large funding gap in Asia calls for new understanding on innovative funding, together with capacity building and technology transfer, especially in promoting green loans and green bonds. Besides, adequate estimates of climate financial needs are often lacking. Assessments are needed here to enhance funding effectiveness. Finally, given the modest consideration of gender in climate funding, research to promote gender targeting in climate finance is highly valued.

The transition to a low-carbon economy profits immensely from digital transformation and other technological advances. Global South countries in Asia such as China and India and those in the ASEAN have huge advantages in speeding up digital transformation and making it work for sustainable development. A wide variety of problems in policymaking for LCT & GE pointed out in this review require innovative solutions. A great deal of research is needed to exploit the full potential of technological advances.

As mentioned in the financing section, the physical and transition risks need to be addressed to boost climate financing in developing Asia. Besides, as in the case of carbon pricing, new understanding is needed to promote green financing in the region, especially given the current limited capacity of banks and financial institutions as well as the ambiguity and weak enforcement of corporate responsibility regulations.

This review also raises the need for data that serve the analysis of LCT & GE in developing Asia. More systematic and accessible data on the ongoing implementation of instruments such as fuel taxes, subsidies (or the removal thereof) and the allocation of revenues from them will greatly benefit the analysis to improve current policies and establish new instruments such as carbon taxes or emissions trading system. On the gender aspect, data availability has been an important hurdle, with implications for inclusive policies. Research to promote domestic climate financing can make good use of a publicly accessible climate finance database.

1.9 Conclusion

In the last three decades, Asia has experienced drastic impacts of climate changes, including large increases in temperature, ocean warming and acidification and abnormal extreme precipitation patterns. The region is also extremely prone to natural disasters, especially hydrological ones, with a strong increase in frequency, making it the most disaster-struck region worldwide. Climate change has disproportionate impacts on men and women in the region. Women are more likely to be affected by climate change due to existing social institutions and norms that hinder their access to resources and economic opportunities.

Asia is the top emitter since 2013. Emissions vary among Asian countries. The three top emitters, China, India and Indonesia rank first, third and eighth in terms of total emissions worldwide respectively. Their sum in emissions is almost three times that of the US and surpass the OECD. On the other hand, countries such as Nepal and Bhutan have remained carbon neutral and pledge to keep their status.

Asian countries are proactive in their LCT commitments. Most of them updated and strengthened their NDCs

continuously. Their action plans cover multiple sectors and pay attention to gender inequality as well as the inclusion of youth and indigenous people. However, the ambitions of top emitters should be questioned. In the most recent Climate Action Tracker assessment, China, India and Indonesia are rated "highly insufficient" for their targets and policies toward the Paris Agreement 1.5°C limit. Strengthened ambitions from these countries are crucial for global climate agendas to achieve their goals.

Across the selected countries, some patterns in the choice of LCT & GE policy instruments can be seen. Carbon taxes, fossil fuel taxes and fossil fuel reforms are facing aggressive opposition from fossil fuel companies and political players, for whom their interest is violated, and from those concerned they will have negative impacts on economic growth. Even in India, a country that is quite aggressive in imposing taxes on coal, the taxes are still lower than optimal rates, and there exists political pressure to axe the taxes. ETS gains more favor from the selected countries, however, except for China that has put it in practice, the instrument is still under consideration in India and Southeast Asia countries, and there is no clear signal for the application of this instrument in other regions.

Renewable energy is one of the favorite choices of both fossil fuel intensive economies (e.g., India, China and Vietnam) and exported energy dependent countries (e.g., the Philippines and Armenia). Preference toward renewable energy comes not only from the fact that it can be a low-carbon substitute for fossil fuels, but also how it improves domestic energy security. However, there are some obstacles to renewable energy expansion in Asia, such as the high cost of renewable energy absorption, the underdeveloped national grid, and diminishing investment capacity.

Other LCT policy instruments are being practiced at different levels. Given their rich ecological capital, countries like Vietnam, China, India, Indonesia, and the Philippines are operating and refining their payment schemes for environmental services. Meanwhile, the application of environmental/emissions standards, which has been popular in developed countries, gains slow progress in Asian developing countries, except for China.

Lacking finance for climate actions is one of the biggest constraints to low-carbon transition in Asia. Huge gaps exist between the countries' financial needs and available sources. Finance provided by developed countries is still the main source for low-income countries such as Nepal, Bhutan and for landlocked Central Asian countries such as Armenia and Uzbekistan and, therefore, directly determine the progress of their climate actions. Domestic financing remains an important source of climate financing, especially adaptation financing in the developing countries that achieved middle-income status. The domestic sources include green bank, green bond, private investment and public expenditure. However, available domestic funding sources only meet a small portion of financial needs to achieve NDCs' targets. Capacity development in the form of greening the banking system is needed to boost green investments.

Despite growing attention to the gender aspect in LCT commitment among Asian developing countries, there is an urgent need to improve the way these problems are incorporated into climate policies and finance. In practice, gender impacts of LCT policy instruments are rarely mentioned or even evaluated. Although gender issues are more likely emphasized in projects financed by international sources, the proportions of funds allocated to projects with gender being a major consideration are only 26% and 41% of total mitigation and adaptation commitments respectively.

The COVID-19 pandemic inevitably affects the progress of LCT in developing Asia. During the lockdown period, there is evidence of GHG emissions reductions in countries like China, India and the Philippines. However, such reductions were only temporary. The negative impacts of the pandemic on low-carbon transition in Asia might outweigh positive ones. In their efforts to accelerate economic recovery, some countries such as China, India and Vietnam rebounded their subsidies for fossil fuels. Renewable energy investment also slowed down due to the diminishing investment capacity of key Asian players. The pandemic also exacerbated poverty, gender inequality and unemployment in Asia, which in turn put more challenges to the LCT.

1.10 Appendix

Table A1: Gender gaps in the selected countries (Source: World Economic Forum, Global Gender Gap Index, 2021; and World Bank, Gender Statistics)

	China	Bhutan	India	Nepal	Indonesia	Philippines	Vietnam	Armenia	Uzbek-istan
Gender gap in work opportunities (score 0-100)	70.1	55.6	32.6	63	64.7	79.5	76.5	65.5	-
Women's labor force participation rate (%)	68.6	62.3	22.3	85.3	56	49.1	79.6	51.0	-
Women in senior roles (Legislators, senior officials, and managers - %)	16.8	18.5	14.6	13.2	29.8	50.5	26.3	26.2	-
Professional and technical workers (%)	51.7	32.8	29.2	30	49.9	61.5	52.7	51.3	-
Gender gap in political empowerment (score 0-100)	11.8	8.2	27.6	24.1	16.4	36.2	11.3	9.1	-
Percentage of women in parliament (%)	24.9	14.9	14.4	32.7	21	28	26.7	22.7	-
Percentage of women in ministerial positions (%)	3.2	10	9.1	13.6	17.1	13	0	0.0	-
Gender gap in educational opportunities (score 0-100)	97.3	95.4	96.2	89.5	97	99.9	98.2	99.8	-
Gap in literacy rate	96	76.1	79.9	76	96.6	100	97	99.9	-
Gap in enrollment in primary education	-	100	100	87	94.9	99.8	-	99.6	-
Gap in enrollment in secondary education	96	100	100	100	100	100	-	100	-
Gap in enrollment in tertiary education	100	99.2	100	100	100	100	100	100	-
Access to resources									
Women who do not own land (% women 15-49, 2016-2018)	-	-	71.7	88.7	71.1	88.4	-	84.3	-
Men who do not own land (%, 2016-2018)	-	-	49.6	78.9	-	-	-	65.2	-
Account ownership at a financial institution, female (% age 15+, 2017)	76.4	-	76.6	41.6	51.3	38.8	30.4	40.9	36.0
Account ownership at a financial institution, male (% age 15+, 2017)	84.0	-	83.0	50.0	46.2	30.0	31.2	55.7	38.3
Loan from a financial inst. or used a credit card, female (% age 15+, 2017)	19.7	-	6.2	14.2	17.5	11.2	19.2	28.3	1.47
Loan from a financial inst. or used a credit card, male (% age 15+, 2017)	25.6	-	10	13	19.4	10.2	24.4	34.6	3.35
Women's role within households and other rights									
Year received right to vote (2020)	1949	1953	1935	1951	1945	1937	1946	1918	1938
Having the same rights to remarry as a man (2020)	yes	yes	yes	yes	no	no	yes	yes	yes
Surviving spouses have equal rights to inherit assets (2020)	yes	yes	yes	yes	no	yes	yes	yes	yes
Sons and daughters have equal rights to inherit assets from their parents (2020)	yes	yes	yes	yes	no	yes	yes	yes	yes
Participating in own health care decisions (% of women, 2016-2018)	-	-	74.5	55.7	88.3	95.8	-	96.0	-
Participating in making major household purchase decisions (% of women, 2016-2018)	-	-	73.4	53.0	76.3	89.1	-	80.3	-

Table A2: Access to Clean Cooking (Source: IEA, World Energy Outlook-2021, based on WHO Household Energy Database and IEA World Energy Balances 2021

	Proportion of the population with access to clean cooking			Population lacking access (million)	Population relying on traditional use of bio-mass (million)
	2000	2010	2020	2020	2020
Developing Asia	30%	43%	62%	1516	1349
China	43%	54%	66%	484	387
India	22%	35%	65%	491	459
Indonesia	6%	42%	82%	48	43
Other Southeast Asia	34%	48%	59%	162	153
Brunei	>95%	>95%	>95%	<1	<1
Cambodia	<5%	11%	31%	12	11
Laos	<5%	<5%	8%	7	7
Malaysia	>95%	>95%	>95%	1	<1
Myanmar	<5%	10%	30%	38	37
Philippines	38%	40%	48%	57	55
Singapore	>95%	>95%	>95%	<1	<1
Thailand	58%	75%	80%	14	13
Vietnam	14%	49%	66%	34	30
Other Developing Asia	19%	27%	39%	332	307
Bangladesh	8%	13%	23%	127	125
DPR Korea	<5%	6%	12%	23	6
Mongolia	23%	35%	53%	2	1
Nepal	6%	21%	32%	20	20
Pakistan	24%	36%	50%	110	106
Sri Lanka	17%	22%	33%	15	14
Other Asia	10%	21%	34%	36	34

Table A3: Electricity Access in Developing Asia (Source: IEA, World Energy Outlook-2021)

	Proportion of the population with access to electricity					Population without access (million)
	National			Urban	Rural	
	2000	2010	2020	2020	2020	2020
Developing Asia	67%	79%	97%	99%	95%	133
China	99%	>99%	>99%	>99%	>99%	<1
India	43%	68%	>99%	>99%	>99%	3
Indonesia	53%	67%	>99%	>99%	>99%	<1
Other Southeast Asia	65%	79%	92%	98%	86%	33
Brunei	>99%	>99%	>99%	>99%	>99%	<1
Cambodia	4%	23%	78%	>99%	71%	4
Laos	43%	75%	97%	98%	97%	<1
Malaysia	97%	>99%	>99%	>99%	>99%	<1
Myanmar	5%	24%	53%	81%	40%	26
Philippines	74%	80%	97%	>99%	95%	3
Singapore	>99%	>99%	>99%	>99%	<1%	<1
Thailand	82%	>99%	>99%	>99%	>99%	<1
Vietnam	76%	97%	>99%	>99%	99%	<1
Other Developing Asian Countries	38%	58%	82%	90%	77%	97
Bangladesh	20%	47%	93%	98%	90%	11
DPR Korea	20%	26%	27%	36%	11%	19
Mongolia	90%	86%	91%	>99%	71%	<1
Nepal	19%	71%	96%	93%	97%	1
Pakistan	53%	67%	79%	91%	72%	46
Sri Lanka	62%	77%	>99%	>99%	>99%	<1
Other Asia	11%	30%	64%	89%	55%	20

Table A4: Multilateral sources of LCT funding – Commitment between 2000 and 2019 - 2019 USD thousand (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate)

Agency	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
Asian Development Bank	4,559,431 (39.01%)	4,943,325 (25.76%)	836,024 (23.13%)	1,547,918 (33.19%)	1,455,836 (41.30%)	165,607 (62.87%)	781,581 (33.24%)	1,002,105 (30.27%)	137,291 (22.49%)	24,891,394 (29.19%)
International Bank for Reconstruction and Development (WB)	5,520,801 (47.24%)	6,615,004 (34.46%)	451,447 (12.49%)	1,883,660 (40.39%)	1,525,945 (43.29%)	0 (0%)	0 (0%)	502,052 (15.16%)	93,524 (15.32%)	21,087,437 (24.73%)
International Development Association (WB)	0 (0%)	1,350,326 (7.04%)	1,885,150 (52.15%)	0 (0%)	0 (0%)	5,187 (1.97%)	910,980 (38.74%)	588,989 (17.79%)	9,026 (1.48%)	13,878,340 (16.28%)
EU institutions (European Investment Bank)	915,877 (7.84%)	2,981,600 (15.53%)	784,770 (2.17%)	4,095 (0.09%)	0 (0%)	0 (0%)	221,180 (9.41%)	113,823 (3.44%)	28,198 (4.62%)	6,154,359 (7.22%)
European Bank for Reconstruction and Development	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	673,296 (20.34%)	261,721 (42.88%)	5,989,962 (7.03%)
Asian Infrastructure Investment Bank	256,062 (2.19%)	1,765,041 (9.20%)	0 (0%)	269,930 (5.79%)	212,634 (6.03%)	0 (0%)	183,298 (7.80%)	82,000 (2.48%)	0 (0%)	3,833,327 (4.50%)
Islamic Development Bank	0 (0%)	0 (0%)	0 (0%)	601 (0.01%)	0 (0%)	0 (0%)	0 (0%)	282,193 (8.52%)	0 (0%)	825,779 (0.97%)
Green Climate Fund	100,000 (0.86%)	316,573 (1.65%)	52,940 (1.46%)	196,196 (4.21%)	9,999 (0.28%)	52,548 (19.95%)	39,299 (1.67%)	0 (0%)	20,845 (3.41%)	2,430,411 (2.85%)
Climate Investment Funds - Clean Technology Fund	0 (0%)	850,606 (4.43%)	169,485 (4.69%)	403,190 (8.65%)	196,299 (5.57%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2,009,497 (2.36%)
Climate Investment Funds - Strategic Climate Fund	0 (0%)	0 (0%)	0 (0%)	43,493 (0.93%)	0 (0%)	0 (0%)	122,606 (5.21%)	0 (0%)	39,754 (6.51%)	749,765 (0.88%)
International Fund for Agricultural Development	145,533 (1.25%)	162,573 (0.85%)	91,033 (2.52%)	184,527 (3.96%)	86,873 (2.46%)	14,860 (5.64%)	39,722 (1.69%)	30,462 (0.92%)	0 (0%)	1,538,243 (1.80%)
Global Environment Facility General Trust Fund	187,724 (1.61%)	197,082 (1.03%)	29,261 (0.81%)	126,720 (2.72%)	32,633 (0.93%)	23,707 (9.00%)	13,343 (0.57%)	30,826 (0.93%)	16,130 (2.64%)	1,222,044 (1.43%)

(Continued)

Agency	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
GEF Least Developed Countries Trust Fund (LDCF)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1,435 (0.54%)	22,766 (0.97%)	0 (0%)	0 (0%)	270,102 (0.32%)
GEF Special Climate Change Trust Fund (SCCF)	0 (0%)	0 (0%)	4,389 (0.12%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	25,071 (0.03%)
Adaptation Fund	0 (0%)	9899 (0.05%)	0 (0%)	835 (0.02%)	0 (0%)	0 (0%)	9,861 (0.42%)	5,054 (0.15%)	3,913 (0.64%)	186,273 (0.22%)
Nordic Development Fund	0 (0%)	0 (0%)	12,808 (0.35%)	0 (0%)	0 (0%)	0 (0%)	5,051 (0.21%)	0 (0%)	0 (0%)	98,422 (0.12%)
Food and Agriculture Organisation	0 (0%)	54 (0%)	195 (0.01%)	0 (0%)	123 (0%)	49 (0.02%)	8 (0%)	55 (0%)	24 (0%)	37,961 (0.04%)
Global Green Growth Institute	1,120 (0.01%)	1,515 (0.01%)	3,391 (0.09%)	2,563 (0.05%)	4,924 (0.14%)	0 (0%)	1,568 (0.07%)	0 (0%)	0 (0%)	36,488 (0.04%)
Total	11,686,548 (100%)	19,193,598 (100%)	3,614,600 (100%)	4,663,728 (100%)	3,525,266 (100%)	263,393 (100%)	2,351,263 (100%)	3,310,855 (100%)	610,426 (100%)	85,264,875 (100%)

Table A5: Bilateral sources of LCT funding - Commitment - 2019 USD thousand (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate **)**

Provider	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
Japan	3,022,917 (35.6%)	27,064,775 (73.4%)	5,620,972 (57.6%)	7,086,569 (53.0%)	7,407,231 (85.2%)	85,150 (36.9%)	87,020 (6.0%)	2,696,215 (93.8%)	141,438 (13.9%)	74,349,958 (55.4%)
Germany	2,975,491 (35.0%)	7,278,357 (19.7%)	1,950,860 (20.0%)	2,007,206 (15.0%)	226,174 (2.6%)	126 (0.1%)	203,488 (14.1%)	13,010 (0.5%)	701,197 (68.9%)	23,210,888 (17.3%)
France	1,596,095 (18.8%)	1,757,916 (4.8%)	809,075 (8.3%)	1,895,838 (14.2%)	235,436 (2.7%)	0 (0.0%)	505 (0.0%)	27,908 (1.0%)	99,329 (9.8%)	10,300,959 (7.7%)
EU Institutions (excl. EIB)	90,605 (1.1%)	54,589 (0.1%)	157,049 (1.6%)	40,344 (0.3%)	147,204 (1.7%)	66,558 (28.8%)	79,474 (5.5%)	101,498 (3.5%)	25,747 (2.5%)	5,861,627 (4.4%)
United States	48,791 (0.6%)	146,337 (0.4%)	130,295 (1.3%)	755,084 (5.6%)	179,725 (2.1%)	0 (0.0%)	152,451 (10.6%)	1,226 (0.0%)	14,853 (1.5%)	3,878,396 (2.9%)
Australia	56,659 (0.7%)	38,448 (0.1%)	146,259 (1.5%)	465,047 (3.5%)	89,000 (1.0%)	3,373 (1.5%)	18,348 (1.3%)	0 (0.0%)	0 (0.0%)	2,781,017 (2.1%)
Korea	8,650 (0.1%)	386 (0.0%)	308,159 (3.2%)	286,082 (2.1%)	174,311 (2.0%)	442 (0.2%)	57,688 (4.0%)	12,029 (0.4%)	0 (0.0%)	2,304,675 (1.7%)
United Kingdom	115,285 (1.4%)	231,010 (0.6%)	14,294 (0.1%)	74,162 (0.6%)	9,878 (0.1%)	137 (0.1%)	266,681 (18.5%)	229 (0.0%)	60 (0.0%)	2,234,577 (1.7%)
Norway	117,616 (1.4%)	108,144 (0.3%)	48,122 (0.5%)	362,637 (2.7%)	53,542 (0.6%)	21,304 (9.2%)	244,191 (16.9%)	0 (0.0%)	3,677 (0.4%)	1,425,380 (1.1%)
Austria	3,371 (0.0%)	587 (0.0%)	0 (0.0%)	4 (0.0%)	434 (0.0%)	17,748 (7.7%)	7,802 (0.5%)	257 (0.0%)	12,530 (1.2%)	185,430 (0.1%)
Belgium	1,649 (0.0%)	10,311 (0.0%)	107,443 (1.1%)	13,989 (0.1%)	25,481 (0.3%)	0 (0.0%)	4,091 (0.3%)	20 (0.0%)	0 (0.0%)	350,930 (0.3%)
Canada	98,694 (1.2%)	29,109 (0.1%)	8,938 (0.1%)	20,215 (0.2%)	23,717 (0.3%)	19 (0.0%)	20,025 (1.4%)	0 (0.0%)	0 (0.0%)	782,501 (0.6%)
Czech Republic	0 (0.0%)	0 (0.0%)	330 (0.0%)	149 (0.0%)	500 (0.0%)	11 (0.0%)	198 (0.0%)	0 (0.0%)	41 (0.0%)	17,137 (0.0%)
Denmark	88,665 (1.0%)	24,910 (0.1%)	135,104 (1.4%)	135,828 (1.0%)	30,560 (0.4%)	23,869 (10.3%)	79,778 (5.5%)	0 (0.0%)	1,155 (0.1%)	1,014,310 (0.8%)
Finland	11,364 (0.1%)	7,820 (0.0%)	52,312 (0.5%)	19,711 (0.1%)	5,878 (0.1%)	2,203 (1.0%)	121,862 (8.4%)	1,119 (0.0%)	0 (0.0%)	434,556 (0.3%)
Greece	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	153 (0.0%)	7,551 (0.0%)
Hungary	50 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	53 (0.0%)
Iceland	0 (0.0%)	24 (0.0%)	23 (0.0%)	5 (0.0%)	244 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1,783 (0.0%)

(Continue)

Provider	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
Ireland	50 (0.0%)	1,603 (0.0%)	54,115 (0.6%)	25 (0.0%)	802 (0.0%)	0 (0.0%)	891 (0.1%)	16 (0.0%)	0 (0.0%)	87,481 (0.1%)
Italy	29,256 (0.3%)	4,821 (0.0%)	12,120 (0.1%)	228 (0.0%)	997 (0.0%)	34 (0.0%)	1,618 (0.1%)	0 (0.0%)	40 (0.0%)	353,512 (0.3%)
Latvia	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	74 (0.0%)	0 (0.0%)	74 (0.0%)
Lithuania	0 (0.0%)	80 (0.0%)	0 (0.0%)	5 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	71 (0.0%)	1,119 (0.0%)
Luxembourg	0 (0.0%)	1,026 (0.0%)	20,446 (0.2%)	0 (0.0%)	1,988 (0.0%)	107 (0.0%)	655 (0.0%)	808 (0.0%)	0 (0.0%)	42,205 (0.0%)
Netherlands	107,863 (1.3%)	13,482 (0.0%)	62,032 (0.6%)	83,790 (0.6%)	15,356 (0.2%)	6,291 (2.7%)	27,474 (1.9%)	0 (0.0%)	0 (0.0%)	1,121,209 (0.8%)
New Zealand	205 (0.0%)	59 (0.0%)	11,392 (0.1%)	19,056 (0.1%)	9,265 (0.1%)	0 (0.0%)	0 (0.0%)	170 (0.0%)	0 (0.0%)	511,470 (0.4%)
Poland	0 (0.0%)	15 (0.0%)	0 (0.0%)	27 (0.0%)	57 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	230 (0.0%)	64,568 (0.0%)
Portugal	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3,379 (0.0%)
Romania	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	92 (0.0%)
Slovak Republic	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	914 (0.0%)
Slovenia	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	283 (0.0%)
Spain	57,445 (0.7%)	5,996 (0.0%)	19,301 (0.2%)	1,379 (0.0%)	42,494 (0.5%)	0 (0.0%)	384 (0.0%)	18 (0.0%)	0 (0.0%)	248,278 (0.2%)
Sweden	8,609 (0.1%)	15,557 (0.0%)	17,100 (0.2%)	18,270 (0.1%)	9,036 (0.1%)	0 (0.0%)	11,035 (0.8%)	0 (0.0%)	27 (0.0%)	946,121 (0.7%)
Switzerland	54,528 (0.6%)	94,689 (0.3%)	81,152 (0.8%)	79,003 (0.6%)	994 (0.0%)	3,683 (1.6%)	58,553 (4.1%)	19,866 (0.7%)	16,957 (1.7%)	1,120,605 (0.8%)
United Arab Emirates	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	486,683 (0.4%)
Total	8,493,858 (100.0%)	36,890,051 (100.0%)	9,766,893 (100.0%)	13,364,653 (100.0%)	8,690,304 (100.0%)	231,055 (100.0%)	1,444,212 (100.0%)	2,874,463 (100.0%)	1,017,505 (100.0%)	134,129,721 (100.0%)

Table A6: Funding allocations for mitigation and adaptation - Commitment - 2019 USD thousand (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate)

Type	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
Mitigation										
Bilateral	7,992,385 (46.5%)	32,008,607 (70.0%)	7,000,894 (83.6%)	11,659,607 (77.0%)	6,333,380 (73.9%)	161,736 (43.7%)	978,038 (48.0%)	2,794,313 (55.7%)	773,367 (58.6%)	105,940,845 (64.9%)
Multilateral	9,052,123 (52.6%)	13,612,261 (29.8%)	1,370,948 (16.4%)	3,456,742 (22.8%)	2,239,216 (26.1%)	208,408 (56.3%)	1,060,813 (52.0%)	2,219,651 (44.3%)	546,559 (41.4%)	56,850,799 (34.8%)
Private Donor	161,208 (0.9%)	108,718 (0.2%)	1,004 (0.0%)	24,580 (0.2%)	245 (0.0%)	0 (0.0%)	178 (0.0%)	0 (0.0%)	0 (0.0%)	343,123 (0.2%)
Total	17,205,716 (100.0%)	45,729,586 (100.0%)	8,372,846 (100.0%)	15,140,929 (100.0%)	8,572,841 (100.0%)	370,144 (100.0%)	2,039,029 (100.0%)	5,013,964 (100.0%)	1,319,926 (100.0%)	163,134,767 (100.0%)
Adaptation										
Bilateral	1,244,237 (30.7%)	6,100,225 (48.2%)	4,201,461 (64.1%)	2,842,194 (64.9%)	2,720,132 (67.8%)	119,250 (53.8%)	771,154 (37.3%)	130,607 (10.5%)	555,424 (87.3%)	41,545,210 (56.9%)
Multilateral	2,801,543 (69.2%)	6,520,884 (51.5%)	2,349,008 (35.9%)	1,531,080 (35.0%)	1,292,269 (32.2%)	102,322 (46.2%)	1,292,858 (62.6%)	1,115,782 (89.5%)	80,621 (12.7%)	31,342,321 (42.9%)
Private Donor	2,339 (0.1%)	29,121 (0.2%)	84 (0.0%)	5,675 (0.1%)	726 (0.0%)	0 (0.0%)	2,516 (0.1%)	0 (0.0%)	0 (0.0%)	90,011 (0.1%)
Total	4,048,119 (100.0%)	12,650,230 (100.0%)	6,550,553 (100.0%)	4,378,949 (100.0%)	4,013,127 (100.0%)	221,572 (100.0%)	2,066,528 (100.0%)	1,246,389 (100.0%)	636,045 (100.0%)	72,977,542 (100.0%)

Table A7: Gender targeting in climate-related development finance - Commitment - 2019 USD thousand (Source: OECD DAC External Development Finance Statistics: http://oe.cd/development-climate)

Gender targeting	China	India	Vietnam	Indonesia	Philippines	Bhutan	Nepal	Uzbekistan	Armenia	Asia (region)
Mitigation										
Not targeted	8,940,386 (52.0%)	23,141,207 (50.6%)	5,714,757 (68.3%)	10,872,518 (71.8%)	992,697 (11.6%)	301,573 (81.5%)	431,738 (21.2%)	3,291,395 (65.6%)	789,472 (59.8%)	81,758,974 (50.1%)
Principal	42,615 (0.2%)	99,655 (0.2%)	46,018 (0.5%)	227,607 (1.5%)	14,553 (0.2%)	29 (0.0%)	51,255 (2.5%)	0 (0.0%)	14,800 (1.1%)	1,603,038 (1.0%)
Significant	2,177,289 (12.7%)	12,163,367 (26.6%)	1,555,214 (18.6%)	2,165,864 (14.3%)	6,262,665 (73.1%)	41,806 (11.3%)	910,314 (44.6%)	419,438 (8.4%)	141,161 (10.7%)	40,907,717 (25.1%)
Unspecified	6,045,426 (35.1%)	10,325,358 (22.6%)	1,056,857 (12.6%)	1,874,939 (12.4%)	1,302,926 (15.2%)	26,735 (7.2%)	645,721 (31.7%)	1,303,130 (26.0%)	374,491 (28.4%)	38,865,037 (23.8%)
Total	17,205,716 (100.0%)	45,729,587 (100.0%)	8,372,846 (100.0%)	15,140,928 (100.0%)	8,572,841 (100.0%)	370,143 (100.0%)	2,039,028 (100.0%)	5,013,963 (100.0%)	1,319,924 (100.0%)	163,134,766 (100.0%)
Adaptation										
Not targeted	790,618 (19.5%)	2,209,070 (17.5%)	3,100,824 (47.3%)	1,178,199 (26.9%)	1,498,233 (37.3%)	75,778 (34.2%)	158,934 (7.7%)	142,469 (11.4%)	492,226 (77.4%)	19,758,956 (27.1%)
Principal	1,845 (0.0%)	109,872 (0.9%)	32,514 (0.5%)	206,996 (4.7%)	17,878 (0.4%)	81 (0.0%)	92,906 (4.5%)	16 (0.0%)	1,860 (0.3%)	1,637,227 (2.2%)
Significant	983,691 (24.3%)	5,091,707 (40.2%)	1,640,933 (25.1%)	1,642,392 (37.5%)	1,237,692 (30.8%)	90,321 (40.8%)	1,016,417 (49.2%)	345,618 (27.7%)	87,418 (13.7%)	28,087,952 (38.5%)
Unspecified	2,271,965 (56.1%)	5,239,579 (41.4%)	1,776,283 (27.1%)	1,351,361 (30.9%)	1,259,324 (31.4%)	55,391 (25.0%)	798,270 (38.6%)	758,286 (60.8%)	54,541 (8.6%)	23,493,407 (32.2%)
Total	4,048,119 (100.0%)	12,650,228 (100.0%)	6,550,554 (100.0%)	4,378,948 (100.0%)	4,013,127 (100.0%)	221,571 (100.0%)	2,066,527 (100.0%)	1,246,389 (100.0%)	636,045 (100.0%)	72,977,542 (100.0%)

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