



# CARBON PRICING FOR ENERGY TRANSITION AND DECARBONIZATION

NOVEMBER 2022

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Cover design by Edith Creus

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# Foreword

The increasing frequency and magnitude of climate-induced disasters and their devastating socioeconomic impacts call for urgent action to achieve the targets under the Paris Agreement. The adverse impacts of climate change require an urgent transition to clean energy while ensuring access to reliable, affordable, and low-carbon energy to reduce poverty and promote development.

The Asian Development Bank (ADB) recognizes the importance of a just energy transition as a key element for climate action. ADB has been supporting its developing member countries (DMCs) in the energy sector for more than 40 years to increase access to electricity, and this has played a critical role in poverty reduction and economic growth. ADB is responding to the transition to an increasingly multifaceted energy sector with a new forward-looking energy policy to guide its operations and to be mainstreamed with other bank policies and goals. ADB's new Energy Policy recognizes the need to support universal access to reliable and affordable energy services, while promoting the low-carbon transition in Asia and the Pacific.

As Asia and the Pacific can only realize its climate goals if it pursues a transition away from coal-based energy in the near term, ADB is working with regional and international partners to support, study, and pilot a scalable Energy Transition Mechanism (ETM). ETM is a collaborative initiative developed in partnership with DMCs that will leverage a market-based approach to accelerate the transition from fossil fuels to clean energy. ETM will be a win for the climate, a win for local communities, and a win for developing economies. It will significantly shorten the life of legacy coal-fired power plants and unlock new investments in sustainable and renewable energy.

As Asia and the Pacific's climate bank, ADB's efforts on energy transition is part of its wider effort to enhance climate action in the region. Under ADB's Strategy 2030, among its operational priorities is tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability. ADB committed to fully align its new sovereign operations with the goals of the Paris Agreement by 1 July 2023,; 85% of new nonsovereign operations by 1 July 2023,; and full alignment of all operations by 1 July 2025. In 2021, ADB announced it is elevating its ambition to deliver climate financing from its own resources to its DMCs to \$100 billion from 2019 to 2030. In addition, further climate finance is needed and a comprehensive and effective climate policy mix with the appropriate policy instruments will be crucial to meet the Paris targets.

Carbon pricing is a climate policy tool that can foster energy transition and decarbonization, while enabling countries to achieve climate targets articulated under their nationally determined contributions (NDCs) cost effectively and raise climate ambition over time. ADB's new Energy Policy also recognizes that if designed and implemented appropriately, robust carbon pricing instruments can be effective in achieving energy transition by accelerating diffusion of advanced low-carbon

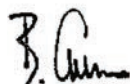
technologies, enhancing the deployment of renewable energy technologies, accelerating e-mobility, encouraging fuel switching, and increasing the use of different forms of nonfossil-fuel energy.

It is therefore not surprising to see a growing momentum to utilize carbon pricing instruments, with around 68 countries globally employing either a carbon tax or an emissions trading system. In addition, international carbon markets, such as under Article 6 of the Paris Agreement, are gaining increased attention as a tool to channel much needed carbon finance and deploy low-carbon technologies.

ADB is fully committed to supporting DMCs in utilizing carbon pricing, as part of the broader climate policy architecture, for energy transition and decarbonization as well as long-term green economic growth toward net-zero emission pathways. ADB has long-standing experience with carbon markets and in providing technical capacity building and carbon finance to support the implementation of greenhouse gas mitigation activities across the region. ADB continues to take a holistic approach to carbon pricing and markets by mobilizing carbon finance, incentivizing investments in low-carbon technologies, and providing technical and capacity-building support to its DMCs.

This study is, therefore, timely as it sheds insights on how well-designed carbon pricing instruments can play a role in accelerating efforts toward energy transition and decarbonization.

Aside from providing relevant case studies and lessons learned from countries that have implemented carbon pricing instruments, it also underscores the importance of design considerations in alignment with national circumstances and priorities. It is our hope that this study will contribute to further discussion on how carbon pricing can be used as part of a broader policy package when approaching energy transition and decarbonization to enhance climate action.



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# Preface

Carbon pricing is an integral element of the broader climate policy architecture that can be used to reduce emissions cost effectively. The basic premise behind carbon pricing instruments is that when well-designed, they can be used effectively to “internalize” the external cost of damage caused by climate change, in part or in full, thereby providing such an incentive.

Along with the host of other benefits, there are strong linkages between carbon pricing and energy transition. Carbon pricing instruments can have a powerful influence on the energy system and can involve substantial flows of funds that can be targeted toward energy policy aims. Long-term predictable carbon pricing policy can incentivize investments into high-value, long-lived, energy-related assets such as power plants, grid infrastructure, and energy-intensive industrial plants. These can in turn support the achievement of wider energy policy aims such as energy security through reduced imports, improved reliability, and greater connectivity.

A notable feature of carbon pricing instruments is they can generate much needed revenue that can be channeled toward climate-related or other development initiatives, for instance, in energy transition or creating green jobs. Revenues raised through carbon pricing can be targeted toward measures that directly benefit energy policy aims, such as improving energy access, affordability, or security—while being mindful of fiscal needs and priorities of governments. International carbon markets, such as under Article 6 of the Paris Agreement, can also play a key role in efforts to foster energy transition and decarbonization. With regard to revenue usage, for example, carbon pricing offsets or domestic and international crediting schemes can deliver similar benefits to revenue utilization from a carbon tax or an emissions trading system (ETS), since the eligible offset regime can be tailored to focus on strategic technologies and co-benefits such as employment and just transition, or target projects that improve energy access, affordability, or security.

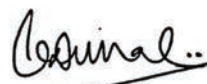
It is therefore not surprising that there is a growing momentum for the use of carbon pricing globally as well as in developing Asia, where there are seven carbon pricing initiatives implemented and/or announced at the national level. This includes an ETS in the People’s Republic of China, Kazakhstan, the Republic of Korea, and New Zealand, while Singapore and Japan utilize a carbon tax. Most recently, Indonesia has started pursuing a hybrid cap-trade-and-tax system. In addition, other countries in the Asia and Pacific region including Pakistan, the Philippines, and Thailand are also working toward adopting direct carbon pricing instruments. This is also an increased momentum in operationalizing international carbon markets under Article 6 of the Paris Agreement in light of the Article 6 Rulebook being finalized at the 2021 United Nations Climate Change Conference (COP26). ADB’s developing member countries (DMCs) are also increasingly moving toward operationalizing international carbon markets under Article 6 of the Paris Agreement.

Despite this positive shift toward utilizing carbon pricing instruments, carbon pricing should not be regarded as a panacea and design considerations need to be aligned with national circumstances and priorities. Carbon pricing instruments also need to be implemented as part of the broader climate policy architecture and in tandem with other policies, such as removing fossil fuel subsidies and creating regulatory conditions that promote private sector investment in renewable energy. As Asia and the Pacific's climate bank, ADB remains steadfast in supporting DMCs utilize carbon pricing instruments as part of the broader climate policy architecture, designed in alignment with national circumstances and priorities.

We hope that this study will help policy makers increase their understanding of the variety of carbon-pricing instruments that are available, how they fit in a larger climate policy context, and how carbon pricing can be designed toward energy transition and decarbonization. It is also our hope that this study can help countries continue their efforts in designing effective climate change responses that can promote a low-carbon transition in Asia and the Pacific, and to do so in a manner that ensures access to clean, reliable, and affordable energy services, while leaving no one behind.

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Virender Kumar Duggal, principal climate change specialist, Climate Change and Disaster Risk Management Division, SDCC, conceptualized and guided the development of this knowledge product.

Mark Johnson, carbon markets business manager at Ricardo PLC, conducted the research and developed the study, which is duly acknowledged and appreciated. The technical inputs from a team of ADB experts including George Anjaparidze, Rastraraj Bhandari, Deborah Cornland, Vinay Deodhar, Darshak Mehta, Takahiro Murayama, and Johan Nylander, are also appreciated.

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# Abbreviations

ADB	Asian Development Bank
CBAM	Carbon Border Adjustment Mechanism
CDM	Clean Development Mechanism
COP	Conference of the Parties
DMC	developing member country
ETM	Energy Transition Mechanism
ETS	emissions trading system (or scheme)
GHG	greenhouse gas
JCM	Joint Crediting Mechanism
MRV	monitoring, reporting and verification
NDC	nationally determined contribution
PPA	power purchase agreement
PRC	People's Republic of China
ROK	Republic of Korea
UNFCCC	United Nations Framework Convention on Climate Change

# Executive Summary

The rising cost of energy is causing concern over the affordability of supplies, especially within the developing Asia region where energy demand continues to grow rapidly. Geopolitical developments have heightened concerns over energy security for import-dependent countries. Alongside these challenges is the need to decarbonize energy systems to mitigate the worst effects of climate change. The increased frequency of severe weather events and their resulting loss and damage show that the world is already facing extreme consequences of current and historic greenhouse gas (GHG) emissions. As such, governments need to have more ambitious policies to keep the pledges made under the Paris Climate Change Agreement. Tackling these dual energy and climate challenges is a defining issue of our time.

Carbon pricing policies can play an important role in addressing carbon emissions, but also in helping to achieve wider energy system objectives. Carbon pricing, in the form of carbon taxes, subsidies, emissions trading, domestic carbon crediting systems, and international carbon markets, can encourage cost-effective realization of climate commitments. It can create incentives for investment in energy efficiency and renewable energy, which help improve energy security and affordability.

This study examines the role that carbon pricing instruments can have in driving a just energy transition within energy supply sectors and major energy use sectors in developing Asia. First, key priorities and challenges for the energy sector in developing Asia are explored. Second, the study outlines the current trends of carbon pricing usage in the energy sector globally and in developing Asia. It then explores how carbon pricing policies can be designed and implemented in ways that support the realization of wider energy policy goals in line with specific energy system characteristics and objectives before sharing insights on assessing readiness on carbon pricing selection, design and implementation, and concluding.

## Energy Policy Challenges and the Need for a Low-Carbon Energy Transition

Energy policies must seek to balance a range of social, economic, and environmental objectives. In particular, key energy policy challenges faced by the developing Asia region include the following:

- (i) **improving energy access**, both in terms of energy supplies and availability of clean and efficient technologies to use this energy;
- (ii) **increasing energy security**, by making sure supplies are available when needed and that a nation is less dependent on energy imports or less vulnerable to price shocks;

- (iii) **improving affordability**, especially for poorer households and energy-intensive industries, which are most vulnerable to high energy costs; and
- (iv) **promoting decarbonization**, as emissions from energy production is a serious contributor to climate change and need to be rapidly reduced.

The need for a sustainable energy transition in line with these objectives requires policy measures that seek greater diversity of supply, more use of cleaner indigenous fuels and renewables, greater system interconnectivity, and higher capacity margins. These elements can be encouraged through market structures, state investment, and the creation of market incentives for private investment. It is also worthwhile noting that while this is generally true for energy systems, they are often more acute for electricity systems.

Possible decarbonization policy options are available to policy makers. These range from market-based incentives such as carbon pricing to subsidy and support schemes, research and demonstration grants, and measures intended to target behavioral change. The effectiveness of these decarbonization policy approaches depends upon the wider policy and fiscal landscape. For example, carbon pricing together with fossil fuel taxation can compound the consumer cost impacts, whereas the presence of fossil fuel subsidies can diminish the environmental effect of carbon pricing.

Therefore, carbon pricing, when designed effectively and in combination with other measures, can be a powerful driver for energy transition and decarbonization and support the realization of wider energy policy objectives.

## Current Trends in Carbon Pricing in the Energy Sector Globally and in Developing Asia

Currently, around a quarter of all global GHG emissions are covered by carbon pricing, with most instruments focusing at least on the power and industry sectors, although others also include transport and buildings.

In the Asia and Pacific region, several new carbon pricing instruments have been introduced in recent years. While there were some early adopters, e.g., New Zealand implementing an emissions trading system (ETS) in 2008, most countries have introduced carbon pricing more recently. Moreover, with the exception of the Republic of Korea (ROK) ETS and New Zealand ETS, most systems are also still experiencing prices below \$10 per ton of carbon dioxide equivalent (tCO<sub>2</sub>e). For example, the carbon price in April 2022 in the People's Republic of China National ETS was \$9.20/tCO<sub>2</sub>e and \$2.09/tCO<sub>2</sub>e in the Indonesia carbon tax, compared to \$18.75/tCO<sub>2</sub>e in the ROK ETS and \$52.62/tCO<sub>2</sub>e in the New Zealand ETS.

The common rationale of governments in introducing carbon pricing was its cost effectiveness in achieving climate commitments. However, other factors are now as important, such as:

- (i) The announcement of the European Union (EU) to introduce a carbon border adjustment mechanism with exemptions applying to countries with similar carbon pricing schemes.
- (ii) Alignment with existing fossil fuel subsidy reform plans.
- (iii) The urgency of the climate crisis and funds for adaptation or to protect vulnerable communities in light of a volatile energy market.

Despite the growth in uptake of carbon pricing instruments, adopting carbon pricing remains politically challenging, particularly amid rising and volatile energy prices. In particular, five key (interrelated) barriers were identified through a literature review related to carbon pricing in the energy sector:

- (i) Carbon pricing instruments that perform effectively in liberalized markets may perform differently or less effectively in **non-liberalized markets**. Assessing policy cost pass-through is one of the key elements to consider when designing appropriate pricing mechanisms.
- (ii) Another market structure that is less compatible with carbon pricing are **centralized markets and markets where the investment landscape for energy infrastructure is dominated by long-term power purchase agreements (PPAs)**. In these cases, government-owned utilities often act as single buyers, and this lack of competition may make it harder for a carbon price signal to incentivize switching to low-carbon sources or energy efficiency.
- (iii) Carbon pricing often faces strong **public opposition in light of affordability concerns**.
- (iv) Countervailing policies such as **fossil fuel subsidies** can directly counteract the price signal that is provided by a carbon price.
- (v) A **lack of reliable data** to estimate scope 3 emissions, together with a consistent monitoring, reporting, and verification (MRV) scheme for how emissions are accounted for and who is held responsible, can make it harder for carbon pricing to be introduced effectively.

Many of these barriers to carbon pricing in the energy sector in developing Asia can be overcome by adjusting the direct design of the carbon pricing instrument as well as the regulatory framework in which it operates.

## Considerations for Carbon Pricing Instruments in Line with Specific Energy System Characteristics and Objectives

Carbon pricing policies have a powerful influence on the energy system and can involve substantial flows of funds that can be targeted toward energy policy aims. Four key ways in which carbon pricing policy and its specific design can support energy policy aims are identified as follows:

- (i) **Investments in high-value, long-lived, energy-related assets.** These include power plants, grid infrastructure, and energy-intensive industrial plants, which require that the policy regime and incentive measures are stable and relatively predictable. This will encourage investments that could support the achievement of wider energy policy aims, such as improving energy security through reduced use of energy imports (in the case of greater use of renewables) and improving reliability through grid infrastructure upgrade and greater connectivity. Policy predictability can be achieved through longer carbon pricing policy phases, clear overarching long-term decarbonization objectives, and wider political consensus for the policy approach.
- (ii) **Revenues raised through carbon pricing.** These can be targeted toward measures that benefit energy policy aims and done by direct financial flow, for example, placing emission trading auction revenues into a dedicated fund, or by tax shifting. Specifically, use of revenues in a way that supports energy savings can provide energy policy benefits through reduced energy imports, greater capacity margins, and potentially lower costs for energy consumers. Support for renewable deployment can also realize similar benefits. Further options that help energy policy aims include direct support to consumers who are less able to pay, or for demonstration and commercialization projects that help establish skills and markets in new energy

technologies. Revenues can also be used directly to address just transition issues through dedicated funds.

- (iii) **International carbon markets such as under Article 6 of the Paris Agreement.** These can deliver similar benefits to use of revenues, since the eligible offset regime can be tailored to focus on strategic technologies and co-benefits such as employment and just transition, or target to projects that improve energy access or affordability.
- (iv) **Measures that mitigate the cost of carbon pricing for key emitters.** These measures can help to sustain the competitive positions of emitters such as carbon- and trade-intensive industries. This could be through conditional recycle mechanisms, such as providing a tax rebate for improved energy performance in industry. In this case, there can be reduced demand for energy, improved capacity margins, and lower energy imports.

## Methodology for Assessing Readiness for Carbon Pricing Selection, Design, and Implementation

The readiness of a country to introduce a carbon pricing instrument depends on the existing political commitment and policy enablers as well as the prevailing governance and systems in place. Elements such as national commitments, legal basis for decarbonization of the sector, existing governance structures, or stakeholder engagement process can facilitate the political acceptance of carbon pricing instruments.

Moreover, adapting the policy environment by either removing countervailing subsidies such as fossil fuel subsidies at the same time as introducing carbon pricing instruments can facilitate a smooth implementation process. This is also true for adjusting enabling and complementary policies such as converting energy taxes into carbon taxes or recycling revenues of a carbon pricing instrument into existing funds aimed at general energy objectives. In addition, the higher capacity and capability available in a country for carrying out detailed impact assessments, for example around abatement costs or trade impacts as well as expertise required to make decisions on design considerations, can improve the readiness for the introduction of a carbon pricing scheme. Last, established roles and responsibilities in government around administration and enforcement of climate policies as well as existing auctioning schemes, MRV systems, and accreditation can also facilitate a smoother introduction.

## Conclusion

Carbon pricing instruments can be an effective tool for driving low-cost decarbonization across many sectors of the economy. A substantial share of these emissions savings will be from energy use, making carbon pricing policy inextricably linked to energy policy. However, energy policy aims are normally broader than climate change mitigation, which in developing Asia often also target improvements in energy access, energy security, and energy affordability. Therefore, carbon pricing needs to be carefully designed in relation to national circumstances and priorities when introduced as part of the broader policy mix to support developing Asia pursue energy transition and decarbonization. Key considerations for the effectiveness of carbon pricing are achieving political stability and predictability, mitigating negative cost impacts on vulnerable consumers such as low-income households and trade-exposed industries, and ensuring an enabling market structure and sufficient liquidity in the case of emission trading.





# 1

## Introduction

An affordable and stable energy system is critical for driving long-term and sustainable economic growth. Yet enormous challenges remain in ensuring that people in Asia and the Pacific have secure and reliable access to the energy supplies they need. In the increasingly global markets, it is vital that enterprises of all sizes and across all sectors can secure low-cost energy to underpin their international competitiveness. Their needs will differ, yet global developments mean the realization of these aims is increasingly challenging. Energy prices are high, volatile, and the reliability of energy imports is not to be taken for granted by governments.

The growth of industrial manufacturing and production in developing Asia heightens the importance of reliable and affordable energy for the region. For example, Indonesia and the Republic of Korea (ROK) are now among the world's manufacturing superpowers along with the People's Republic of China (PRC), with production increasing over time<sup>1</sup> and demand for energy rising as a result. Further, secure energy supplies have contributed in a major way to improved quality of life, higher household incomes, and longer schooling time for children in the region.<sup>2</sup> Inequalities in energy access persist and addressing these requires substantial resources. This is the backdrop against which governments are developing energy policies fit for the coming years and decades.

The accompanying challenge is the urgent need to tackle climate change. Globally, the increased frequency of extreme climate events and the associated loss and damage of recent years leaves no doubt that the world is already facing severe consequences of historic and current greenhouse gas (GHG) emissions, much of which results from energy use. Yet it is not too late to avoid the worst impacts of a changing climate. Pledges made by governments under the Paris Agreement on climate change need to be more ambitious and urgent action is needed to ensure pledges are translated into long-term road maps. This will require new decarbonization policies and strengthening of existing ones.

Carbon pricing instruments can be a key element of the broader climate policy architecture that can be utilized to meet this dual challenge of tackling climate change and ensuring energy security. They can do so due to their ability to cost-effectively meet climate commitments as well as create opportunities for increased finance for energy-related investment from both public- and private-sector sources, and leverage that capital to catalyze both domestic and foreign investment.

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<sup>1</sup> Statista. 2022. The World's Manufacturing Superpowers (accessed 19 August 2022).

<sup>2</sup> Asian Development Bank (ADB). 2021. *Energy Policy Supporting Low-Carbon Transition in Asia and the Pacific*. Manila.

## Objective

This study explores the role that carbon pricing instruments—through the view point of carbon taxes, emissions trading, and carbon-crediting systems—can play in driving energy transition in energy supply sectors (fuels, electricity) and major energy use sectors (industry, transport, buildings),<sup>3</sup> both domestically and internationally. Wider energy sector issues are considered together with those specific to the electricity sector.<sup>4</sup>

This study explores how energy and climate change objectives can be met in a coherent, consistent, and effective way through carbon pricing. It specifically addresses these questions:

- (i) How can carbon pricing policies be designed and implemented in ways that also support the realization of wider energy policy goals?
- (ii) How does the current and changing energy landscape impact the effectiveness of carbon pricing policies, and how can they be designed to be most effective?

## Priorities and Challenges for the Energy Sector in Developing Asia

Energy policies must seek to balance a range of social, economic, and environmental objectives. Energy is critical for basic day-to-day living, comfort, health, and mobility and enables enterprises to operate and provide essential public services. As explained in a report by the Asian Development Bank (ADB) on energy policy supporting low-carbon transitions in Asia and the Pacific, key energy policy priorities within Asia can be categorized as energy access, sustainability, security, and affordability.<sup>5</sup>

- (i) **Improving energy access.** Energy access is a key priority across developing Asia. Around 116 million people within the region do not have access to electricity.<sup>6</sup> Further, 44% of the population do not have access to clean cooking fuels and efficient cooking equipment.<sup>7</sup> Use of traditional cooking equipment leads to household air pollution, which has been linked as a primary cause to multiple serious health conditions, such as heart disease, cancers, and childhood pneumonia. Household air pollution, which has greater impact on women and children due to exposure, is linked to almost 4 million premature mortalities.<sup>8</sup>

Across developing Asia, measures to improve energy access include extending the reach of electricity grid transmission and distribution networks by deploying local small-scale electricity generation (especially hydropower, solar, and hybrid) and encouraging the reach of supply chains for cleaner fuels and the equipment to use them. These are achieved through centralized initiatives of state-owned energy enterprises, creation of market structures that

<sup>3</sup> ADB. 2021. *Carbon Pricing for Green Recovery and Growth*. Manila.

<sup>4</sup> Carbon pricing systems can cover just carbon dioxide (CO<sub>2</sub>) but sometimes include other GHGs. In this study product, the use of carbon dioxide equivalent (CO<sub>2</sub>e) refers to all GHGs covered by the relevant carbon policy.

<sup>5</sup> ADB. 2021. *Energy Policy Supporting Low-Carbon Transition in Asia and the Pacific*. Manila.

<sup>6</sup> Asia Pacific Energy Portal – World Bank Group 2020. *Proportion of Population with Access to Electricity in Asia and the Pacific, 2016-2020* (accessed 15 September 2022).

<sup>7</sup> United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). 2019. *Clean Cooking: Evidence and Innovations for Filling the Gap*.

<sup>8</sup> UN Secretariat of the High-level Dialogue on Energy. 2021. *Theme Report on Energy Access*.

enable private access to these markets and investment, and direct financial support and incentives for both new connections to the grid and off-grid installations.

- (ii) **Achieving environmental sustainability and decarbonization.** The environmental sustainability of the energy sector is a priority that is pursued through switching to lower or zero pollution fuels and by encouraging more efficient use of energy. It is important in the context of decarbonization but also for local air quality and water quality pollutants. Energy policies target these outcomes through regulatory and market reform, as well as market incentives that improve access for low-carbon and renewable energy suppliers and improve the economic viability of the technologies that use those fuels.

Decarbonization of the electricity sector is a particular challenge in developing Asia, with high growth in demand and continued investment in long-life high carbon assets. Future energy demand in the region will be driven by increased use of space cooling, compounded by the effects of climate change. By 2050, three countries from developing Asia are expected to contribute half of the world's demand for space cooling.<sup>9</sup>

Currently, roughly 50% of global carbon dioxide (CO<sub>2</sub>) emissions (from the combustion of fossil fuels) are from Asia and the Pacific,<sup>10</sup> and while increases in electricity demand will be met with increases in cleaner production, significant subsidies for fossil fuels (e.g., 30 billion in the PRC<sup>11</sup>) serve to dampen the potential of renewables to meet the increased demand. In fact, five Asian countries account for 80% of new investment into coal plants.<sup>12</sup>

- (iii) **Promoting secure and affordable energy.** The security of energy supplies is important to people in Asia from two perspectives. First, for electricity, capacity margins need to be sufficient to avoid supply interruptions, either planned or unplanned. While much progress has been made in recent years, load shedding remains a problem for many people. In the Asia and Pacific region, about 940 million people experience frequent interruptions, 350 million people are without adequate supplies of power, and around 150 million have no access to electricity.<sup>13</sup> Power shortages can arise due to power plant or grid transmissions and/or distribution system failure or unavailability, also to shortages of fuel for power generation, as has been seen recently with gas supplies for some countries.

The risk is exacerbated by the variability of demand during the daily cycle, which in turn can become more extreme with greater penetration of solar photovoltaic (PV), due to its diurnal cycle. This pattern, coined a “duck curve,” was first explored in California in the early part of the last decade<sup>14</sup> and is shown in Figure 1, showing electricity demand in California (footnote 10). This curve can be “smoothed” with energy storage technologies, such as hydro and batteries, and recent developments in battery technology are beginning to help and become more accessible.<sup>15</sup> Figure 2 provides examples of electricity demand curves across developing Asia with variations of the “duck” curve.

<sup>9</sup> International Energy Agency (IEA). 2018. *The Future of Cooling—Opportunities for Energy Efficient Air Conditioning*. Paris.

<sup>10</sup> ADB. 2021. *Energy Policy Supporting Low-Carbon Transition in Asia and the Pacific*. Manila.

<sup>11</sup> A. García-Herrero, and S. Tagliapietra. 2021. *For the Climate, Asia-Pacific Must Phase out Fossil-Fuel Subsidies*. Bruegel.

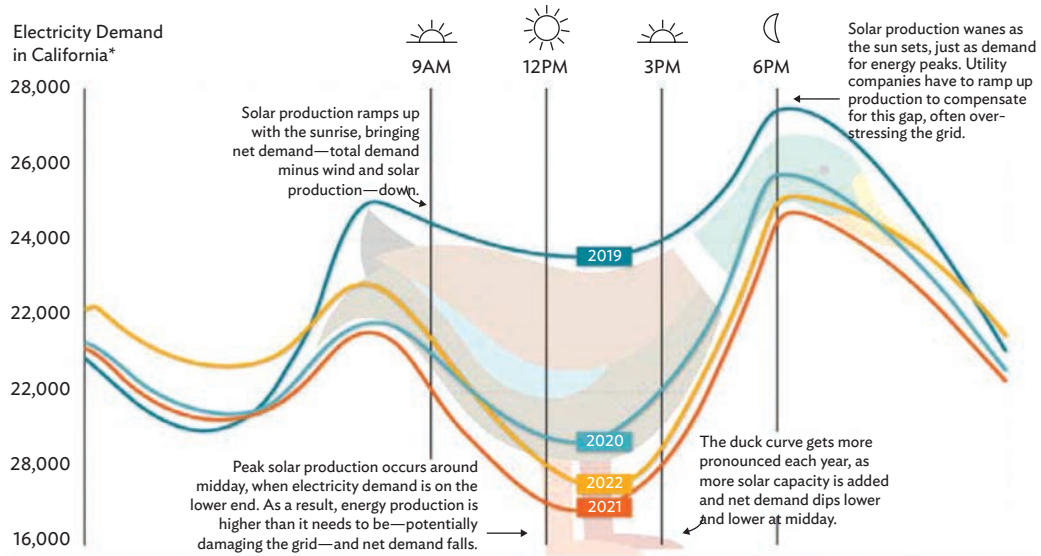
<sup>12</sup> J. Ambrose. 2021. Five Asian Countries Account for 80% of New Coal Power Investment. *The Guardian*. 30 June.

<sup>13</sup> ADB. 2021. *Energy Policy Supporting Low-Carbon Transition in Asia and the Pacific*. Manila.

<sup>14</sup> O. Wallach. 2022. The Solar Power Duck Curve. *Elements. Energy Shift*. 4 April.

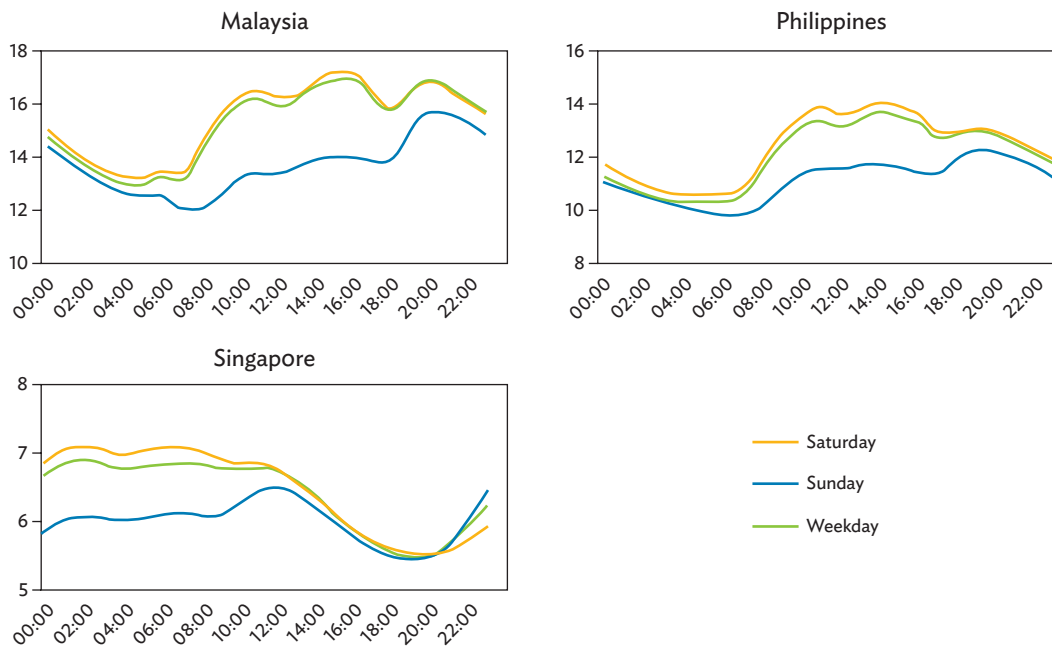
<sup>15</sup> J. Kosowatz. 2018. Energy Storage smooths the Duck Curve. *Mechanical Engineering*. 140 (06). pp. 30–35.

**Figure 1: Solar Power Duck Curve (megawatt)**



Source: Kosowatz, J. 2018. Energy Storage Smooths the Duck Curve. *Mechanical Engineering*. 140 (06). pp. 30-35.

**Figure 2: Hourly Electricity Demand Curves—Malaysia, Singapore, and the Philippines (gigawatt)**



Source: International Energy Agency. 2022. Real-Time Electricity Tracker (accessed 25 September 2022).

The second related dimension arises from reliance on energy imports and international markets. High dependence risks exposure to high prices, with cost impacts for consumers, and ultimately presents a risk of physical interruptions. Policy measures to mitigate these risks seek greater diversity of supplies, more use of indigenous fuels and renewables, greater system interconnectivity, and higher capacity margins. These are encouraged through market structures, state investment, and creation of market incentives for private investment. Importantly, measures to improve security do not necessarily result in lower emissions. For example, the PRC boosted indigenous coal production in 2021—a 6% year-on-year increase (increased to 12.6% in the first half of 2022)—after a domestic energy crisis, which saw electricity rationing.

For the Asia and Pacific region, total coal production decreased by 1.4% in 2020 (compared to 2019), and then rose by 5.5% in 2021.<sup>16</sup> Another example of increased coal production is Germany, which plans to increase coal burning for a “transitional period,”<sup>17</sup> seeking to compensate for a cut in natural gas imports. In all these instances, efforts to improve energy security in the short term have been detrimental to decarbonization.<sup>18</sup> Figure 3 also shows coal use doubling in 5 years in Indonesia, a large coal exporter with significant reserves.

The affordability of energy is important for all sectors of the economy. Fossil fuel prices continue to rise, and the costs associated with meeting energy demand with lower carbon fuels is a politically charged issue, with protests against approaches such as carbon taxes becoming evident, especially when they coincide with fossil fuel price increases. Perhaps most noticeably were the “Yellow Vest” demonstrations in France against a carbon tax on fuel, which was at the same time as a sharp increase in fuel prices.

Against this backdrop, it is important that decarbonization policies are designed and delivered in a way that minimizes the associated costs (which becomes easier as renewable costs continue to fall) and distributes those costs in a way that society deems as fair. The most affected segments of the society and economic sectors are poor households with a limited ability to pay for higher energy costs and high energy intensity industries trading internationally, which are unable to accommodate high energy and carbon costs and which cannot pass those costs on in the products they sell.

Fossil fuel subsidies are thus widespread, as policy instruments aim to maintain lower energy costs for critical sectors or for the whole economy and/or encourage more use of secure indigenous fossil resources. Removal of these policies is essential for reducing emissions, especially as energy cost subsidies function to lower prices and work counter to the decarbonization incentive that carbon pricing seeks to achieve.

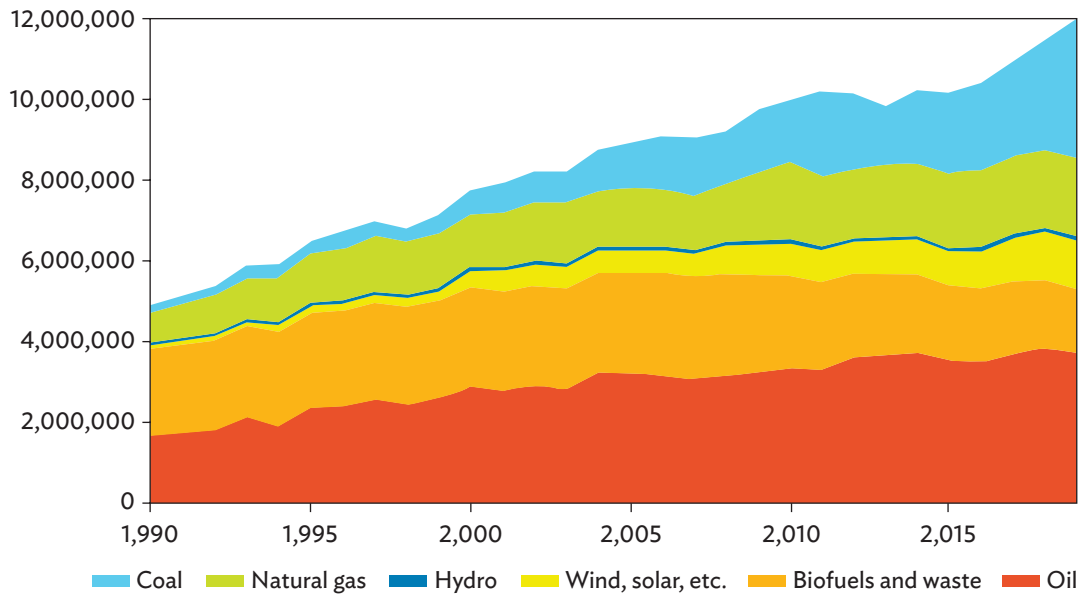
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<sup>16</sup> Statista. 2022. Coal Production in the Asian-Pacific Region from 2012 to 2021 (accessed 10 September 2022).

<sup>17</sup> S. Meredith. 2022. “The Situation is Serious”: Germany Plans to Fire up Coal Plants as Russia Throttles Gas Supplies. CNBC. 20 June.

<sup>18</sup> W. Patterson. 2022. *Asia’s Energy Security Trumps Green Push*. Internationale Nederlandse Groep (ING). 1 August. Amsterdam.

**Figure 3: Total Energy Supply by Source and Increase in Domestic Coal Use in Indonesia, 1990–2019 (terajoules)**



Source: International Energy Agency. 2019. *Indonesia*. Paris.

## Decarbonization and Carbon Pricing as Part of the Policy Mix to Achieve Energy Transition

Carbon-pricing instruments are effective at promoting low-cost emission reductions.<sup>19</sup> Nevertheless, achieving cost-effective emission reductions may be hindered by the presence of nonprice barriers and may require other policy interventions.<sup>20</sup> Furthermore, carbon pricing may not encourage innovation into new technologies that may be initially expensive but with longer-term, lower-cost potential.<sup>21</sup> In practice, carbon pricing is most effective when combined with a broader policy mix.<sup>22</sup>

Figure 4 is an illustration of an effective policy mix for addressing climate change mitigation, showing an illustrative marginal abatement cost curve. The first set of measures, depicted on the left-hand side, represent cost-negative factors that are hindered by non-price barriers. The second set of measures, depicted in the middle section, represent relatively lower positive cost measures, which may be financially attractive to implement in the presence of carbon pricing. The third set of measures, on the

<sup>19</sup> Intergovernmental Panel on Climate Change. 2022. Sixth Assessment Report of Working Group III, Mitigation of Climate, Chapter 13.6.3. Geneva.

<sup>20</sup> L. Ryan et al. 2011. *Energy Efficiency Policy and Carbon Pricing*. IEA Information Paper. Paris: IEA/OECD.

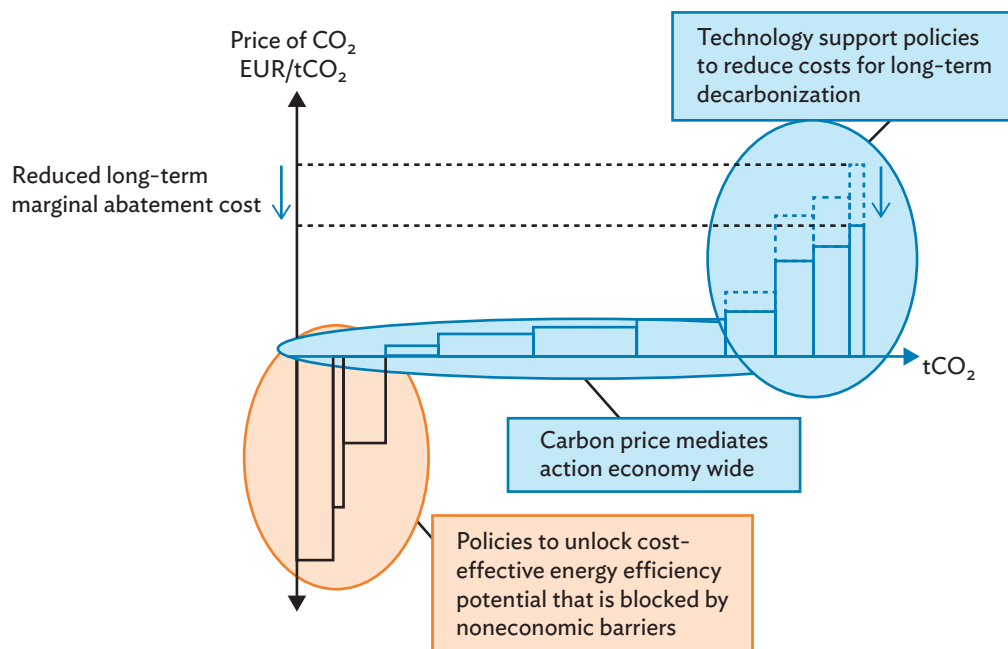
<sup>21</sup> OECD. 2009. *The Economics of Climate Change Mitigation*. Paris.

<sup>22</sup> For details, see Box 1: Carbon Pricing in the Overall Climate Policy Architecture in ADB. 2021. *Carbon Pricing for Green Recovery and Growth*. Manila.

right-hand side, represent currently higher cost abatement measures. Policy intervention for supporting higher cost abatement measures can include mechanisms that drive selected key technologies down the learning curve, through interventions such as investments in research and development. Crucially, the appropriate policy mix will vary across national contexts.<sup>23</sup>

A mix of possible decarbonization policy options is available to the policy maker. These range from market-based incentives such as carbon pricing, through subsidy and support schemes, research and demonstration grants, and measures intended to target behavioral change. The effectiveness of these decarbonization policy approaches depends upon the wider policy and fiscal landscape. For example, carbon pricing together with fossil fuel taxation can compound the consumer cost impacts, whereas the presence of fossil fuel subsidies can diminish the environmental effect of carbon pricing.

**Figure 4: Schematic of Policy Mix for Addressing Climate Change Mitigation Effectively**



CO<sub>2</sub> = carbon dioxide, EUR = euro, t = ton.

Source: C. Hood. 2013. *Managing Interactions Between Carbon Pricing and Existing Policies*. Paris: IEA/OECD.

<sup>23</sup> C. Hood. 2011. *Summing Up the Parts: Combining Policy Instrument for Least-Cost Climate Mitigation Strategies*. Paris: OECD.



Therefore, carbon pricing when designed effectively and in combination with other measures can be a powerful driver for energy transition and decarbonization and support the realization of wider energy policy objectives. Carbon pricing is defined by any instrument that puts a price on carbon emissions and thereby captures the external costs of carbon dioxide equivalent (CO<sub>2</sub>e) emissions and its impacts.<sup>24</sup> Carbon pricing can take the form of carbon taxes, subsidies, emissions trading, domestic carbon crediting systems, and international carbon markets. The main carbon pricing mechanisms and their concepts relevant to this knowledge product are briefly introduced in Box 1.

### Box 1: Key Carbon Pricing Options

Carbon taxes involve taxable entities making payments to government in relation to their liable emissions. The carbon tax rate is set by government and may be changed over time. Taxable entities may be able to offset their tax liability by buying and surrendering emissions units that represent savings made by other parties.

In a similar way, subsidies for low-carbon or zero-carbon outcomes could be made on the basis of the carbon saved and in relation to a fixed carbon price, for example using carbon contracts for difference.

Emissions trading involves the creation of tradable units that correspond to each ton of carbon dioxide equivalent emitted. Liable entities are required to acquire and surrender these units (commonly called allowances or certificates) to match their actual emissions in a compliance cycle. The units are released to the market by the system administrator either for free or at a charge, normally via auctions. Units issued for free can be allocated based on the past performance of liable entities, often termed grandfathering, or on the basis of performance metrics, commonly called benchmarks. The number of units released represents an emissions cap and the trade of units in the market establishes their value, i.e., the carbon price, which corresponds to the marginal cost of meeting the cap.

Domestic carbon crediting involves covered entities earning credits representing emissions savings that are better than a predetermined baseline. These credits can be traded, and the price is established in the market. The demand for credits may come from outside the system, if they can be used for compliance in other regimes, or be internal to the system, for instance if entities that emit above the threshold are required to acquire and surrender credits to match that difference (known as baseline and credit).

International carbon markets refer to situations in which emissions units are traded internationally. This could be through linked trading systems, eligibility of offsets that come from overseas, or international cooperation that involves payments made by entities in one country for mitigation outcomes achieved in others, as established under Article 6 of the Paris Agreement.<sup>a</sup>

The targeted use of revenues raised through carbon pricing (i.e., tax receipts or emission trading auction income), beyond the general budget of the country, is termed revenue recycling.

<sup>a</sup> ADB. 2021. *Article 6 of the Paris Agreement: Drawing Lessons from the Joint Crediting Mechanism*. Version II. Manila. Source: Asian Development Bank (Sustainable Development and Climate Change Department).

<sup>24</sup> World Bank. 2022. Carbon Pricing Dashboard. Washington, DC.

In a carbon pricing regime, the value placed on a ton of carbon is the same across the whole system, affecting all participants in the same way. This creates an incentive for emissions reductions where it is cheaper than the prevailing carbon price, since such savings either earn carbon credits, or avoid the need to buy and surrender carbon allowances or pay a carbon tax. This is the strength of the system: it encourages the lowest cost decarbonization. However, two resultant features can create challenges for wider energy policy:

- (i) Carbon pricing creates an incentive based solely on carbon outcomes. Therefore, no value is placed on wider impacts of the technologies deployed, whether they contribute to or hinder the achievement of energy policy goals.
- (ii) Most carbon pricing instruments are technology-neutral. This means they drive low-carbon outcomes from whatever available technologies are most cost-effective. It does not explicitly target any particular technology, even if the wider energy policy aim might be to do so. For the same reason, carbon pricing does not naturally deliver energy diversity and any resultant improvement in energy security.

There are, however, two important ways in which carbon pricing can be used to realize energy policy outcomes. First, carbon pricing can raise revenues for government, for instance through carbon tax receipts or the auction of emissions allowances. These revenues can be used to support a just transition, for instance by encouraging new enterprises through tax benefits or funding worker reskilling in communities where high carbon assets close. The revenues can also be used more directly toward energy policy aims, for instance by supporting investment that delivers energy access or supports the poorest households with energy costs. The decisions on whether to raise revenue and how to use it are political choices and can be targeted toward a just transition and a green recovery.<sup>25</sup>

A second factor is the international dimension. Carbon pricing can support international finance through carbon market linking, voluntary offsetting using independent standards and mechanisms, and carbon trade under Article 6 of the Paris Agreement (footnote 25). This finance can be targeted toward projects that deliver wider cobenefits and support energy policy aims and a just transition.

Thus, carbon pricing can be a powerful tool for decarbonizing the energy sector. With careful design, it can also complement the achievement of wider energy policy aims and help enable a just energy transition. Specific design considerations to align carbon pricing with energy policy aims is further discussed in Chapter 3.

## Decarbonization, Carbon Pricing, and Energy Transition as Crosscutting Themes

Decarbonization of the energy sector must be achieved within the wider context of the energy policy priorities introduced earlier. Emissions must be cut to the lowest cost against the backdrop of growing demand for energy (expected to double in Asia and the Pacific by 2040).<sup>26</sup> However, emissions reductions alone are not enough. It is essential that clean energy access is addressed, energy security

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<sup>25</sup> ADB. 2021. *Carbon Pricing for Green Recovery and Growth*. Manila.

<sup>26</sup> ADB. 2022. *Navigating the Challenges to a Clean Energy Future*. 18 May.

improved, and energy becomes affordable for all. In these respects, the relationship between energy policy and carbon pricing in particular is complex, as decarbonization policies can contribute to these wider aims, or can act in a contradictory way. This study will specifically focus on the combination of decarbonization and just transition, whereby the just transition refers to minimizing the negative effects of “climate action on people and societies.”<sup>27</sup>

The decarbonization of the energy sector will fundamentally change its structure. It involves a combination of increased use of a wider variety of renewables, measures to improve energy efficiency, as well as more sustainable consumption habits. Further, as a transitional measure, switching from coal to natural gas can realize medium-term emission reductions. The way energy is supplied and stored will change, as will the use of more localized, distributed energy sources.<sup>28</sup> Energy market reforms and measures to encourage more public and private investment will all be critical to making this happen.

Carbon pricing can impact energy priorities (positively and negatively) in the following main ways:

- (i) **Rural renewables affecting energy access.** Medium- and smaller-scale renewables can utilize natural resources and contribute to emissions reductions. Yet these resources can be in remote locations and also serve an important role in improving energy access and rural energy reliability (footnote 28).
- (ii) **National energy mix impacting energy security.** Decarbonization of the energy system will lead to less use of high-carbon indigenous fossil fuels such as coal, in favor of renewable sources and alternative fuels. In the absence of sufficient, achievable, cost-effective, and realizable renewable potential, there may be greater use of natural gas as a transitional measure, which may be imported. Increased reliance on gas can be detrimental to a country’s energy security, as they are more exposed to the potentially volatile energy commodity markets, both international and domestic. For example, the recent reduction in natural gas traded between the Russian Federation and Europe due to the Russian invasion of Ukraine has led to soaring gas prices and destabilizing energy security in the region, with similar knock-on effects for Asia and the rest of the world.<sup>29</sup>
- (iii) **Renewables affecting energy reliability.** The increased deployment of renewables can further impact the security of energy, as renewables are often intermittent in grid-connected electricity supply systems if there are insufficient capacity margins, standby generation and/or interconnectivity to manage periods of low supply. These challenges can be overcome by increasing investments for baseload power supply and storage capacity to manage the higher share of intermittent power sources. It is therefore important that carbon pricing is implemented within an energy policy environment that encourages the investment needed to manage the higher share of renewables that is to be deployed within the electricity mix.<sup>30</sup>
- (iv) **Carbon costs impacting energy affordability.** A further countervailing impact of carbon pricing (depending on how the instrument is designed) is that it can increase the cost of energy and make it less affordable, especially for critical groups such as poorer households or high energy intensity trade exposed industrial sectors. This higher cost results either from an explicit

<sup>27</sup> K. Hughes and M. Rescalvo. 2021. Just Transition Beyond the Energy Sector. *ADB Briefs*. No. 195. Manila: ADB.

<sup>28</sup> UNESCAP. 2017. Regional Cooperation for Sustainable Energy in Asia and the Pacific. Bangkok.

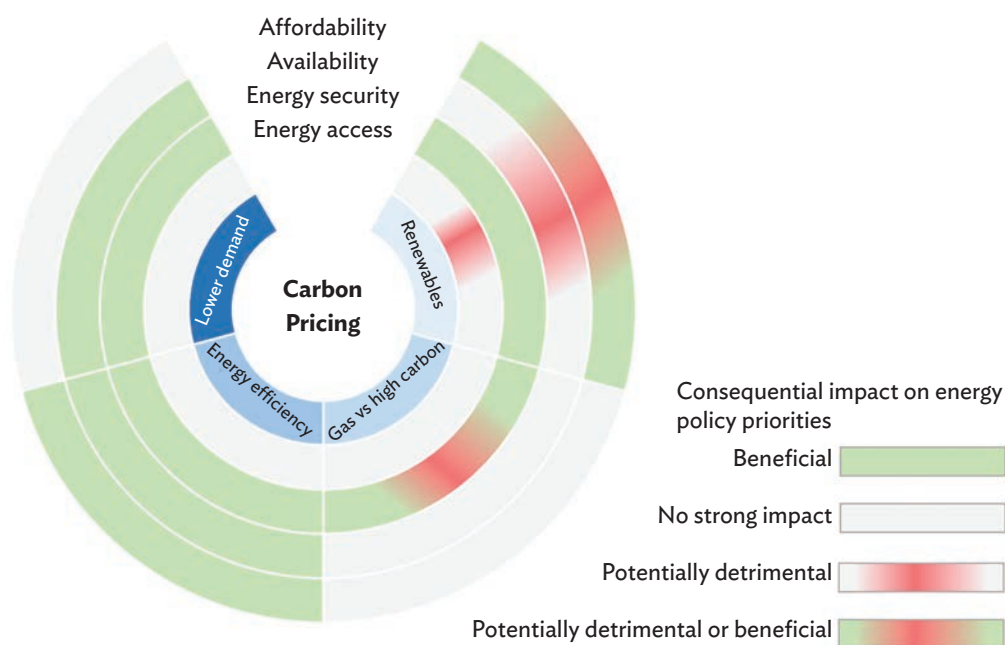
<sup>29</sup> L. Gibson. 2022. Russia Gas Cuts Stoke Asia’s Energy Security Fears. *Al Jazeera*. 29 July.

<sup>30</sup> ADB. 2021. *Financing Clean Energy in Developing Asia*. Manila.

carbon price applied to energy supplies, or from the pass-through of carbon costs within energy prices (in cases where that carbon price is applied upstream in the energy supply chain). This cost is greater with higher decarbonization ambition, due to the costs of low-carbon technologies, energy efficiency, and demand reduction necessary to meet the policy objective. The role of the design of the instrument to mitigate these negative impacts is further discussed in Chapter 3.

The complex mix between the changes in the energy system that are encouraged by carbon pricing, and their contribution to different energy policy priorities is summarized in Figure 5. It shows, simplistically, that carbon pricing can influence decarbonization by incentivizing the four changes within the central blue ring: reducing demand for energy using activities, improving the energy efficiency of those activities, meeting the energy needs through greater deployment of renewables, and meeting the energy needs by switching away from high carbon fuels like coal, but still using natural gas. In turn, these shifts can impact the achievement of wider energy policy aims, sometimes positively and sometimes negatively, as indicated in the outer rings. In some cases, the impact is circumstantial, for instance, whether renewable deployment is positive or negative for affordability depends on the availability of renewable resources and technology costs. The figure is a summary of a complex set of interactions that will vary by country and is intended to illustrate the nature of the interactions and contributions rather than their strengths.

**Figure 5: Interactions Between the Immediate Effects of Carbon Pricing and Energy Policy Aims**



Note: The blue rings indicate the main immediate impacts of carbon pricing. The consequential impacts on energy policy objectives are shown in the outer rings. Some energy policy impacts depend on circumstances, such as whether a driver's use of gas instead of coal would increase or decrease energy imports.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

A final important consideration is impact on jobs and local communities arising as energy systems change. The closure of large, high-carbon assets such as fossil fuel power plants or inefficient steel plants in favor of more efficient lower carbon alternatives incentivized by carbon pricing can have a huge impact on the communities in which they are located. The workers who lose their jobs may not be able to reskill for work in alternative sectors or relocate to new centers of employment. This can have an indirect effect on the local economy as less wages are spent on local goods and services.

By contrast, the enablers of new energy system investments may not be in place either or may not naturally be incentivized by carbon pricing policies alone. These include financial system and energy market incentives, regulatory environment, political commitment (national and local), governance systems, institutional capacity, human capital, and wider energy infrastructure.

The management of these energy aspects, among other social considerations, can enable a just transition in which decarbonization goals are achieved at scale and cost effectively, while satisfying wider energy policy objectives and societal needs as well. The realization of these outcomes is a key challenge of decarbonization policy and its interrelation with energy policy.

# 2

## Trends in Carbon Pricing in the Energy Sector Globally and in Developing Asia

Globally, a growing number of countries are implementing carbon pricing instruments to realize their international climate commitments,<sup>31</sup> or are at least considering doing so. This chapter provides an overview of the current carbon pricing trends (usage in the energy sector globally and in developing Asia particularly), with a focus on energy transition.

### Trends in Carbon Pricing Usage in the Energy Sector

The World Bank's annual report, *State and Trends of Carbon Pricing* states that government revenues from carbon pricing increased by 60% between 2020 and 2021 to a record high of \$84 billion (footnote 31). This reflects a set of three major trends in global carbon pricing:

- (i) the introduction of new instruments by governments around the world;
- (ii) higher carbon prices in existing carbon tax and emission trading systems. However, it should be noted that most carbon pricing schemes still have prices that are deemed too low (below the 40–80 tons of carbon dioxide equivalent [tCO<sub>2</sub>e] range) to achieve the 2 degrees Celsius objective of the Paris Agreement (as reflected in Table 1); and
- (iii) a higher proportion of auctioning in existing emission trading systems.

This increase in revenue collection from carbon pricing demonstrates its potential role as a fiscal policy instrument to redirect finance toward policy objectives, in addition to the direct incentive created for low-carbon investment. For example, finance could support a just transition, pandemic recovery, and the protection of vulnerable communities both in respect to climate impacts and energy prices.

Table 1 provides an overview of the current coverage of carbon pricing schemes in terms of countries and energy sectors.

Currently, around a quarter of all global CO<sub>2</sub>e emissions are covered by some form of carbon pricing, with most instruments focusing on the power and industry sectors as a minimum, and often also other sectors such as transport and buildings.

In the Asia and Pacific region, several new carbon pricing instruments have been introduced in recent years. Table 2 shows that while there were some early adopters in the region, e.g., New Zealand implementing an ETS in 2008, most countries have introduced carbon pricing more recently. Moreover, with the exception of the ROK ETS and New Zealand ETS, most systems are also still

<sup>31</sup> World Bank. 2022. *State and Trends of Carbon Pricing 2022*. Washington, DC.

experiencing prices below \$10/tCO<sub>2</sub>e. For example, the carbon price in April 2022 in the PRC National ETS was \$9.20/tCO<sub>2</sub>e and \$2.09/tCO<sub>2</sub>e in the Indonesia carbon tax, compared to \$18.75/tCO<sub>2</sub>e in the ROK ETS and \$52.62/tCO<sub>2</sub>e in the New Zealand ETS. In addition, the momentum toward carbon pricing did not stop despite the impacts of the COVID-19 pandemic (Box 2),<sup>32</sup> with Indonesia recently announcing a hybrid cap-trade-and-tax system.<sup>33</sup>

**Table 1: Overview of Mandatory Government-Led Carbon Pricing Instruments in the Energy Sector**

Geography (and no. of instruments implemented) <sup>a</sup>	Name and Type of Instruments (and year of implementation) <sup>a</sup>	Share of Total Emissions in Geography Covered (%) <sup>a</sup>	Energy Sectors Covered <sup>a</sup>
Europe (24)	EU ETS (2005)*	41	Power, industry, aviation
Latin America and the Caribbean (4)	Argentina Carbon Tax (2018)	20	All
	Colombia Carbon Tax (2017)	23	All
	Chile Carbon Tax (2017)	29	Power, industry
	Uruguay Carbon Tax (2022)	11	All
North America (5)	Mexico Carbon Tax (2014)	44	All
	Mexico Pilot ETS (2020)	40	Power, industry
	The Regional Greenhouse Gas Initiative (2009)	11	Power
	Canada Federal Fuel Charge (2019)	22	Fuels
	Canada federal OBPS (2019)	7	Industry
Africa (1)	South Africa Carbon Tax (2019)	80	Industry, power, transport

ETS = emissions trading system, EU = European Union, OBPS = Output-Based Pricing System.

<sup>a</sup> From World Bank. 2022. *Carbon Pricing Dashboard* (accessed 20 September 2022).

Note: Europe has 24 total carbon pricing instruments in place, but only the EU ETS as the main scheme is highlighted in this overview table.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

### Box 2: COVID-19 Impacts on Energy System Development

While still being studied for its exact impacts, the coronavirus disease (COVID-19) pandemic is widely believed to have significantly impacted the energy system development globally. The main impacts include reduced energy demand, e.g., because of lower demand for transport, and reduced investment in new energy assets due to a slowdown of the global economy. However, according to a World Bank *State and Trends of Carbon Pricing* paper in 2022, the COVID-19 pandemic did not notably delay the introduction of decarbonization policies for the energy sector despite the ongoing crisis.<sup>a</sup>

Furthermore, any energy demand suppression may be short-lived. For example, due to the rapid recovery of global economies, worldwide coal use has already rebounded above prepandemic levels. Global coal demand is expected to peak in 2022 and remain at that level for the following until 2024.<sup>b</sup>

<sup>a</sup> World Bank. 2022. *State and Trends of Carbon Pricing*. Washington, DC.

<sup>b</sup> International Energy Agency. 2021. Coal Power's Sharp Rebound is Taking It to a New Record in 2021, Threatening Net Zero Goals. Press Release. 17 December.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

<sup>32</sup> D. Nachtigall, J. Ellis, and S. Errendal. 2022. Carbon Pricing and COVID-19: Policy Changes, Challenges and Design Options in OECD and G20 Countries. *OECD Environment Working Papers*. No. 191. Paris.

<sup>33</sup> World Bank. 2022. *Carbon Pricing Dashboard* (accessed 20 September 2022).



**Table 2: Carbon Pricing Instruments in the Asia and Pacific Region**

Name and Type of Instruments (year of implementation) <sup>a</sup>	Share of Total Emissions in Geography Covered (%)	Carbon Price Level as of April 2022 (\$/tCO <sub>2</sub> e)	Energy Sectors Covered	Main Point of Regulation
Kazakhstan ETS (2013)	46	1.08	Power, heating, industry	Midstream
PRC National ETS (2021)	33	9.20	Power	Upstream
ROK ETS (2015)	73	18.75	Industry, power, buildings, domestic aviation, waste	Midstream
Japan Carbon Tax (2012)	2	2.36	All	Upstream
Tokyo CAT (2010)	20	5.42	Industry, power, buildings	Midstream
Saitama ETS (2011) (linked to Tokyo CAT)	20	5.42	Industry, buildings	Midstream
New Zealand ETS (2008)	49	52.62	Industry, power, waste, transport, forestry	Upstream
Singapore Carbon Tax (2019)	80	3.69	All	Midstream
Indonesia Carbon Tax (2022)	26	2.09	Coal power	Upstream

CAT = Cap and Trade, ETS = emissions trading system, tCO<sub>2</sub>e = tons of carbon dioxide equivalent.

<sup>a</sup> From World Bank. 2022. *Carbon Pricing Dashboard* (accessed 20 September 2022).

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

The motivations for introducing carbon pricing have become more complex. While previously the rationale of governments for introducing carbon pricing was primarily as a way to achieve existing climate commitments in a cost-effective manner, additional justifications are being cited, as follows:

- (i) **The announcement of the EU to introduce a carbon border adjustment mechanism with exemptions applying to countries with similar carbon pricing schemes.** As an example, the Government of the Republic of Türkiye has stated that introducing a robust domestic carbon price could give it a competitive advantage in trade with the EU bloc, in light of the newly planned Carbon Border Adjustment Mechanism (CBAM) in the EU (see Box 3 and 4).<sup>34</sup>
- (ii) **Alignment with existing fossil fuel subsidy reform plans.** As an example, the Presidential Climate Commission in South Africa includes measures to promote the Just Transition Framework to a climate-resilient economy, among other priorities, and these plans have been integrated alongside the introduction of the carbon tax.

<sup>34</sup> European Bank for Reconstruction and Development. 2022. *Turkish Carbon Market*. London.



### Box 3: Carbon Border Adjustment Mechanism of the European Union—Impacts on Countries in Asia and the Pacific

The publication of the European Commission’s “Fit for 55 Package” included a proposal to introduce a Carbon Border Adjustment Mechanism (CBAM).<sup>a</sup> This was in response to the risk that the European Union (EU) emissions trading system (ETS) was pushing carbon-intensive industrial processes to territories outside of the EU, where carbon regulations or pricing can be less rigorous. This process is often referred to as “carbon leakage,” and its reduction is the primary justification of the mechanism. The CBAM will apply a carbon price to certain imports, ensuring equivalence between the carbon pricing policy applied to both imports and the EU’s internal market,<sup>b</sup> while incentivizing low-carbon manufacturing outside the European Union.

In its initial transitional phase, the CBAM will cover carbon-intensive products with high emissions and a high risk of carbon leakage such as cement, iron and steel, aluminium, fertilizer, and electricity sectors. Naturally, this means the countries in Asia and the Pacific that will suffer the most from CBAM’s implementation are those that export these products in high volumes to the EU. For example, Australia exports a limited amount of carbon-intensive products to the EU, meaning the CBAM would have little effect, whereas the People’s Republic of China (PRC) will be impacted much more heavily through its high carbon global exports (such as steel). Across the region, acceptance of the proposed scheme varies from strong objections (the PRC and Japan) to slight pushback (the Republic of Korea and Thailand).<sup>c</sup>

There are also concerns from high-exporting countries in the region that the CBAM could widen inequality outcomes. A possible reduction in export revenue could lead to higher unemployment and reduced wages, particularly for women,<sup>d</sup> but also, smaller businesses are more likely to be resource-constrained, leading to delayed implementation and loss of international competitiveness.

An important issue is the destination of revenues from the CBAM. Developing countries have expressed concerns that proceeds will not be provided to these countries to help with the costs of decarbonization, and that part of the cost of EU environmental policy will be placed on various countries in Asia and the Pacific.

The level of climate protection policy development varies across the Asia and Pacific region. From already setting and committing to decarbonization targets (the PRC, Japan, and the Republic of Korea), to relatively slower policy development (Indonesia), how countries are affected by the CBAM will vary by their own circumstances.

<sup>a</sup> European Commission. 2021. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Empty: ‘Fit for 55’: delivering the EU’s 2030 Climate Target on the Way to Climate Neutrality.

<sup>b</sup> European Commission. 2021. *Proposal for a Regulation of the European Parliament and of the Council Establishing a Carbon Border Adjustment Mechanism*. Brussels.

<sup>c</sup> Konrad-Adenauer-Stiftung. 2021. *Perception of the Planned EU Carbon Border Adjustment Mechanism in Asia Pacific—An Expert Survey*. Hong Kong, China.

<sup>d</sup> C. Soprano. 2021. Integrating Gender into the Work of ESCAP’s Trade, Investment and Innovation Division. *Trade, Investment and Innovation Working Paper Series*. Bangkok: UNESCAP.

Source: European Commission. 2021. *Proposal for a Regulation of the European Parliament and of the Council Establishing a Carbon Border Adjustment Mechanism*. Brussels.

**Box 4: Proposal of the International Monetary Fund for an International Carbon Price Floor**

Following the announcement of the European Union (EU) plans on introducing a Carbon Border Adjustment Mechanism (CBAM) as well as given rising concerns that rapid scaling up of decarbonization efforts worldwide are needed to achieve the Paris Agreement, the International Monetary Fund (IMF) published a proposal in 2021 for an international carbon price floor (ICPF). The plan proposes for the ICPF to apply to a small set of high-emitting countries that would agree on a minimum carbon price. The IMF argues that such an ICPF would prevent the need for CBAMs to be introduced by individual jurisdictions, as the ICPF would already apply a carbon price to all imports of the country considering a CBAM. Moreover, it can be argued that the ICPF would be even more effective in this sense as it would apply to all global emissions rather than only to imports into countries with a CBAM. The ICPF could possibly also include flexibility provisions to allow for lower-emitting countries with generally also lower average incomes to pay a lower price and thereby be more effective in addressing equity concerns compared to a CBAM.

Source: I. Parry, S. Black, and J. Roaf. 2021. Proposal for an International Carbon Price Floor Among Large Emitters. *Staff Climate Notes*. Washington, DC: International Monetary Fund.

## Key Barriers in Implementing Carbon Pricing in the Energy Sector

Despite the uptake of carbon-pricing instruments, adopting carbon pricing remains politically challenging, particularly amid rising inflation and volatile energy prices. While carbon taxes have faced significant public opposition thus far due to the visibility of added costs, cap-and-trade schemes are also being challenged.<sup>35</sup> This section explores the key barriers to implementing carbon pricing in the energy sector and provides examples of how these may be overcome. Each of the barriers dampens one or more of the three key elements that carbon price signals incentivizes, as follows:

- (i) promotion of more rational use of energy, i.e., energy efficiency;
- (ii) fuel switching, i.e., preferential support for low-carbon sources to be dispatched and/or utilized before higher carbon sources; and
- (iii) long-term fuel switching, i.e., make investing in low-carbon energy sources more attractive compared to high-carbon energy sources.

The following provides an overview of the five key interrelated barriers relating to carbon pricing in the energy sector.

### Non-Liberalized Markets

In non-liberalized electricity markets, there may be no pass-through of carbon costs into electricity prices and therefore no incentive for energy efficiency or less energy-consuming activity.<sup>36</sup>

<sup>35</sup> K. Harrison. 2018. The Politics of Carbon Pricing. *Nature Climate Change*. 8 (852).

<sup>36</sup> International Energy Agency. 2020. *Implementing Effective Emission Trading Systems: Lessons from International Experience*. Paris; E. Kuneman. 2022. *Influence of Market Structures and Market Regulation on the Carbon Market: Insights from Selected Emissions Trading Systems*. Berlin; and K. Neuhoff and R. A. Ritz. 2019. Carbon cost pass-through in industrial sectors. *Working Papers EPRG1935*. Energy Policy Research Group, Cambridge Judge Business School, University of Cambridge.

The extent of carbon price pass-through may be impacted by whether the electricity prices in the system are based on marginal cost, cost-base, rate of return, price cap, or other mechanism.

In non-liberalized electricity markets or “regulated electricity markets,” utilities often have complete control over electricity, from its generation to the consumer’s meter, i.e., there is vertical integration of generation, transmission, and distribution. As utilities often own and operate the generation infrastructure as well as transmission and distribution lines, they can sell their generated electricity directly to the customers. In these systems, electricity tariffs are usually regulated by public utility regulatory commissions. Due to the lack of competition and regulation of how tariffs are set, non-liberalized electricity markets with state-owned power companies are not directly suitable to carbon pricing.<sup>37</sup> See Box 5 for further information on carbon pricing in electricity dispatch.

### Box 5: Carbon Pricing in Electricity Dispatch

Incorporating carbon pricing in decisions on electricity dispatch can help ensure generating capacity is used in a climate-optimal way. The merit order is used across many energy systems to determine the sequence in which electricity generators supply power to the grid. Direct carbon pricing instruments, such as carbon taxes and cap-and-trade schemes, will result in the merit order favoring low-carbon alternatives when policy cost pass-through is high.<sup>a</sup> In the absence of direct carbon pricing or when policy cost-pass through is low, climate-oriented dispatch can be used to set the merit order to incorporate climate considerations. Instruments such as shadow carbon pricing or climate-oriented dispatch can be used to influence the merit order.<sup>b</sup>

However, the ability of generators to switch to less carbon-intensive fuels will greatly influence the effectiveness of introducing changes to the merit order. For example, in Germany where there is a diverse capacity mix including natural gas and coal, carbon prices play a larger role in short-term abatement compared to coal-based systems like Poland where fuel switching is more difficult.<sup>c</sup>

When flexible capacity mix is available, incorporation of climate-oriented dispatch in the merit order may have economy-wide impacts on competitiveness and raise energy affordability concerns among vulnerable groups. In a developing country context, such adverse impacts could potentially be cushioned through using international climate finance to cover the cost differential between the business-as-usual and climate-oriented merit orders. These cost differences could be settled in the wholesale market, thereby insulating electricity users from negative consequence. Alternatively, the cost-differential supported by international climate finance can be used to negate the adverse impacts of targeted groups.

<sup>a</sup> I. G. Wilson and I. Staffell. 2018. Rapid Fuel Switching from Coal to Natural Gas through Effective Carbon Pricing. *Nature Energy*, 3 (5), pp. 365–372.

<sup>b</sup> International Energy Agency. 2020. *Implementing Effective Emission Trading Systems: Lessons from International Experience*. Paris.

<sup>c</sup> W. Acworth et al. 2021. *Emissions Trading in Pursuit of Electricity Decarbonization—Market Structures and Regulations Matter*. Berlin. Source: Asian Development Bank (Sustainable Development and Climate Change Department).

<sup>37</sup> P. Benoit et al. 2022. Decarbonization in State-Owned Power Companies: Lessons from a Comparative Analysis. *Journal of Cleaner Production*, 355 (131796).

## Centralized Markets and Investment Landscape Dominated by Long-Term Power Purchase Agreements

Other market structures not especially compatible with carbon pricing are centralized markets and markets where the investment landscape for energy infrastructure is dominated by long-term power purchase agreements (PPA). In these cases, government-owned utilities often act as single buyers, and this lack of competition makes it harder for a carbon price signal to incentivize switches to low-carbon sources, or to incentivize energy efficiencies. A further concern is the lack of liquidity if there are only a small number of compliance entities in the carbon market. Box 6 provides more details on carbon pricing as an incentive to invest in less carbon-intensive power generation.

### Box 6: Carbon Pricing as an Incentive to Invest in Less Carbon-Intensive Power Generation

In theory, direct carbon pricing instruments, such as carbon taxes and emission trading systems, encourage investment in less carbon-intensive technologies by making high-emitting ones less profitable.<sup>a</sup> In practice, the effectiveness with which carbon pricing influences long-term investment decisions depends on confidence in the continuation of the policies and expectations of future carbon prices.<sup>b</sup>

Investment and planning decisions can also be influenced by incorporation of shadow carbon pricing as part of the investment decision process. Shadow carbon pricing can be used to help state companies to make investment choices that are consistent with the low-carbon transition.<sup>c</sup> Similarly, in a regulated investment environment, the planning authorities could incorporate shadow carbon pricing in investment decision-making (footnote a).

Using shadow carbon pricing in investment decisions could lead to higher investment cost, which may have economy-wide impacts on competitiveness and raise energy affordability concerns among vulnerable groups. In a developing country context, the capital cost differential, between business-as-usual investments, and those incorporating a shadow-carbon price, could potentially be funded by international climate finance.

<sup>a</sup> International Energy Agency. 2020. *Implementing Effective Emission Trading Systems: Lessons from International Experience*. Paris.

<sup>b</sup> S. Brunner, C. Flachsland, and R. Marschinski. 2012. Credible Commitment in Carbon Policy. *Clim. Policy*. 12 (2). pp. 255–271. doi: 10.1080/14693062.2011.582327.

<sup>c</sup> P. Benoit. 2019. *Engaging State-Owned Enterprises in Climate Action*. New York: Center for Global Energy Policy, Columbia University.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

One example of directly addressing long-term PPA issues is ADB's Energy Transition Mechanism (ETM). The ETM is a scalable, collaborative initiative developed in partnership with developing member countries (DMCs). It leverages a market-based approach to accelerate the transition from fossil fuels to clean energy. Public and private investments—from governments, multilateral banks, private sector investors, philanthropies, and long-term investors—will finance country-specific ETM funds to retire coal power assets on an earlier schedule than if they remained with their current owners. Repurposed plants will be converted into sources for renewable energy generation. ADB is working with DMCs and key partners to ensure ETM is a replicable and scalable mechanism that can be successfully adjusted and adopted across different contexts.<sup>38</sup>

### Public Opposition and Affordability Concerns

There can be strong public opposition to carbon pricing due to its increasing energy costs. This was observed in 2011, in Australia, when the government attempted to implement a carbon tax. The public responded with protests and the incumbent government experienced a drop in the polls.<sup>39</sup> Most recently, in January 2022, Kazakhstan experienced backlash after gas prices spiked, leading to a rollback of energy policy reforms.<sup>40</sup> Reframing the role of carbon pricing instruments in these countries (in light of the wider development and climate agendas) has been shown to help with addressing cost concerns and to increase stakeholder buy-in.

Affordability concerns can also be addressed through the redistribution of carbon price revenues to more vulnerable consumers, e.g., through energy tax rebates or lump sum payments. Where direct earmarking of revenues from the carbon pricing system is not possible, compensatory schemes (where one levy is reduced by a similar level as the introduction of the carbon price scheme) may play a similar role.

### Countervailing Policies Such as Fossil Fuel Subsidies

Countries may have existing policies that directly counteract the price signal provided by a carbon price. A prime example of this are fossil fuel subsidies (Box 7). These subsidies directly reduce the cost of using fossil fuels and thereby act in direct opposition to a carbon price. Removal of such fossil fuel subsidies is important to enable effective carbon pricing. However, the underlying driver of the original subsidies, to protect vulnerable consumers from high energy costs, for instance, may need to be addressed in other ways (see Box 8 on lessons learned from Kazakhstan's ETS).

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<sup>38</sup> ADB. 2022. *Energy Transition Mechanism (ETM)*. Manila.

<sup>39</sup> P. Mercer. 2011. Australia carbon tax plans spark protests. BBC News. Sydney. 23 March.

<sup>40</sup> International Institute for Sustainable Development. 2022. Kazakhstan Energy Price Uprising Risks Another Blow to Carbon Pricing. Winnipeg.

### Box 7: Central Asia—A Case Study on Barriers and Potential Cooperation

Kazakhstan is the only Central Asian country to have introduced carbon pricing, although all of the remaining countries in the former Soviet Union, namely, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan have made commitments in their nationally determined contributions to develop carbon pricing.<sup>a</sup> To succeed, they must address the barriers to carbon pricing implementation and exploit the potential mutual benefits arising from regional cooperation.

A clear barrier to introducing effective carbon pricing comes from heavy fuel subsidies. Kazakhstan, Turkmenistan, and Uzbekistan all subsidize fuel costs that serve to increase government spending and push electricity prices below costs, reducing incentives for green energy investment. In addition, the region relies heavily on fossil fuels for production and consumption. Connecting renewable sources (wind, solar, and hydropower) with existing infrastructure (gas) in a way that encourages cooperation and coordination between Central Asian countries could allow for lower-cost renewable energy development that strengthens grid stability.

At the cross-border level, peak and backup electricity demands could be reduced through regional cooperation. More specifically, cross-border electricity exchanges would allow for seasonal hydropower trading, resulting in lower national capacity requirements, and would likely foster a more attractive green investment environment.

A notable regionally common barrier to carbon pricing is its misalignment with the prevailing government strategies (capitalizing on resource rents). A lack of available funding also contributes to reducing interest in scheme implementation. There is a need to develop channels of communication in the region as well as produce technical academic publications relating to carbon pricing implementation and its interconnectivity with the energy sectors. Additionally, there is a requirement and opportunity to build a local expertise capacity in all the Central Asian countries. Finally, there is a significant pushback from the fossil fuels industry across the region, exacerbating barriers to implementation.

Areas highlighted by recent regional dialogues on carbon pricing for cooperation relate to exploring the potential of expanding Kazakhstan's emissions trading system scheme to the subregional level and developing a monitoring, reporting, and verification system that could be integrated regionally (a point corroborated by each of the region's representatives).

The region is particularly vulnerable to economic shocks due to its dependence on oil rents and associated price fluctuations. The worry for the landlocked region is that low investment trust and insufficient institution-building capacities will foster an environment where the oil-dependent nations are left trapped with fossil fuel infrastructure, and an inability to transition to renewables. As such, for carbon policies to be successful in the region, a complementary energy policy must address these concerns.

<sup>a</sup> Uzbekistan's nationally determined contributions only mention a potential carbon tax, whereas the remaining three discuss the possibilities of an emissions trading system.

Sources: ADB. 2021. Regional Dialogue on Carbon Pricing (REdiCAP) in Central Asia: Bambang Susantono. Manila; Regional Dialogue on Carbon Pricing (REdiCAP). 2021. *Report from the Regional Dialogue on Carbon Pricing (REdiCAP) in Central Asia*. Bangkok: UNFCCC; ADB. 2022. *COVID-19 and Economic Recovery Potential in the CAREC Region*. Manila.

### Box 8: Lessons Learned from Kazakhstan's Emissions Trading System

Kazakhstan's high dependence on coal for its own power generation and reliance on oil export means the energy sector is carbon-intensive. Launched in 2013, Kazakhstan's emissions trading system (ETS) is a nationwide carbon pricing scheme with the goal of becoming the primary tool for regulating and reducing carbon dioxide equivalent (CO<sub>2</sub>e) emissions in the energy sector (through increasing the share of renewables in the energy mix).

Kazakhstan introduced its ETS in phases, increasing the complexity of the scheme at each phase. The most significant lesson learned from the initial phase (2013–2020) came after the scheme had to be suspended for 21 months. Allocating allowances based on historical emissions caused serious defects and market distortions and so was replaced by a benchmarking approach. The government also updated the trading procedures; monitoring, reporting, and verification system; and operating rules.<sup>a</sup>

A major inhibiting factor for the scheme is that the cost pass-through mechanism—which would pass on electricity and heat price increases—was disabled by the government. Concurrently, investment in the power sector has decreased since 2014 (as have real electricity prices, driven by fossil fuel subsidies). This means that even if energy policy and the ETS were to foster carbon price increases, the absence of a pass-through mechanism would render them ineffective. Finally, without this form of indirect emissions regulation, plants in the electricity and heat sector are not incentivized to innovate or adopt best practices. Other significant lessons learned from the scheme are as follows:

- Active stakeholder engagement in policy development and throughout the phasing is crucial so that measures are accepted and understood.
- There should be a multiyear learning phase or a gradual phasing in of the policy and increased ambition, which can also increase stakeholder buy-in.
- It is preferred to restrict over-the-counter trading so that the carbon price is more visible. It also facilitates a more liquid market.
- Benchmarked allowances should be pegged to the most carbon-efficient firms to ensure the policy is effective in reducing emissions.

Finally, a huge contributing factor to the limitations of the scheme—and to stagnant power plant innovation—is that non-carbon dioxide emissions (footnote a) are not explicitly required to be covered. Compared to the People's Republic of China and the European Union, Kazakhstan has low environmental performance and efficiency standards (such as mild nitrogen oxide requirements), which minimize the modernization of new and existing plants.<sup>b</sup>

<sup>a</sup> ICAP. 2022. Kazakhstan Emissions Trading System (ETS) (accessed 20 September 2022).

<sup>b</sup> P. Howie and A. Atakhanova. 2022. Assessing Initial Conditions and ETS Outcomes in a Fossil-Fuel Dependent Economy. *Energy Strategy Reviews*. 4 (100818).

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

## Lack of Standardized and Transparent Monitoring, Reporting, and Verification Systems

Last, no standardized methods exist currently for estimating and monitoring GHG emissions under scope 1, 2, and 3 in the energy sector. (Scope 1 energy sector emissions cover direct combustion of fossil fuels whereas scope 2 covers the emissions from the generation, transmission, and distribution of purchased electricity. Scope 3 emissions relate to indirect emissions in the energy sector, e.g., emissions occurring as part of the supply chain, or as transport emissions including road, rail,



aviation, and shipping. Scope 3 emissions generally account for a significant share in total emissions and are usually left out of consideration when emission reduction targets are set for companies and sectors. The availability and reliability of scope 3 data and an inconsistent set of monitoring, reporting, and verification (MRV) schemes make introducing scope 3 emissions into carbon pricing schemes particularly challenging.

Despite a recent increase in the use of carbon pricing instruments in the Asia and Pacific region, there are many key barriers to its successful implementation. First, there is a high proportion of non-liberalized and regulated electricity markets in developing Asia. Table 3 shows the market structure, prices, and subsidy levels of selected countries in the region. Table 3 highlights the PRC as having mostly non-liberalized power markets, which could form significant barriers to the implementation of carbon pricing instruments.

Second, many of the countries in the region are still battling issues around electricity access and affordability, which are strong reasons for leadership to maintain or even increase fossil fuel subsidies. The introduction of carbon pricing should therefore be considered in light of these wider objectives and market structures.

**Table 3: Overview of Energy Market Structures in Some Key Countries in Developing Asia**

Country	Electricity and Heat Production, and Transport Sector Emissions, 2019 (Mt CO <sub>2</sub> e) <sup>a</sup>	Population Without Electricity Access, 2019 (%) <sup>b</sup>	Average Price of Electricity, 2020 (\$/kWh) <sup>c</sup>	Type of Energy Market Structure and Regulation	Total Subsidies Applied to Fossil Fuel as Share of GDP <sup>d</sup> (%)
People's Republic of China	6,489 (66% of total emissions)	0	0.081	Non-liberalized, largely state-owned	0.2
Kazakhstan	132 (64% of total emissions)	0	0.042	Liberalized, ETS in place	2.6
Malaysia	192 (81% of total emissions)	0	0.050	Largely liberalized	0.0
Pakistan	99 (58% of total emissions)	20.8	0.039	Increasingly liberalized	0.5

CO<sub>2</sub>e = carbon dioxide equivalent, ETS = emissions trading system, GDP = gross domestic product, kWh = kilowatt-hour, Mt = metric ton.

<sup>a</sup> International Energy Agency (IEA). 2022. *Countries and Regions, Key Energy Statistics* (accessed 25 September 2022).

<sup>b</sup> IEA. 2022. *SDG7: Data and Projections* (accessed 25 September 2022).

<sup>c</sup> Global Petrol Prices.com. 2022. *Electricity Prices*.

<sup>d</sup> IEA. 2021. *Fossil Fuel Consumption Subsidies, 2010-2020* (accessed 25 September 2022).

Source: Asian Development Bank (Sustainable Development and Climate Change Department).



# Considerations in Carbon Pricing Instruments

The suitability of carbon pricing policies in energy sectors depends upon their market structures, the nature of the decarbonization opportunities, and the degree to which these opportunities are likely to be incentivized by purely economic factors. The issues of suitability are explored further here as relevant to the energy sector generally and highlight aspects specific to the electricity sector.

## Suitability of Carbon Pricing Instruments by Sector

### Economic Rationale for Carbon Pricing

Carbon pricing systems present emitters with an economic choice: whether it is a better strategy to bear the costs of reducing emissions, or to instead pay the carbon cost associated with those emissions. For carbon taxes, the saved emissions avoid the need to pay the tax, and for emissions trading, to avoid surrendering emissions allowances. For carbon crediting, the saved emissions earn credits that have a value. In any case, the decision is determined by the cost of abatement relative to the carbon price anticipated over the life of the investment.

A key consideration in the effectiveness of carbon pricing is whether this economic rationale is sufficient to drive the necessary low-carbon investment. Many factors will influence that decision, and they vary by sector. Thus, it is necessary to consider how effective carbon pricing can be for each energy sector when deciding upon the scope of the policy.

More specifically, carbon pricing will be most effective under conditions in which investment decisions are highly weighted toward economic considerations, and in which the carbon price could have a material impact on the cost-benefit assessment. This will be the case for the electricity and industry sectors operating high energy intensity assets in highly liberalized or competitive markets. To a degree, it also applies to other commercial sectors including commercial transport.

By contrast, sectors in which decision making is not predominantly based on economic considerations will not be so receptive to carbon prices driving decarbonization. Most notably, this will be the case for individuals making personal choices about the use of energy in their homes and their transport decisions. Decisions around utility, comfort, and recreational or leisure activities may be less influenced by the economics of carbon prices.

The readiness of decarbonization options is an important factor in policy design. Commercially-ready technology options provide opportunities for decarbonization based upon their economic life cycle characteristics and can be encouraged by carbon pricing. However, investment in innovation of

new technologies can be risky and have much longer-term payback. In this case, the influence of carbon pricing can be more muted and instead specific research and development support measures are needed.<sup>41</sup>

The effectiveness of carbon pricing in encouraging investment in sectors is affected by the detailed policy design choices specifically covering the following factors:

- (i) **The long-term stability and predictability of the carbon price policy.** Many decarbonization investments relate to long-life assets and consequentially have long payback times. They can be better encouraged by a longer-term stable carbon pricing incentive; for instance, with longer emissions trading phase lengths and caps set by reference to long-term decarbonization targets.
- (ii) **The point in the supply chain at which the carbon price policy acts.** The economic signal must be felt by the entity that makes the decision about energy use and investment related to energy use. A good example of this is in the electricity sector. It is much more feasible to apply emissions trading to the electricity generators than to the final consumers, yet if the tariff setting regime does not allow pass-through of that carbon price, then those consumers will not be incentivized to use energy more efficiently. Instead, in some cases carbon pricing systems do not aim to influence consumer demand, but aim to influence the supply mix by adding a cost to fossil fuel generation.
- (iii) **Economic viability.** Carbon pricing would not be the right choice for a sector if it were to impact its economic viability to the point where it would not be able to make investments to reduce emissions, for example in industries with high emission intensity and low profit margins. In this case, policy design can reduce those costs while still encouraging emissions mitigation, for example by using performance-related rebates. In other words, the net cost impact of carbon pricing is an important feature to assess its effectiveness.
- (iv) **Structure of the market.** The structure of the market may affect the efficacy of carbon pricing, especially emissions trading. Many market participants are needed to ensure price discovery, price stability, and liquidity. If there were few participants, for instance in a state-controlled electricity sector, then the market may not function well. In practice, grouping sectors under the same system can help mitigate this.

In summary, key considerations for the effectiveness of carbon pricing are (i) policy stability and predictability, (ii) longevity and reach (pass-through), (iii) net cost impact, and (iv) market structure and liquidity. The key features of carbon pricing related to these factors are summarized in Box 9.

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<sup>41</sup> D. Helm. 2017. *Cost of Energy Review*. United Kingdom: Department for Business, Energy & Industrial Strategy.

### Box 9: Key Features of Carbon Pricing Options

There are a range of carbon pricing options available to policy makers, which have different features compared to the regular considerations for effective carbon pricing: (i) policy stability and predictability, (ii) longevity, (iii) reach (pass-through), (iv) net cost impact, and (v) market structure and liquidity. Some of these different features are as follows.

- **Carbon taxes can provide a degree of certainty around future carbon prices, if a planned future trajectory is published.** However, like any policy, it is subject to change by the prevailing regimes, so wider stakeholder confidence can be gained if the tax forms part of a long-term decarbonization commitment and has support across the political spectrum. Taxes applied through energy bills can reach end-consumers directly. Additionally, the policy does not require a market and hence liquidity to function. Cost impacts can be a major concern and addressing these through exemptions and rebates while maintaining the incentive for decarbonization can be complex.
- **Emissions trading systems normally operate in planned phases, which provides a degree of confidence in the policy to underpin investment in decarbonization.** By setting an absolute cap on emissions, emissions trading systems (ETS) also provide certainty in terms of achieving emission reduction targets. However, as prices are discovered in the market in ETS, these systems can be more vulnerable to shocks and price volatility compared to a carbon tax, which can diminish the policy's predictability. Moreover, ETS that rely on trading of certificates require liquidity, so they tend to function better with larger numbers of participants. If allowances are auctioned rather than allocated freely, then cost impacts on businesses can be substantial, especially to emission-intensive, and trade-exposed industrial sectors.
- **Domestic carbon crediting has the advantage of providing positive revenues for developers.** However, there must be a source of demand for the credits, possibly a carbon tax or emissions-trading system. Policy longevity is important again as the investment timescales for emissions saving projects can be long.
- **International crediting mechanisms whereby emission reduction activities are sold to “buyer” countries or private sector actors can also be revenue positive.** This is especially true for projects in beneficiary countries that are less developed and benefit significantly from the inward investment. However, the effectiveness of a national strategy to utilize international carbon pricing cooperation mechanisms will depend upon international demand for mitigation outcomes facilitated by the specific scheme. The section “Participation in International Carbon Markets” under Chapter 3 describes participation in international carbon markets as a design consideration for carbon pricing to align with energy policy in more detail, including the utilization of possible future mechanisms under Article 6 of the Paris Agreement.
- **Green bonds are a debt instrument that could enable capital raising for “green” projects, covering sustainable resource use and climate adaptation projects, among others.** Creating a connection between fixed income investors and sustainable development, green bonds can provide funding for climate-focused projects where financing is critical. Combining these bonds with carbon credits could also be considered a hybrid format of climate financing. When combined, green bonds and carbon pricing can create a stable direction for long-term green investment, creating economic efficiency and political stability.<sup>a</sup> Countries are increasingly using both green bonds and carbon pricing to finance low-carbon transitions.

<sup>a</sup> J. Liu et al. 2022. China's National ETS: Global and Local Lessons. *Energy Reports*. 8 (Supplement 6). pp. 428–437. Source: Asian Development Bank (Sustainable Development and Climate Change Department).

Project developers face technical and financing hurdles at different stages of the project life cycle, and it is important that policy incentives account for this. In particular, development times can be long. Therefore, the returns on results-based measures, such as carbon crediting, may come long after the initial investment.

## Sectoral Suitability for Carbon Pricing

Sectors may be faced with wide-scale technological transformation or major infrastructure investment, and it is right to consider whether carbon pricing can drive these changes. Decarbonization pathways and investment needs will differ by sector, as will the suitability of carbon pricing. A specific example of an ETS design with respect to the power sector comes from the PRC, and has been expanded in Box 10.

### Box 10: People's Republic of China—Emissions Trading System Pilot Scheme

After trialing seven regional emissions trading system (ETS) programs from 2013, the People's Republic of China (PRC) introduced a nationwide ETS in 2021 that mostly covered the power sector. Following are lessons from three out of the seven provincial schemes, followed by a discussion on the national scheme's ability to contribute to the PRC's power sector decarbonization.

- Beijing applied an approach whereby allowances were allocated using both historical data and a benchmarking method. The aim of this approach was to avoid overallocation of allowances that could diminish trading, and instead ensure that the allocation still allowed for sending a price signal to reduce emissions. The approach was extremely effective at reducing emissions.<sup>a</sup>
- In the Shanghai system, one of the main lessons learned is related to the system it had in place to validate emission reports. Validation was organized by government-assigned experts to increase the quality of monitoring, reporting, and verification (MRV), which was enforced with high penalties. Due to its effectiveness to improve the MRV system associated with the ETS, the registry and exchange of the Shanghai ETS were also selected to be used as part of the national system.
- In Hubei Province, the lack of sufficient greenhouse gas monitoring capacity and misalignment in allowance allocations meant that its ETS scheme had no discernible effect on carbon dioxide emissions, nor on energy consumption. Its design encouraged market activity by slowly increasing the percentage of emissions covered in the region (and the allowance price) but ultimately, the approach failed due to the monitoring and quota allocation data issues. It has been estimated that in the Hubei Province system, gradually tightening benchmarks (which would increase the allowance price), if executed without data issues, could facilitate a 12% reduction in emissions from electricity generation in 2035, compared with a non-ETS scenario.

Building on these lessons learned, the national ETS includes specific mechanisms for encouraging power sector decarbonization. By allowing electricity power plants with carbon capture, utilization, and storage technology to sell surplus allowances, the scheme incentivizes green investment in these technologies. Specifically, it also incentivizes the retrofitting of carbon capture technologies to existing units.

<sup>a</sup> From 2013 to 2018, Beijing's scheme had the second highest carbon emissions intensity decrease rate of 9.7% (Hebei Province was the highest with 10.8% over the same period).

Sources: J. Liu et al. 2022. China's National ETS: Global and Local Lessons. *Energy Reports*. 8 (Supplement 6). pp. 428–437; K. Zhang et al. 2019. Has China's Pilot Emissions Trading Scheme Influenced the Carbon Intensity of Output? *International Journal of Environmental Research and Public Health*. 16 (10). p. 1854; International Carbon Action Partnership; Y. Wen et al. 2020. Does China's Carbon Emissions Trading Scheme Really Work? A Case Study of the Hubei Pilot. *Journal of Cleaner Production*. 277 (6). p. 124151.

## Electricity Sector

The transformation of the electricity sector requires substantial changes to infrastructure to replace and retrofit existing production capacity as well as expand production capacity. Therefore, huge investment in low-carbon generating assets is needed, involving a mix of large-value, long-life centralized assets (for example, biomass plant) and greater use of smaller decentralized generation (for example, small-scale hydropower). Much greater investment in renewables is needed, as is transition from high-carbon fuels to lower ones, such as switching from coal to gas. In turn, the closure of large high-carbon assets can impact communities and require measures to manage a just transition.

The wider infrastructure needs are also substantial, as this decarbonization pathway can require greater transmission capacity; more developed distribution networks; and for high deployment of intermittent renewables, greater interconnection and standby capacity. In particular, investments in national and regional transmission and distribution can reduce losses and increase reliability by enabling increased introduction of renewables (both from baseload, i.e., hydropower and variable sources). Regulations are needed to enable these changes to market structures, including potentially more liberalization to encourage investment.

## Industry Sector

The challenge for industry also concerns long asset life investment. Retrofitting of an existing plant or the construction of a newer efficient plant requires major investment and stable longer-term incentives. Reduced energy use or greater use of on-site renewable energy can lower industry energy costs and improve competitiveness. For example, heavy industries such as cement and steel production (which contribute almost 20% of all energy-sector emissions in Southeast Asia),<sup>42</sup> have also recently started to shift toward the use of renewables. Moreover, carbon capture, use, and storage may emerge as a key technology for decarbonizing industry and is being explored by some developing countries in Southeast Asia. For example, its use has been actively investigated by the Government of Brunei Darussalam since November 2020.

## Transport Sector

In the transport sector, the transition involves improved carbon performance of new vehicles, especially hybrids, use of biofuels and electric vehicles, and a phase-out of existing high-carbon, low-efficiency vehicles. Currently, adoption rates (percentage of new passenger vehicles sales) of electric vehicles<sup>43</sup> in Asian countries vary significantly. In 2021, the PRC's rate was 16.1%, the Republic of Korea's 6.5%, and Japan's 1.2%. By comparison, in emerging markets (such as Indonesia, Malaysia, and Thailand) the rate is below 1%.<sup>44</sup> Furthermore, greater use of public transport is essential, requiring both network expansion and traveler behavioral change.

## Residential Sector

In the residential sector, improved air conditioning performance and greater use of cleaner cooking equipment and lower carbon fuels will be important. In particular, for the residential sector cooling is a growing source of electricity demand (predicted to make up 30% of Southeast Asian peak electricity

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<sup>42</sup> IEA. 2021. *Carbon Capture, Utilisation and Storage: The Opportunity in Southeast Asia*. Paris.

<sup>43</sup> Including battery electric vehicles, plug-in hybrid vehicles, and fuel cell electric vehicles.

<sup>44</sup> R. Farmer, R. Gupta, V. Lath, and N. Manuel. 2022. *Capturing Growth in Asia's Emerging EV Ecosystem*. McKinsey & Company. 30 June.

demand by 2040<sup>45</sup>). Access to sustainable cooling is also an important aspect of climate adaptation in many developing Asian countries. Sustainable cooling can be incentivized partly through improved building standards, particularly in urban environments. In addition, the shift toward clean cooking also involves a gradual transition toward electricity that will increase demand from the residential sector.

Crosscutting technologies, i.e., technologies that require electrification of the sector or switching to different types of fuels, will play an important role. Electrification in transport industry and buildings in tandem with decarbonization of the electricity supply system may deliver emissions savings. The development of the hydrogen economy may also fuel decarbonization, especially in industry but also in transport.

Bringing together the sectoral decarbonization characteristics and the key features of each carbon pricing option, it is instructive to present a high-level assessment of how well each carbon pricing instrument option can be suited to each sector. There are many possible designs for each policy, and it is not intended to state or justify the “best” approach for any sector. Instead, the main advantages and drawbacks of the policy options are highlighted.

The main features of each option supporting the decarbonization actions and trends in each sector are illustrated in Table 4.

**Table 4: Key Decarbonization Trends and Policies by Carbon Pricing Instrument for Key Energy Sectors**

Sector	Key Decarbonization Technologies and Actions	Associated Issues and Concerns with Sector and Proposed Technologies	Key Policy Advantages, Disadvantages, and Design Considerations	
			Mandatory Carbon Pricing Schemes <sup>a</sup>	Voluntary Carbon Pricing Schemes <sup>b</sup>
Electricity	Renewable markets and deployment	Connectivity and/or interconnectivity	Advantages <ul style="list-style-type: none"> <li>• Sector-wide</li> <li>• Technology neutral therefore low-cost decarbonization</li> </ul>	Advantages <ul style="list-style-type: none"> <li>• Can target new (commercial) technologies</li> <li>• Can factor benefits and just transition through eligibility criteria</li> </ul>
	Other low-carbon fuels	Distributed generation		
	Nuclear	Cost for consumers	Disadvantages <ul style="list-style-type: none"> <li>• Costs for consumers</li> <li>• Technology-neutral therefore does not target new markets or support new technologies other than generally incentivizing less carbon and capital-intensive solutions</li> <li>• Does not directly support infrastructure needs</li> </ul>	Disadvantages <ul style="list-style-type: none"> <li>• Self-selecting, thus will not necessarily deliver transformation at scale</li> <li>• Does not support infrastructure development</li> </ul>
	Carbon capture and storage		ETS requires liquidity (sufficient number of different actors) so it is less suited in monopolistic structures. Both ETS and carbon tax deliver energy efficiency outcomes of cost pass through to end-use consumers.	

*continued on next page*

<sup>45</sup> IEA. 2019. The Future of Cooling in Southeast Asia.

Table 4 continued

Sector	Key Decarbonization Technologies and Actions	Associated Issues and Concerns with Sector and Proposed Technologies	Key Policy Advantages, Disadvantages, and Design Considerations	
			Mandatory Carbon Pricing Schemes <sup>a</sup>	Voluntary Carbon Pricing Schemes <sup>b</sup>
<b>Space conditioning (heating and cooling)</b>	<p>Electrification Geothermal, solar- or biomass-based water heating</p> <p>Waste-to-energy Energy efficient building design and construction</p>	<p>Affordability in light of increased cooling demand</p> <p>Reliability Distributed generation</p>	<p>Large numbers of consumers in the residential sector and high use in the commercial sector need an upstream approach. This can be more straightforward as a charge on energy bills.</p> <p>Economic signal from carbon price may not influence the investment needed in boiler or solar systems, nor behavior change.</p>	<p>Difficult to target crediting systems at residential sector and achieve scale</p>
<b>Industry</b>	<p>Renewable deployment and green hydrogen (e.g., energy carrier based on renewable energy)</p> <p>Energy efficiency</p> <p>Carbon capture and storage</p>	<p>Competitiveness concerns due to higher costs</p> <p>Reliability</p>	<p>Carbon pricing indirectly supports innovation of technologies needed through higher costs for current technologies, but additional direct subsidy or research and development support may be needed for demonstration projects of the technologies needed.</p> <p>Targeted use of revenues can be used for this purpose.</p> <p>Carbon pricing as a cost raising instrument can cause competitiveness concerns, for trade-intensive industries.</p>	<p>Sectoral crediting approaches achieving emissions scale are possible for sectors with more homogenous product groups</p>
<b>Transport</b>	<p>Electrification</p> <p>Hydrogen</p> <p>Synthetic fuels</p>	<p>Reliability</p> <p>Costs to consumers</p>	<p>Transport sector consists of a large number of different actors and therefore needs an upstream approach with carbon pricing applied to fossil fuel suppliers or importers that can pass down prices in fuel bills or transport service charges.</p> <p>Carbon price alone may not encourage development and deployment of alternative fuels.</p>	<p>Crediting system in transport more suited to larger operations such as public transport and freight</p>

ETS = emissions trading system, R&D = research and development.

<sup>a</sup> Includes emissions trading systems and carbon tax.

<sup>b</sup> Includes domestic credit schemes, Article 6, and international credit schemes.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).



## Design Considerations and Alignment of Carbon Pricing with Energy Policy

While the previous section examines the suitability of carbon pricing for encouraging decarbonization in different energy sectors, it is also important to consider how well those carbon pricing instruments contribute to the achievement of wider energy and development policy objectives. Those objectives were introduced earlier as energy access, energy security, energy affordability, and sustainability. Carbon pricing policies can be designed in ways that support the achievement of these wider objectives, through the more detailed choices of policy makers.

In the following subsections, the main design features of carbon pricing that enhance the wider energy policy outcomes are explored. The particular features described are measures enabling long-term carbon price policy stability, use of revenues, use of offsets both in mandatory carbon pricing schemes and in international schemes, and cost mitigation measures.

### Long-Term Carbon Price Stability

Decarbonization of the energy sector, including both electricity and industry, requires a long-term regime in which large-scale and low- and zero-carbon assets are economically viable. This especially includes capital-intensive infrastructure with longer payback periods such as electricity-generating assets, grid infrastructure, and efficient and low-carbon industrial plants. To enable this, the incentive framework must be reliable enough that investors can commit finance at an acceptable level of risk.<sup>46</sup> By creating that framework, the electricity system investment can support greater penetration of renewables and enhanced transmission and distribution networks, benefiting the energy policy objectives of **energy access** and **security** (**energy dependency** and **energy reliability**).

For carbon taxes, there are several ways that confidence in the policy longevity and stability can be achieved. The tax rates themselves can be prescribed in a way that states the intended future trajectory. For instance, if the tax rate is stated as increasing by a fixed percentage each year or to increase by no less than the rate of inflation or another economic metric. Taxes cannot be set in stone for future years as governments may need to react to unforeseen circumstances or may change economic strategy. Factors that increase confidence in the longevity of the policy as intended are the ambition within national climate change commitments, the extent to which those commitments are governed by law and the degree to which those commitments or the tax itself received support across the political spectrum.

For emissions trading, the broader inherent policy uncertainties are similar to those for carbon taxes, in that governments can intervene or change direction to alter or cancel the emissions trading policy, just as they can for a carbon tax. Overarching long-term national commitments and the extent of political support to an ETS or a carbon tax can improve the overall confidence to political certainties. Emissions trading systems commonly operate in compliance phases, within which the emission cap or carbon intensity target for each year is predetermined. Thus, longer compliance phases provide more market certainty as to policy ambition, even if it is for the market to determine the carbon price necessary to realize that ambition.

<sup>46</sup> S. He. 2021. Why Aren't Asset Owners in Asia Committed to Decarbonization Targets? *Asian Investor*. 16 November. Page 7.



Experiences such as those of the EU ETS in 2008 have shown that long compliance periods carry the risk that unforeseen economic shocks have a big impact on the price of carbon.<sup>47</sup> Such shocks may be seen as requiring government intervention, in cases of both low and high carbon prices. Consequently, policy makers can consider design options that predetermine the conditions and nature of any market intervention, and therefore reduce the risk that governments may intervene in an ad hoc and less predictable way. A prominent example of this is the EU's Market Stability Reserve, which is a mechanism within the EU ETS that can address issues around surplus of allowances or shocks to the system by either releasing or absorbing allowances from the reserve based on predefined rules. For example, if the total number of allowances in circulation in the EU ETS exceeds a certain amount, then allowances will automatically be transferred to the reserve to address the issue of surplus. An example on the effect of a sector on allowance prices can be seen from the ROK's ETS, as expounded on in Box 11.

### Box 11: Republic of Korea Emissions Trading System—Carbon and Electric Price Stability

The Republic of Korea (ROK) became the second country (after Kazakhstan) in Asia to introduce a nationwide cap-and-trade emission trading system (ETS). The scheme covers 79.6% of carbon dioxide (CO<sub>2</sub>) emissions from energy use in the country.<sup>a</sup> In the ROK, the government fixes the electricity price so there is no automatic cost pass-through from external policy implementation such as the ROK emissions trading system (ROK ETS). To accommodate this, indirect emissions from electricity use are included in the ROK ETS, in addition to those from power generation. The result is carbon regulation for electricity production through the inclusion of power station emissions, and an efficiency incentive for electricity end-users provided by the direct price signal that the scheme provides. However, by covering both electricity power plants and electricity consumption, the scheme covers electricity emissions twice.

The electricity sector has had a major effect on the ROK ETS allowance prices.<sup>b</sup> Electricity sector regulators compensated electricity producers by providing extra allowances, which reduced the costs faced by these producers and even compensated them in case of unabated emissions. This has meant that electricity producers became net buyers by surrendering or banking 60% of total allowances while only emitting 44% of ETS emissions in 2018.<sup>c</sup> This has driven up prices for other obligated entities in the ROK ETS. To keep the carbon price in a functional range for participating entities, price management provisions have been introduced by the government during various scheme phases. One such stabilization mechanism is the allowance reserve, which has the effect of taming price volatility but also acts as a backup for potential new entrants. On top of reassuring participants of additional allowances in case of shortages, the government intervened by revising banking and borrowing rules across phases.<sup>d</sup>

The ROK ETS demonstrates that carbon market liquidity is not solely determined by allowance allocation and supply or demand price discovery, but also by encouraging the selling of allowances (as opposed to banking them) through policy design. For example, the ungoverned banking of permits in the ROK caused entities to save their allowances for future periods, when prices may be higher.

<sup>a</sup> See OECD. 2021. Carbon Pricing in Korea. *Carbon Pricing in Times of COVID-19 Country Notes*. The ROK ETS includes buildings, transport, aviation, waste, and industry and power generation, which together comprise one of the widest coverages globally (see also ADB. 2018. *The Korea Emissions Trading Scheme*). Manila.

<sup>b</sup> E. Kuneman, W. Acworth, T. Bernstein, and A. Boute. 2021. *The Korea Emissions Trading System and Electricity Market: Influence of Market Structures and Market Regulation on the Carbon Market*. Berlin and Hong Kong, China: German Environment Agency.

<sup>c</sup> GIR. 2020a. *2018 K-ETS Summary Report*. Seoul: Ministry of Environment.

<sup>d</sup> Banking refers to retaining unused allowances to use for future periods. Borrowing involves entities using a future period's allowances to cover current responsibilities (ADB. 2018. *The Korea Emissions Trading Scheme*. Manila).

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

<sup>47</sup> N. Koch et al. 2014. Causes of the EU ETS Price Drop: Recession, CDM, Renewable Policies or a Bit of Everything?—New Evidence. *Energy Policy*. 73. pp. 676–685.

In current voluntary markets that may transition to mandatory schemes, such as the International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) or the regime under Article 6 of the Paris Agreement, certainty may come from long-term commitments concerning the demand for credits, for example, the phase length and lead time. In addition, in purely voluntary systems, policy certainty for specific projects (i.e., certainty for project developers that additional income can be earned from credits) can be enhanced by allowing preregistration and use of established methodologies that give confidence to investors that their projects will lead to issuance of credits.

## Use of Revenues

The raising and use of revenues is often an important part of carbon pricing design, although not always the main purpose for implementing a carbon pricing instrument. The main sources of revenues are carbon tax receipts and the payments made for emission trading allowances (commonly through auctions). Where the costs of these payments are a key concern, the liable entities can be protected by measures that allow them to avoid carbon payments in the first instance, such as through carbon tax thresholds or free emissions allowance allocation. The next step in cost mitigation would be to award performance-related carbon tax rebates, for instance to selectively compensate operators who make efforts to improve their carbon performance.

For revenues that are retained by governments, the choice is what purpose to put them. The most likely direct purpose is simply general taxation, since many countries' fiscal rules do not permit earmarking or hypothecation. However, this does not prevent policy design that allows for an equivalent indirect use of revenues to support a particular policy purpose. For example, at the point of introduction of a revenue-raising instrument, other taxes could be reduced in counterbalance, or funding schemes created that provide an equivalent revenue source for projects or programs. They could also be used to provide support to consumers who would ultimately pay the carbon costs through their energy bills, especially support those consumers less able to pay.

From an energy policy perspective, the last two of the mentioned revenue uses are the most relevant—funds for projects and programs or financial support to energy users. This is because they can be most targeted toward realizing energy policy aims.

Funds can be used to support investment in modernizing the energy system. This can target environmental performance but also improve energy efficiency, reduce costs of supply, and improve grid resilience and connectivity. By investing this way, the funds can support the wider energy policy aims of affordability and security. It is also possible that funds could be used to improve energy access. The EU's modernization fund, associated with revenues collected from Phase 3 of the EU ETS, is a good example of how auction revenues were used to support development of the electricity sector to improve environmental and energy policy outcomes for EU countries with more scope for modernizing equipment and systems.

Also, within the energy system, funds can support measures that address the impacts of the decarbonization transition, by supporting the economies and communities of those sectors and regions that are most adversely affected by the closure of high carbon assets. The EU ETS Just Transition Fund seeks to use revenues in this way. The types of actions could include financing for new enterprises

or enterprise zones, digital connectivity, reskilling, or infrastructure development to support local employment, such as transport links.<sup>48</sup>

Finally, payments can be made directly to those affected by carbon costs and who are least able to pay. This can particularly target those less able to pay energy costs and therefore contribute to the energy policy aim of affordability. Again, the carbon tax rebate system in South Africa is an example of this.

## Use of Offsets in Domestic Carbon Pricing Compliance Schemes

Offsets in mandatory carbon pricing schemes, such as ETS and carbon tax, allow regulated entities to acquire and use carbon credits (also called emission reduction credits) for compliance. These credits represent emissions savings made by parties outside of the carbon pricing system. They can be from projects or programs within the carbon pricing system country or from those in other countries. However, there can be risks associated with allowing offsets as part of an ETS or carbon tax. One is a potential oversupply of overseas offset credits, which can substantially reduce emission abatement from within the country. A second is exposure to price volatility if the price of carbon is affected by international values. Setting a limit to the total amount of offsetting allowed or to the sources from which offsets can be used can mitigate these risks. This can include permitting only offsets from national (not overseas) systems. Policy makers may favor national offsetting systems because this provides greater benefits to the country by providing finance directly to emission reduction activities in country rather than elsewhere. This is the case in Colombia for example, which is further explained in Box 12.

### Box 12: Colombia—A Carbon Offsetting Case Study

In 2016, Colombia passed Law 1819 as part of a national carbon tax package. This was followed by Decree 926, which allowed for tax liability reductions through offsetting with carbon neutrality certificates.<sup>a</sup>

Projects eligible for carbon neutral certification under the offset scheme must meet multiple criteria. Projects must have been completed since 1 January 2010, within Colombian borders, and compliant with Clean Development Mechanism (CDM) or other accredited methodologies. Voluntary offsetting could also be used to offset the carbon tax, if approved methodologies were used. Previously, non-CDM offsets carried out outside of Colombia were valid until 31 December 2017. After this point, projects eligible for offsets under the carbon tax must have been completed within the country. Limiting eligibility requirements to national projects has boosted the Colombian carbon market and emission reduction technologies in the country, particularly of Reducing Emissions from Deforestation and Forest Degradation or REDD+ projects, which aim to limit deforestation.<sup>b</sup>

<sup>a</sup> The Carbon Trust, Environmental Defence Fund, and IETA. 2018. *Colombia: An Emissions Trading Case Study*. Mexico, California, and Brussels.

<sup>b</sup> G. Dufrasne. 2021. *Two Shades of Green: How hot air forest credits are being used to avoid carbon taxes in Colombia*. Carbon Market Watch. 30 June.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

<sup>48</sup> European Commission. 2022. *The Just Transition Fund*.

The attraction for carbon pricing entities is that use of offsets can be a cheaper compliance option than reducing their own emissions or paying the carbon price. The attraction for the offset developers is that they receive carbon finance for their projects, through the additional offset sale revenue stream. From the government perspective, national offsetting allows carbon pricing to incentivize abatement across a greater range of sectors and for the achievement of national climate change commitments at lower cost. If the offset projects have significant co-benefits, such as reducing air pollution or creating skilled jobs, then there are advantages to the local communities as well.

Economically, by allowing offsets to be used within the carbon pricing system, the government may be foregoing revenue and instead allowing a financial flow directly from the carbon pricing liable entity to the offset developer. The government will be foregoing revenue in these cases because the carbon pricing entities would pay less carbon tax or, in the case of emissions trading, the permitted use of offsets would increase the volume of carbon units in the system, suppress the price, and lower the value of emissions allowance auction receipts. However, governments might wish to allow such offset use because of the wider benefits already mentioned and because the offset projects that are permitted could be restricted to, or prioritized in favor of those that contribute to wider policy aims, such as energy policy objectives.

In principle, there are many project types that could contribute to meeting wider energy policy objectives and thus be supported through carbon pricing offsetting. Examples follow:

- (i) **Projects to install new local community small-scale renewable generation, such as run-of-river hydropower or solar photovoltaic cells.** These could improve **energy access** where grid connection does not otherwise exist, and contribute to **energy security** by providing reliable sources of electricity and reducing the national need for energy imports.
- (ii) **Projects utilizing alternative fuel sources, such as refuse-derived fuel, for electricity generation or energy use within industrial installations.** As well as the environmental benefit, these projects could improve the **affordability** of energy and industrial **competitiveness** if the carbon finance were to benefit the end user in terms of lower energy costs. These could deliver co-benefits in terms of waste management and avoided landfill use.

A final consideration for policy makers looking to realize these energy policy benefits through domestic and international offsetting within a carbon pricing regime is the avoidance of possible double counting, specifically, the situation in which domestic offset projects are carried out within sectors covered by a mandatory carbon pricing regime. This is most direct in emissions cap-and-trade schemes where the government sets an overall cap for emissions and creates an equal number of allowances. Obligated entities in the scheme need to obtain and surrender an allowance for each unit of their emissions. In the case where offsets are allowed in the same sectors where the cap-and-trade scheme operates, savings made by offset projects would be accounted for as savings within the system, allowing lower abatement elsewhere to meet the cap. If offsets were also earned and used, this would double count the savings.

The overlap risk in a carbon tax is less direct, as there is no emissions cap. Instead, the project developers could receive a double benefit of reduced carbon tax liability (for instance if they were switching from gas to renewable fuels) and an offset benefit. Such a double incentive may not be desired economically although could provide a boost to projects that are a policy priority.

## Participation in International Carbon Markets

In addition to developing credits to be used in a domestic mandatory carbon pricing scheme, such as an ETS or carbon tax, credits can also be developed for participation in international carbon markets. In particular, Article 6 of the Paris Agreement outlines a mechanism whereby a country can transfer its carbon credits from emission reduction activities to another country in exchange for finance.<sup>49</sup> The “buyer” country in this instance can then count this emission reduction toward its climate target, whereas the “seller” country can use this as a way of accessing international finance. Article 6.2 under the Paris Agreement outlines that when a seller country transfers its mitigation outcome in the form of credits to another country, it needs to make a corresponding adjustment to its climate target to avoid double counting at a global level.

In addition, Article 6.4 under the Paris Agreement outlines the intention to develop an international carbon crediting scheme similar to the Clean Development Mechanism (CDM), which was developed as part of the Kyoto Protocol. This new mechanism will provide a mechanism for trading emission reduction activities between countries using MRV tools by the Conference of the Parties of the UN Framework Convention on Climate Change (UNFCCC). Box 13 provides information on the Article 6 Rulebook adopted at the 2021 United Nations Climate Change Conference (COP26) and linkages with the Indo-Pacific Carbon Offsets Scheme Design Principles.

### Box 13: Article 6 Rulebook and Indo-Pacific Carbon Offsets Scheme Design Principles

Six years after negotiators agreed to adopt the 2015 Paris Climate Agreement, deliberations at the 2021 United Nations Climate Change Conference (COP26) provided a rulebook<sup>a</sup> that governs permitted activities and outlines certain standards and requirements that contribute to sustainable development goals.

Coincidentally, in the same month, the Government of Australia finalized four draft design principles for the Indo-Pacific Carbon Offsets Scheme. Under the scheme, Australia will partner with countries in the region to develop a carbon market that supports projects that reduce emissions.<sup>b</sup>

The second principle is to be “Aligned with the Paris Agreement and Sustainable Development Goals,” which includes the commitment to use robust accounting to avoid double counting and for actors involved in the scheme to pursue projects that align with Sustainable Development Goals.

Further, the first principle to practice “Transparent and inclusive governance” also aligns with the updated rulebook from COP26. Specifically, it demands that governance arrangements must give a voice to those impacted by carbon offsetting projects, while delivering market assurance (all while respecting foreign country’s sovereignty).

<sup>a</sup> See *Draft Text on Matters Relating to Article 6 of the Paris Agreement: Rules, Modalities and Procedures for the Mechanism Established by Article 6, paragraph 4, of the Paris Agreement*.

<sup>b</sup> Government of Australia, Department of Climate Change, Energy, the Environment and Water. 2021. *Design Principles to Guide the Indo-Pacific Carbon Offsets Scheme*. 1 November.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

<sup>49</sup> ADB. 2021. *Decoding Article 6 of the Paris Agreement—Version II*. Manila.

Both of these Article 6 mechanisms may support countries in developing Asia with the selling of emission reduction activities in return for access to international finance streams, technology transfer, and other support such as capacity building. Demand for these credits may come both from compliance markets in buyers' countries (e.g., ROK ETS) (see Box 14) as well as from private sector's voluntary commitments to reduce emissions. For example, the International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation is expected to create significant demand for such credits by emission reduction commitments made by aviation companies.

#### **Box 14: Republic of Korea—Emissions Trading System and Offsetting Program**

With the goal of supporting participating entities and encouraging voluntary emissions reductions from sectors outside of the scheme, the ROK Offset Program (KOP) allows decarbonizing efforts outside of its system boundary to be included in compliance for the ROK emissions trading system (ETS). The program was introduced in phases. Initially, a cautious approach was taken whereby only projects from within the ROK after 2014 and eligible under the Clean Development Mechanism (CDM) or carbon capture and storage projects were accepted. In the second phase, CDM projects developed by ROK companies were also accepted. In both phases, a limit of 10% for carbon offsets was set.

After the introduction of the offsetting allowance to the ROK ETS, trading could now take place between those managing carbon offset projects, in addition to those participating in the ROK ETS. Increasing the number of trades (number of market participants) acted as additional stimuli to the market which reduced transaction costs. This was an important addition to the scheme as high trading and numerous participants were critical for market liquidity.

<sup>a</sup> ADB. 2018. *The Korea Emissions Trading Scheme*. Manila.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

Similar to as described for offsets in mandatory domestic carbon pricing schemes, governments might wish to restrict or prioritize carbon credit development for participation in international carbon markets in favor of those that contribute to wider policy aims, such as energy policy objectives around energy access, affordability, and the just transition. This is because they will want to avoid selling too many credits for which the benefits accrue overseas and, through corresponding adjustments, risk leaving the country short of meeting its NDCs. They will also want to prioritize activity to the types of mitigation that deliver co-benefits and strategic value, such as technology transfer.

Indeed, international crediting regimes have often focused on projects like installing new local community small-scale renewable generation or utilizing alternative fuel sources. For example, Japan's Joint Crediting Mechanism (JCM) is aimed at achieving a more ambitious reduction target. Details of how the system works are included in Box 15.



### Box 15: Case Study: Japan's Joint Crediting Mechanism

The Joint Crediting Mechanism (JCM) was established by Japan as a mechanism by which Japan provides finance and technical support for emission reduction activities in specific donor or partner countries. In return, Japan receives corresponding carbon credits that it can use to achieve its emission reduction target. By facilitating diffusion of low-carbon technologies in partner countries, Japan offsets its emissions and contributes to progress toward meeting global energy policy objectives, namely, the Sustainable Development Goals (SDGs) set by the 2030 Agenda for Sustainable Development, and the climate actions agreed under the Paris Agreement.

As of September 2021, 194 projects have been facilitated by the JCM since 2013, with the majority being in energy efficiency (in transformers, boilers, and chilling technology) and renewable energy (solar and micro hydropower stations).<sup>a</sup> In accordance with Article 6 of the Paris Agreement, bilateral implementation efforts between Japan and partner countries are expected to reduce 100 million tons of carbon dioxide equivalent (tCO<sub>2</sub>e) by 2030.<sup>b</sup> Such knowledge and technology transfers contribute to climate action directly, but also to energy policy objectives such as affordable and clean energy and reducing air pollution caused by coal power plants. By way of example, cooperation between Japan and Mongolia since 2013 has allowed for solar power generation projects that meet over half of the country's nationally determined contributions (NDCs) target to develop its network to 145 megawatts. This target is part of Mongolia's ambition to increase renewable energy capacity to 30% by 2030.

To be eligible for support programs available for the JCM, projects must either reduce CO<sub>2</sub>e emissions in partner countries and deliver some portion of carbon credits issued under the JCM to the Government of Japan. To be further in line with Article 6 rulebooks, projects accessing JCM support are required to be consistent with the NDCs and relevant policies of the country where the projects are being implemented.

To avoid double counting of emission reductions, the JCM holds registries of credits in both Japan and the partner country and credits are shared via formal agreement at the individual project level between the governments of Japan and the partner country and project participants. This inherent safeguarding in the system makes the scheme prepared for alignment with Article 6.2 of the Paris Agreement and the idea of corresponding adjustments in the future.<sup>c</sup>

The Box Table presents several micro studies as an example of how JCM projects have been assisting energy transition, international cooperation, and carbon trading relating to Article 6 of the Paris Agreement through the encouragement of renewable generation and energy efficiency. In particular, the JCM can be seen as a forerunner of what is intended to be implemented under Article 6.2 of the Paris Agreement where Parties have committed to include "environmental integrity and transparency" rules when engaging in voluntary cooperative approaches.<sup>d</sup>

*continued on next page*

Box 15 continued

**Box Table: Japan—Micro Examples from the Joint Crediting Mechanism**

Country	Year	Summary	Drivers of Energy Policy Outcome	Estimated CO <sub>2</sub> e Emission Reduction (tCO <sub>2</sub> e/year)
Mexico	2018	Installation of a 33 MW direct current ground-mount solar photovoltaic system using single-axis trackers in Guanajuato, Mexico	Renewable generation	31,782 (Installation underway)
Viet Nam	2018	Introduction of invertors to control the motors at the intake pumping station in Ho Chi Minh City, reducing energy consumption as well as CO <sub>2</sub> e emissions	Energy efficiency	602 (Active or installed)
Indonesia	2019	Installation of a 6 MW turbine, generator, control system and auxiliary equipment at Bayang Nyalo hydropower plant located in Bayang River, West Sumatra	Renewable generation	17,242 (Installation underway)
Indonesia	2019	Construction of a 2 MW small hydropower plant in the Wae Lega River (basin area: 20 square kilometers) of Flores Island in East Nusa Tenggara Province	Renewable generation	7,471 (Installation underway)
Thailand	2019	Installation of 37 MW solar power system on the rooftop of the vehicle factory of Toyota Motor Thailand Co., Ltd.	Renewable generation	19,512 (Installation underway)

MW = megawatt, tCO<sub>2</sub>e = ton of carbon dioxide equivalent.

<sup>a</sup> UNESCAP. 2017. *Accelerating Climate-Smart Trade and Investment for Sustainable Development*. Bangkok.

<sup>b</sup> International Institute for Sustainable Development. 2019. Guest Article: How the Joint Crediting Mechanism Can Contribute to NDCs Implementation and SDG Achievement. SDG Knowledge Hub; Government of Japan. 2022. *Recent Developments of the Joint Crediting Mechanism (JCM)*.

<sup>c</sup> ADB. 2021. *Article 6 of the Paris Agreement: Drawing Lessons from the Joint Crediting Mechanism. Version II*. Manila.

<sup>d</sup> UNFCCC. 2015. *Paris Agreement*.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

## Cost Mitigation Measures

Carbon pricing policies can impose costs to commercial enterprises that have an impact on their competitiveness. This is especially a concern for emissions-intensive (or energy-intensive), trade-intensive sectors, where sectors compete internationally. Competition may be both for product sales in international markets and with international firms for product sales in domestic markets. In both cases, overseas firms may not experience equivalent carbon costs as those faced by companies covered by a domestic carbon pricing scheme. In that case, the enterprise covered by a carbon pricing regime may not be able to pass on its carbon cost in the value of the products it sells. Instead, it may suffer reduced market share, profitability, and/or ability to raise finance and make investments.



For these reasons, it is common that carbon pricing systems include mechanisms to protect such trade-exposed industries. These can be through carbon tax rebates or free emissions trading allowances. A recent policy development is the EU's Carbon Border Adjustment Mechanism (CBAM), which applies a charge for imports of certain goods where they have been produced in a country with a lower carbon pricing regime (or have no carbon pricing at all). Other countries have also stated their plans to consider their own CBAMs, which could become a more significant policy tool as they become more common and are applied to a greater scope of products.

From a national policy perspective, it is the prospect of carbon tax rebates and free emissions trading allowances that offers the greatest potential to pursue energy policy aims. More specifically, where the degree of support provided to enterprises is related to their energy or emissions performance, then there becomes an incentive for improvements in that performance. This provides benefits to the enterprise in terms of reduced energy bills (helping achieve the energy policy aim of **affordability**) and potentially to the country in terms of further **energy security** if lower energy use or greater use of domestic renewable energy resources reduces energy imports. By contrast, a tax rebate system or allowance allocation mechanism not linked to enterprise performance would not realize these energy policy benefits.

A way by which carbon tax rebates can be targeted to incentivize performance improvements is to establish them as conditional on the enterprise meeting an energy or carbon benchmark. This is a common approach, and some examples illustrate it.

- (i) In the South Africa carbon tax, an element of the tax allowance system relates to the emission performance of the industrial enterprises (Box 16).
- (ii) Within Europe many countries applied a performance rebate system for their energy or carbon tax. In the United Kingdom, for example, the Climate Change Agreement regime provides industrial enterprises with a substantial rebate on their Climate Change Levy payments if they meet biennial specific emissions intensity targets. These targets are set on a sector approach and have contributed to substantial energy and emissions reductions within the sectors covered.
- (iii) The EU ETS free allocation system is based on emissions performance benchmarks, predominantly determined as the number of emissions per quantity of product manufactured. This creates a signal as to the level of performance expected and avoids poorer performers being rewarded for their relative carbon intensity.

Thus, the concern over the impact of carbon pricing on industrial competitiveness can be addressed in a way that encourages improved energy efficiency and/or reduced carbon intensity, and thereby contributes to wider energy policy objectives.

### Box 16: Case Study: South Africa's Carbon Tax

Gaining stakeholder acceptance of the proposed carbon tax in South Africa was challenging. During the 9 years of development, the government recognized the need to clearly present the tax as a climate change policy instrument. During stakeholder consultations, trade unions and business sector representatives lobbied against specific aspects of the proposals.<sup>a</sup> Concerns were raised around the alignment with South Africa's carbon budget policy and pressures arising from rising operation and energy and electricity costs.

The government responded by changing design elements of the tax. Electricity price concerns were addressed by providing credits for renewable energy premiums built into electricity tariffs, as well as credits for the existing electricity generation levy.<sup>b</sup> Concerns over the impact of the tax on industry competitiveness meant that the maximum overall tax-free emissions allowance increased to 95% as the trade exposure allowance was developed. The tax design was also developed to incorporate fugitive + process emissions, in response to concerns over the challenges of measurement.

Five emission allowances (tax exemptions) were catered to in the tax design, reaching the total 95% allowance:<sup>c</sup>

- basic tax-free allowances (on 60% of combustion emissions for all activities and all companies),
- industrial process or fugitive emissions allowance (10% on one option for manufacturing sectors e.g., iron, steel, glass, and cement),
- trade exposure allowance (maximum 10% for exposed sectors);
- performance allowance (up to 5%); and
- a carbon budget allowance (5% for complying with the reporting requirements).

The performance-based allowance allows taxpaying commercial entities to compare their emissions generated to those emitted by their industry. The formula used works by accounting for the emission intensity of the taxpayer compared to approved emission intensity benchmark factors. If the taxpayer performs at a level higher than the agreed sector benchmarks, they will qualify for the performance allowance.<sup>d</sup> In addition, a carbon offset scheme was introduced to provide flexibility and incentivize mitigation in sectors not covered by the tax.

<sup>a</sup> A. Averchenkova, K. E. Gannon, and P. Curran. 2019. *Governance of Climate Change Policy: A Case Study of South Africa*. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science.

<sup>b</sup> Republic of South Africa, National Treasury. 2019. *Media Statement Publication of the 2019 Carbon Tax Act*. Media Statement. 26 May.

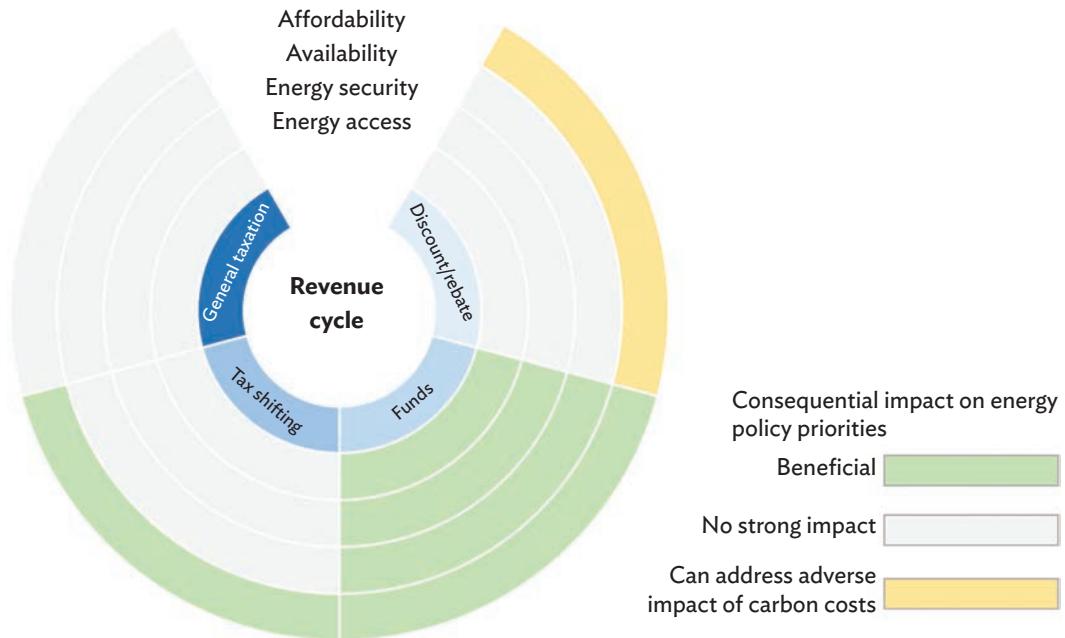
<sup>c</sup> International Energy Agency. 2020. *South African Carbon Tax*.

<sup>d</sup> KPMG. 2020. *South Africa: Regulations Implementing Carbon Tax*. South Africa.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

Figure 6 illustrates how carbon pricing revenue can support energy policy aims. This is presented for the methods of revenue use and cost mitigation measures, together with general taxation. It is illustrative because there are different degrees to which these mechanisms can be designed to target wider energy policy outcomes. Many uses of revenues can be designed to have a positive wider energy policy outcome, which is why so many elements are green, especially regarding how funds can be dispersed. Discounts and rebates for carbon price payers mitigate a negative impact (i.e., reduce carbon cost liability) so is shown in yellow—the aggregate impact of the rebate and the carbon cost is not necessarily (or likely) positive.

**Figure 6: Potential Impacts of Revenue Recycling on Energy Policy Aims**



Note: The blue rings indicate the main immediate approaches to revenue recycle. The consequential impacts on energy policy objectives are shown in the outer rings. These consequential impacts depend upon whether the revenues are targeted in a particular way, so illustrate the potential impact.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

# 4

## Methodology for Assessing Readiness for Carbon Pricing Selection, Design, and Implementation

This chapter outlines a methodology for assessing a country's readiness for carbon pricing selection, design, and implementation. This includes the level of capability required for selecting and designing an instrument as well as identifying a road map for implementation. The framework outlined here will also assess the readiness of the country in relation to decarbonizing the energy sector.

A country's readiness to introduce a carbon pricing instrument can be assessed by evaluating the existing political commitments and policy design, as well as its institutional and systems readiness. In the following, each element to be considered is outlined with a description of what may constitute a low or high level of readiness. The implications of readiness for carbon pricing design are described, with a specific focus on energy sector objectives.

### Political Commitment and Policy Design

#### Political Enablers

Political enablers represent elements that are required to be in place to facilitate the introduction of any carbon pricing instrument in the energy sector from a political economy perspective. These include the following:

- (i) **National commitment.** A national commitment such as nationally determined contributions (NDCs) can provide clarity on outcomes to be achieved by energy sectors against which the role of carbon pricing can be understood. Additionally, the existence of a long-term strategy (LTS) can give clarity on the need for carbon pricing in the long-term to achieve the targets. If the NDCs of a country identifies absolute emission reduction targets, broken down by different energy subsectors, and an LTS has been developed outlining growth and technology assumptions by sector (e.g., scope for renewable technologies, carbon capture and storage, etc.), then this can constitute a high level of readiness, as this information can underpin carbon price target outcomes. If NDCs only outline a relative emission target, or limited breakdown by sector and underlying assumptions, then these will need to be developed further to outline the specific role a carbon pricing instrument can have in the jurisdiction. A national commitment can also outline intentions of a country to participate in international schemes, such as Article 6 under the Paris Agreement.
- (ii) **Legal basis for emissions policy.** The existence of primary legislation that commits to or enables the introduction of carbon pricing or sets carbon targets or budgets that carbon pricing can seek to achieve can accelerate the speed at which carbon pricing can be developed and implemented.

- (iii) **Legal basis for institutional set-up.** In addition to primary legislation for carbon pricing, any legislation that establishes the responsibilities of institutions with respect to any future carbon pricing in the energy sector will also accelerate its implementation. For example, this could relate to legislation outlining the responsibility of an energy market regulator and any other responsibilities it has for driving decarbonization or introduction and updating of relevant policies for the sector.
- (iv) **Governance structures.** Cross-government governance arrangements such as committees can allow for the necessary collaboration and consultation within government to develop carbon pricing. For example, it could relate to any existing links among the ministries of environment, energy, and finance with different responsibilities around achieving climate commitments, governing energy market regulators, and managing revenues, respectively.
- (v) **Stakeholder involvement.** Carbon pricing requires sufficient buy-in from relevant stakeholders to be accepted. Established mechanisms for consultation with institutions, nongovernment organizations, academia, and the private sector are required, to develop and refine the policy and gain buy-in (see Box 17).

### Box 17: The Importance of Early Stakeholder Dialogues to Avoid Political Opposition—A Case Study on the Australian Carbon Tax

In 2011, the Government of Australia implemented the Clean Energy Act, which included a carbon tax applied to the electricity sector, stationary combustion, and a few nonenergy sectors. The tax was set around \$17.4 per ton of carbon dioxide equivalent (tCO<sub>2</sub>e), and it was first implemented in 2014. However, the act was subsequently repealed in 2014 after a change in government and as a result of very strong political opposition. According to literature,<sup>a</sup> the act suffered from stakeholder opposition issues from the beginning, including the use of different terminology of carbon price versus carbon tax by the government and opposition.

Other issues that may have contributed to the strong public opposition include the lack of mandate by the government for the policy as it had not featured in political campaigns during the elections. It was perceived as a stricter scheme than that of other countries thereby possibly leading to carbon leakage and lack of clarity around the mechanism of the policy, its cost, and its environmental impacts.<sup>b</sup>

This case study therefore shows the importance of creating stakeholder buy-in early on so responses from different actors can be anticipated and planned for. An early dialogue that includes clear communication, robust policy preparation, and wide stakeholder involvement from across the political spectrum and including both public, private, and civil sector actors may have avoided these issues.

<sup>a</sup> S. Copland. 2019. Anti-Politics and Global Climate Inaction: The Case of the Australian Carbon Tax. *Critical Sociology*. 46(4-5). <https://doi.org/10.1177/0896920519870230>; B. Zeller and M. Longo. 2013. Australia's Clean Energy Act: A New Measure in the Global Carbon Market. *Loy. U. Chi. Int'l L. Rev.* 10 (179).

<sup>b</sup> T. S. Herald. 2011. Opposition Vows to Repeal Carbon Tax. *The Sunday Morning Herald*. 2 October; Select Committee on the Scrutiny of New Taxes. 2011. *The Carbon Tax: Economic Pain for No Environmental Gain—Interim Report*.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

## Policy Environment

When a new carbon pricing instrument is introduced, it needs to be done in a way that fits with existing policy or indeed the existing policy regime may also need to be changed. It is necessary to avoid inefficiencies and contradictions and ensure that all policy objectives related to the energy sector and decarbonization are met. The policies that may need to be adjusted before the introduction of carbon pricing can be broadly divided into the following three groups:

- (i) **Enabling and synergistic policies.** These are policies that provide precedents for carbon pricing elements, or which give confidence in the availability of relevant expertise to introduce such a policy. For example, policies such as energy taxation, existing voluntary carbon markets, and requirements for corporate emissions reporting fit into these categories. Existing energy taxes could be transformed into a carbon tax by making them dependent on the carbon content of fuels, thereby avoiding having to implement a new tax and thus facilitating a smoother transition to carbon pricing. A country will therefore be seen as being at a higher level of readiness when there are suitable enabling and synergistic policies in place for the preferred carbon pricing instrument.
- (ii) **Countervailing policies.** These are policies that could undermine the effectiveness of carbon pricing by counteracting the price signal provided. The main example of a countervailing policy in the energy sector are fossil fuel subsidies as they reduce carbon costs exactly where a carbon pricing instrument would increase them. Countervailing policies have more general objectives, such as affordability or competitiveness, which could be undermined when these subsidies are removed or counteracted by carbon pricing. Therefore, on removal of these subsidies it is necessary to consider how those other objectives can be met in different ways.

Countries with high levels of fossil fuel subsidies are considered at a lower level of readiness, as significant policy and regulatory reforms may be needed to remove these subsidies while ensuring the objectives are met by other support schemes. An example of such a country is Kazakhstan, where the total value of applied fossil fuel subsidies was estimated to be \$4.27 billion in 2020.<sup>50</sup> This amounts to a subsidization rate of 35%, or \$228 subsidy for fossil fuels per capita. Compared to other Asian countries, Kazakhstan's relatively high subsidization rate has been identified as a factor limiting the effectiveness of the established ETS.<sup>51</sup> Complex energy subsidies have led to pre-existing distortions, as they prevented a cost-pass through to customers and limited the volume of emissions trading. When combined with other political and social pushbacks, this resulted in a temporary suspension of the ETS between 2016 and 2018.

- (iii) **Complementary policies.** These are existing measures in the policy landscape that can make carbon pricing more effective in its objective to drive decarbonization in the energy sector. Examples of such measures could be support schemes to encourage low-carbon skills development, research and demonstration projects, and innovation policies. For example, the Pan-Canadian Framework was complemented by a \$36 million program to invest in

<sup>50</sup> International Institute for Sustainable Development and Organisation for Economic Co-operation and Development. 2022. *Fossil Fuel Subsidy Tracker*.

<sup>51</sup> IEA. 2021. *Fossil Fuel Consumption Subsidies, 2010–2020*. Paris; P. Howie and Z. Atakhanova. 2022. Assessing Initial Conditions and ETS Outcomes in a Fossil-Fuel Dependent Economy. *Energy Strategy Reviews*. 40.

low-carbon technologies in the oil and gas sector.<sup>52</sup> Likewise, in Sweden, the carbon tax implemented alongside an Energy Research Programme focused on new methods of fuel production.<sup>53</sup> In both cases, there is evidence that careful consideration of how carbon pricing can be complemented by these additional measures can not only amplify its impact in terms of decarbonizing the energy sector but also help increase political buy-in.

In addition, these types of policies could also work as possible destination for the recycling of revenue raised from carbon pricing, as they work alongside the general decarbonization targets. For example, renewable energy or energy efficiency support schemes could fit into this category.

While all these policy considerations are important elements to understand the readiness for a country to introduce a domestic emission trading system and/or carbon tax, they are less important for the introduction of a domestic carbon crediting scheme. Domestic carbon crediting schemes do not impose additional carbon costs on obligated entities, but are instead used for raising additional revenue for decarbonization activities in country. However, complementary policies could be used to encourage domestic crediting, for example, in supporting the market for project development or validation services. Importantly, communicating carbon pricing policies within the wider landscape will also be key, as highlighted by an example of the introduction of a carbon tax in South Africa in Box 18.

### Ability to Carry Out Required Impact Assessments

The introduction of carbon pricing can have significant impacts on energy costs, competitiveness, affordability, and trade. It is therefore necessary to carry out impact assessments studying these effects to understand what the optimal design would look like to avoid or mitigate negative socioeconomic impacts and increase the effectiveness of the instrument. Countries with the ability to carry out these assessments are therefore generally considered to be at a higher level of readiness, as these will facilitate clear insights for decision-making on the design. The types of assessments and the required ability to carry these out are as follows:

- (i) **Macroeconomic assessments.** This refers to the ability to model the economic impact of carbon pricing against main indicators such as gross domestic product (GDP) or gross value added (GVA) by each energy subsector. It also requires the ability to analyze the possibility and mechanisms by which carbon costs may be passed through to end-users, and the impact on key intermediate and final product prices such as electricity and fuel. Last, it may also require the ability to analyze fiscal impacts from tax shifting or carbon revenue use, e.g., what would happen if income tax were reduced at the same rate as an increase in carbon tax. Countries with macroeconomic models available as well as data sets by subsector around carbon content and investment structures are therefore considered to be at a higher level of readiness (see example in Box 19).

<sup>52</sup> Environment and Climate Change Canada. 2016. *Pan-Canadian Framework on Clean Growth and Climate Change: Canada's Plan to Address Climate Change and Grow the Economy*. Quebec.

<sup>53</sup> L. Scordato et al. 2018. Policy Mixes for the Sustainability Transition of the Pulp and Paper Industry in Sweden. *Journal of Cleaner Production*. 183. 1216–1227.



### Box 18: Communicating the Role of Carbon Pricing in the Wider Policy Landscape—A Case Study on the South African Carbon Tax

An example of the need to ensure that a new carbon pricing instrument fits into the existing policy landscape comes from South Africa. While the tax was first discussed in 2010, it only came into force via the Carbon Tax Act No. 15 in 2019.<sup>a</sup> The main reason for choosing a carbon tax was due to the nature of the electricity market in South Africa, which is dominated by one big power utility, Eskom.<sup>b</sup>

The carbon tax was planned as one part of a wider policy package that has been designed and planned to drive the climate and energy transition in South Africa since 1996. This policy package includes the National Climate Change Response Policy (NCCRP), which was developed in 2011 outlining the vision for a long-term transition to a low-carbon economy.<sup>c</sup> Stakeholders' opposition both from the private sector and civil society early on around the carbon tax was focused on a wide range of issues including concerns around increase in electricity prices and impacts such as unemployment.<sup>d</sup>

Another major issue that featured in the stakeholders' opposition was the perceived lack of alignment between the new carbon tax and existing climate and energy plans. In particular, some stakeholders mentioned that the objective of a carbon tax was already covered by other policies, causing uncertainty for the entities being covered by the tax.<sup>e</sup> In response to this opposition, the government organized consultations and workshops to increase the understanding of possible impacts, as well as the objective and mechanism of the new carbon tax within the existing context, with a particular focus on the administrative and carbon costs burden of taxation. In this case, communication was required to demonstrate how a carbon tax can work synergistically next to existing policies aimed at low-carbon technologies and promotion of green economic development to make each instrument more effective. While this delayed the implementation of the carbon tax in South Africa by 9 years, it ultimately meant the carbon tax was approved and implemented in 2019. Some argue however that the delayed stakeholder engagement process meant that opposing parties were able to disproportionately influence the policy design and timeline.<sup>f</sup>

<sup>a</sup> International Energy Agency. 2020. South African Carbon Tax. Paris.

<sup>b</sup> R. Crompton. 2019. Explainer: Why South Africa's Energy Generator Is in So Much Trouble. *The Conversation*. 2 October.

<sup>c</sup> S. Nakhoda. 2014. Carbon Taxes in South Africa: The Political and Technical Challenges of Pricing Carbon. *Working Paper*. No. 399. London: ODI.

<sup>d</sup> Republic of South Africa, National Treasury. 2013. *National Climate Change Response Policy: Carbon Tax Stakeholder Consultation Process in South Africa*.

<sup>e</sup> A. Averchenkova, K. E. Gannon, and P. Curran. 2019. *Governance of Climate Change Policy: A Case Study of South Africa*. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science.

<sup>f</sup> Chandra. 2019. *Climate Governance Assessment of the Government's Ability and Readiness to Transform South Africa into a Zero Emissions Society*. *Climate Analytics*.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).



An example of macroeconomic modelling to assess the impacts of carbon pricing comes from the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), which has developed a model to assess the social impacts of different carbon pricing designs, including carbon border adjustments and the ability of carbon pricing to contribute to a green recovery from the coronavirus disease (COVID-19).<sup>54</sup>

- (ii) **Trade and competitiveness assessments.** To understand the full impact of carbon pricing, sectors that are most exposed to competition and potential carbon leakage will need to be identified and quantified. Therefore, countries with data and insights into the exposure of subsectors to trade and their relative carbon intensity will be in a better position to understand the impacts of a carbon pricing.
- (iii) **Abatement analysis.** This refers to the ability to model emission baselines and potential emissions impacts resulting from the application of carbon pricing, by subsector as well as data and insight, to understand the effects of carbon pricing to stimulate clean technology and market innovation, e.g., hydrogen, carbon capture and storage, renewable technologies.
- (iv) **Co-benefits analysis.** Countries with the ability to analyze wider benefits of carbon pricing options such as impacts on air quality in industrialized areas or changes in energy security will also be in a more ready position to assess impacts.
- (v) **Social impacts.** This refers to the ability and availability of data to determine impacts on employment and workers, localized to specific industries and regions. This assessment is important to understand the impact of carbon pricing on just transition goals and to understand how changes in design or revenue use could support just transition objectives.

Analytical capacity and data availability for each of the points listed above are typically more readily available for assessing, designing, and implementing taxes than the other carbon pricing instruments.

### Box 19: Australia Carbon Tax—The Importance of Detailed Impact Assessments for Stakeholder Buy-In

As part of the scoping of the Australian carbon tax, the Australian Treasury undertook a modeling exercise aimed at understanding the costs of implementing the tax as well as its environmental impacts.<sup>a</sup> The study focused on the costs faced by an average household and the impact on the consumer price index as well as how these impacts could be mitigated by recycling around 50% of the tax revenue for rebates for low- and middle-income households.<sup>b</sup> However, the modeling was faced with significant opposition both from opposition parties and industry groups. They criticized the lack of transparency in the assumptions used as well as the use of some unrealistic assumptions that they claimed led to an underrepresentation of the total costs. They also claimed it was not possible to reproduce the results obtained by the modelling thereby discrediting the study further.<sup>c</sup> This meant that the poor communication and appearance of incompleteness or lack of transparency can significantly increase political opposition to the plan of introducing a carbon pricing instrument. Careful design, communication, and analysis of a carbon pricing instrument is therefore crucial for its successful introduction.

<sup>a</sup> Treasury of Australia. 2011. *Strong Growth, Low Pollution*. Commonwealth of Australia.

<sup>b</sup> M. Rahman. 2013. *The Proposed Carbon Tax in Australia: Impacts on Income Distribution, Employment and Competitiveness*. Queensland: School of Accounting, Economics and Finance, University of Southern Queensland.

<sup>c</sup> A. Robson. 2013. *Australia's Carbon Tax: An Economic Evaluation*. Australian Institute for Energy Research. Source: Asian Development Bank (Sustainable Development and Climate Change Department).

<sup>54</sup> UNESCAP. 2021. *How Can Carbon Pricing Contribute to Post COVID-19 Recovery*. 15 September.

## Ability to Establish Detailed Design

After understanding the political economy, the policy landscape, and potential impacts of different carbon pricing schemes, decisions on the more detailed design of the scheme will need to be made. Following are the main requirements for making design decisions:

- (i) **Granular data on emissions by energy subsector and data on energy use by major companies.** This data will allow for an assessment of how different sectors could be covered for effective decarbonization and what possible options for exemptions and thresholds may be applied. The PaSTI system supported by Japan is currently in Phase 2 of the project to develop facility level MRV frameworks for CO<sub>2</sub>e emissions in member states of the Association of Southeast Asian Nations, allowing member states to identify priority sectors for MRV guidelines, and facilities and to quantify emissions for use in MRV systems.
- (ii) **Clear targets by energy subsector.** Understanding different ambition levels by energy subsector in the context of national commitments or other existing policies can help to set the caps in emission trading, or rates of carbon taxation that will be needed to achieve objectives. Often in developing Asia, targets have not been disaggregated by subsector.
- (iii) **Offsets.** Knowledge of opportunities for project-based offsetting in country, including technologies, levels of savings by subsector, availability of finance (which depends on the cost of capital, payback periods for investments, willingness to participate based on private sector trust in government programs, and the perception of and appetite for risk among potential project developers and investors) can inform decisions on whether sectors not directly covered by carbon pricing should be covered via offsets or through domestic carbon crediting.
- (iv) **Emissions accounting rules.** Emission accounting rules are needed to understand the requirements of carbon pricing. Other considerations include industrial sector process issues, standards, and practices on materiality, uncertainty analysis, and metering standards. This also relates to defining regulatory workflow such as monitoring plans and permit requirements.

## Considerations in an Emission Trading System

The following elements are mostly relevant in case an emission trading system is considered:

- (i) **Market dynamics.** Ability to assess need for, design, and impact of market flexibility mechanisms such as carbon price or volume interventions and/or reserves, etc.
- (ii) **Allocation method and/or benchmarking.** Methods designed and applied to attribute emissions-based compensation measures to alleviate the effects of carbon pricing and carbon leakage. This could be through free allowance allocation, tax rebate mechanisms, or crediting baselines. Approaches can be data-intensive and utilize concepts such as benchmarking; see Box 20 for an illustration.
- (iii) **Auction design.** Ability to develop and assess auction design options and analyze potential auction behavior issues based on likely participants (e.g., accessibility and engagement of smaller actors, market power of large ones, liquidity and cost effectiveness issues). Existing auctioning schemes, for example, electricity trade platforms, could indicate a higher level of readiness for this element.

### Box 20: Colombia Carbon Tax—Case Study on Offsetting as Part of Carbon Pricing to Lower the Costs of an Existing Mandatory Scheme

Offsetting as part of carbon pricing can lower the costs of an existing mandatory scheme (e.g., emissions trading system or carbon tax) to support national mitigation projects. In 2016, the Government of Colombia introduced a carbon tax through a reform of existing taxes on fossil fuels.<sup>a</sup> Due to concerns around economic effects, the tax was set at a low rate of \$5 per ton of carbon dioxide equivalent (tCO<sub>2</sub>e) with the plan to slowly increase this to \$10/tCO<sub>2</sub>e over time.<sup>b</sup> Another way by which the government aimed to reduce negative economic impacts from the carbon tax was by allowing offsets as part of the tax liability for obligated entities.<sup>c</sup> In fact, covered entities can offset 100% of their tax obligations in the current system as long as they meet a certain set of criteria, including being issued a greenhouse gas certificate by a publicly available registry, and using Clean Development Mechanism methodologies since 2010.<sup>d</sup>

Offsets can lower the carbon price as they allow obligated entities to purchase emission reductions that are possibly cheaper than the carbon tax rate. Moreover, allowing offsets can also provide additional support to achieving national mitigation targets as it allows for additional funding to flow to sectors not directly covered by the carbon price. However, this is mainly applicable to cases where only domestic offsetting is allowed. In the case of Colombia, international offsets were allowed at first but this was later changed to domestic only to promote more mitigation activities on a national level. While the allowance of offsets in Colombia helped to address industry concerns around economic impacts, it did lower the overall revenue the government could collect from the carbon tax. Therefore, the government is currently considering putting limits on the offset allowance.<sup>e</sup>

<sup>a</sup> World Bank. 2020. *Expanding Carbon Pricing in Colombia: Final report for the Partnership for Market Readiness Project*. Washington, DC.

<sup>b</sup> Carbon Trust, EDF, and IETA. 2018. *Colombia: An Emissions Trading Case Study*. Mexico, California, and Brussels.

<sup>c</sup> Minambiente. 2017. *Principales Preguntas Frente Al Impuesto Nacional Al Carbono y La Solicitud de No Causacion Por Carbono Neutralidad (Decreto 926 de 2016)*.

<sup>d</sup> International Carbon Action Partnership. 2020. *Colombia: ETS Detailed Information*.

<sup>e</sup> N. Rona. 2019. *Colombia: Impuesto Nacional al Carbono*. Euroclima.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

## Institutional Readiness of Government and Private Sector

In addition to assessing the political commitment and policy design of carbon pricing, the existing institutional structures, capabilities, and systems will also need to be considered to understand the readiness for carbon pricing. This section explores these elements both from the government and the private sector perspective.

### Government

Table 5 indicates the main institutional roles, capabilities, and systems that are required of the government for three types of carbon pricing instruments.

**Table 5: Main Institutional Roles, Capabilities, and Systems Required of the Government to Implement Carbon Pricing Instruments**

Element	Description of Requirements	Relevance		
		Domestic Emissions Trading System	Carbon Tax	Domestic Carbon Crediting and Article 6
<b>Regulation (administration)</b>	Regulator or other entity must be able to support obligated entities through guidance and capacity building, manage process of registration or eligibility checking, and manage compliance cycle process and communications	High	Medium	High
<b>Regulation (enforcement)</b>	Regulator must be able to implement scheme with capacity and technical expertise (including on sectors) to carry out compliance assessment, implement enforcement and fines, and carry out site inspection and prosecute	High	High	High
<b>MRV systems</b>	Ability to commission and/or develop and implement electronic emissions reporting and compliance workflow system for operators, facilities, and companies	High	Medium	High
<b>Accreditation</b>	Ability to accredit verifiers and maintain oversight of verifier register and periodically audit capabilities and update standards	High	Medium	High
<b>Market registries</b>	Ability to commission and/or develop and implement a trading account system and account registration system, manage allowance allocation, and surrender and administer transaction log	High	Low	Medium
<b>Auction platform</b>	Ability to design and/or commission and implement an auction platform for emissions allowances to run transparent auction process and provide necessary financial transaction services (registration, due diligence, collateral, clearance, etc.)	High	Low	Low
<b>Market oversight</b>	Ability to independently oversee auction and secondary market activity	High	Low	Medium

MRV = monitoring, reporting, and verification.

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

Most elements related to institutional and system readiness for the government are relevant to domestic emissions trading, as these are complex systems that require regulation, market oversight, and systems to allow for trading and logging of compliance. Similarly, domestic carbon crediting and international carbon crediting such as under Article 6 of the Paris Agreement requires regulation, oversight, and systems for trading. As these systems are voluntary, less requirements exist around auctioning and compliance systems. Conversely, for carbon taxation, MRV systems are important to ensure liable entities pay the correct tax rates, but the lack of need for marketplaces makes this an easier instrument to implement from an institutional and system perspective.

## Private Sector

The introduction of carbon pricing does not only require institutional and system readiness from the government perspective, but also from relevant private sector actors. Table 6 provides an overview of the three main elements required of the private sector for the implementation of different types of carbon pricing instruments. As with the public sector, the domestic emissions trading and domestic and international carbon crediting schemes are more complex for the private sector, as these require the market to be able to provide trade-related services and support in policy and operational services.

**Table 6: Main Institutional Roles, Capabilities, and Systems Required of the Private Sector to Implement Carbon Pricing Instruments**

Element	Description of Requirements	Relevance		
		Domestic Emissions Trading	Carbon Tax	Domestic Carbon Crediting and Article 6
<b>Third party financial institutions</b>	Ability of market to provide trade-related services such as brokering, carbon market financial products, exchanges, etc.	High	Low	Medium
<b>Verification</b>	Ability and capacity of public or private sector verification specialists to perform necessary compliance verification activities at the scale needed	High	Medium	High
<b>Consulting services</b>	Ability of private sector to support regulated entities with policy and operational services	High	Low	High

Source: Asian Development Bank (Sustainable Development and Climate Change Department).

Carbon pricing instruments, as part of the broader climate policy architecture, can be effective tools for driving low-cost decarbonization across many sectors of the economy. Carbon pricing, in the form of carbon taxes, subsidies, emissions trading, domestic carbon crediting systems, and international carbon markets, can encourage cost-effective realization of climate commitments. These instruments have unique features and as such, design considerations are important for a coherent carbon pricing mix in alignment with the broader climate objectives. Under carbon pricing utilization, a substantial share of these emissions savings will be from energy use, making carbon pricing policy inextricably linked to energy policy. However, energy policy seeks to achieve broader aims than climate change mitigation, which in developing Asia often also target improvements in energy access, energy security, and energy affordability. Consequentially, it is necessary to consider the role of carbon pricing in the context of these energy objectives, and address two key questions:

- (i) How can carbon pricing instruments be designed and implemented in ways that also support the realization of wider energy policy goals?
- (ii) How does the current and changing energy landscape impact the effectiveness of carbon pricing instruments, and how can they be designed to be most effective?

These issues have been examined drawing on literature and international examples relevant to developing Asia. Key conclusions are summarized as follows.

## Use Carbon Pricing to Realize Wider Energy Policy Goals

Carbon pricing policies have a powerful influence on the energy system and can involve substantial flows of funds that can be targeted toward energy policy aims. Four key ways in which carbon pricing policy can support energy policy aims are identified.

- (i) Investments in high-value, long-lived, energy-related assets such as power plants, grid infrastructure, and energy-intensive industrial plants require that the policy regime and incentive measures are relatively predictable. This will encourage investments that could support the achievement of wider energy policy aims, such as improving energy security through reduce use of energy imports (in the case of greater use of renewables) and improving reliability through grid infrastructure upgrade and greater connectivity, and also allows for innovation to take place. Policy predictability can be achieved through longer carbon pricing policy phases, clear overarching long-term decarbonization objectives, and wider political consensus for those objectives.

- (ii) Revenues raised through carbon pricing can be targeted toward measures that benefit energy policy aims. This can be done by direct financial flow, for example by placing emission trading auction revenues into a dedicated fund, or by tax shifting. Use of revenues in a way that supports energy savings can provide energy policy benefits through reduced energy imports, greater capacity margins, and potentially lower costs for energy consumers. However, there can be other benefits from revenue use too, for instance through direct support to consumers less able to pay, or through demonstration and commercialization projects that help establish skills and markets in new energy technologies. Revenues can also be used directly to address just transition issues through dedicated funds.
- (iii) Carbon pricing offsets can deliver similar benefits to use of revenues, since the eligible offset regime can be tailored to focus on strategic technologies, co-benefits such as employment and just transition, or projects that improve energy access or affordability.
- (iv) Measures that mitigate the cost of carbon pricing for key emitters such as carbon-intensive and trade-intensive industries can also realize wider benefits. This could be through conditional recycle mechanisms (such as providing a tax rebate for improved energy performance in industry). In this case there can be reduced demand for energy, improved capacity margins, and lower energy imports.

## Design Carbon Pricing within the Energy Policy Landscape

The structures of energy market systems and policy can impact the effectiveness of carbon pricing policies. These need to be considered in the design of carbon pricing and policy makers need to be mindful that their energy policy decisions can help or hinder the conditions for successful carbon pricing. Five key interactions are identified.

- (i) The first interaction of carbon pricing in the energy system relates to the extent to which the generation, transmission, and distribution system is liberalized, especially for electricity; and the extent to which it is a market-based energy pricing system. In the case of a liberalized market with a market-based energy pricing system, it logically follows that the carbon cost of the energy supplied (e.g., carbon costs faced by power plants because of the introduction of a carbon pricing instrument) can be factored into the price charged to consumers. That way, there is an economic incentive for fuel switching to renewables upstream and incentivization of the more efficient use of energy or a reduction in energy using activities downstream. In regulated markets it may be less likely that this price signal reaches the consumers, at least in the short term, depending on the tariff-setting regime.
- (ii) Where electricity supplies are centralized within a state-controlled utility, or if such a utility dominates the market, then the effectiveness of carbon pricing may be impacted in two respects. First, the decisions about power plant dispatch may be made under central direction rather than pure economic optimization, reducing the influence that carbon pricing could have. It should be noted that in some contexts dispatch regulations can be used to prioritize the use of power sourced from renewables, in which case such a market structure can drive the energy transition, but a carbon pricing instrument may still not play a role in this context. Second, for emission trading, it is important to have large numbers of participants in the carbon market to provide liquidity, which would be hindered by the dominance of just one entity.



- (iii) A key concern with energy policy is the cost of energy, which is increasingly becoming a politically charged issue as prices rise and the ability of consumers to pay reduces further. Against this backdrop, the introduction of carbon pricing policies that drive a further uplift in overall energy costs will also meet resistance, leading to greater public and political resistance to such policies.
- (iv) Many countries apply energy policies that are counter to the functioning of carbon pricing. Most notably, energy subsidies, especially fossil fuel subsidies, keep the cost of energy low to improve its affordability, yet this runs counter to the functioning of carbon pricing, which seeks to increase the cost of greenhouse gas emissions from energy use.
- (v) Finally, it is important to establish a consistent MRV system for energy emissions across the supply chain, under scopes 1, 2, and 3. This can help ensure that all emissions are valued equally and enable carbon pricing policies to seek reductions wherever it is cheapest to do so. At present such standardized approaches are often lacking.



## **Carbon Pricing for Energy Transition and Decarbonization**

Carbon pricing is an integral element of the climate policy architecture that can help countries reduce emissions cost-effectively, achieve climate targets articulated under their nationally determined contributions, and raise ambition over time. This study provides insights on how well-designed carbon pricing instruments can be woven into climate policies to accelerate efforts toward energy transition and decarbonization. Targeted at policymakers, it aims to help countries design and implement carbon pricing instruments tailored to their national circumstances and priorities that create low-cost, sustainable energy systems capable of boosting resilience and driving long-term growth.

### **About the Asian Development Bank**

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