CLIMATE CHANGE
40/2021

Carbon Pricing Potential in East and South Asia

Interim report

German Environment Agency

Umwelt Bundesamt

CLIMATE CHANGE 40/2021

EVUPLAN of the Federal Ministry of Economic Affairs and Energy

Project No. (FKZ) 3719 42 501 0

Report No. FB000509/ZW,ENG

Carbon Pricing Potential in East and South Asia

Interim report

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Imprint

Publisher
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Report performed by:
adelphi research gemeinnützige GmbH
Alt-Moabit 91
10559 Berlin
Germany

Report completed in:
November 2020

Edited by:
Section V 3.3 Economic Aspects of Emissions Trading, Monitoring, Evaluation
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Publication as pdf:
http://www.umweltbundesamt.de/publikationen

ISSN 1862-4804

Dessau-Roßlau, May 2021

Abstract: Carbon Pricing Potential in Asia

A broad consensus exists that carbon pricing is key for cost-effective emission reductions and that it must play a major role in driving the transition to a climate-neutral economy. However, despite significant progress in wider climate policy uptake in recent years, the vast majority of greenhouse gas (GHG) emissions remain unpriced. Making a success of carbon pricing in individual jurisdictions requires a detailed and methodical understanding of their circumstances. The aim of the current report is to develop an analytical framework that contributes to such an understanding, with a view to applying it later to assess carbon pricing potential in several Asian jurisdictions. To this end, an in-depth literature review picks out over 500 relevant papers and reports published between 1975 and 2020. Their findings are used to identify the relevant conditions for the implementation of carbon pricing policies along political, legal, economic, technical and regional dimensions, which in turn become the core components of the analytical framework developed to assess carbon pricing readiness. For each component, the literature indicates multiple aspects that can impact carbon pricing potential and suggests variables and indicators for assessing their empirical relevance. The different components are deeply intertwined, as features of an economy can operate through multiple channels simultaneously. At the same time, each individual component of the framework, and each aspect within the components, can contribute valuable information to an empirical assessment of carbon pricing potential.

Kurzbeschreibung: Potenziale für CO_2-Bepreisung in Asien

Es besteht ein breiter Konsens darüber, dass die Bepreisung von Treibhausgas (THG)-Emissionen der Schlüssel für kosteneffiziente Emissionsminderungen ist und dass sie eine wichtige Rolle beim Übergang zu einer klimaneutralen Wirtschaft spielen muss. Trotz signifikanter Fortschritte bei der Umsetzung einer umfassenderen Klimapolitik in den letzten Jahren ist der Großteil der THG-Emissionen nach wie vor nicht mit einem Preis belegt. Um die CO_2-Bepreisung in den einzelnen Ländern erfolgreich voranzutreiben, ist ein detailliertes und methodisches Verständnis der länderspezifischen Gegebenheiten erforderlich. Das Ziel des vorliegenden Berichts ist es daher, einen analytischen Rahmen zu entwickeln, der zu einem solchen Verständnis beiträgt und diesen später zur Bewertung des Potenzials der CO_2-Bepreisung in verschiedenen asiatischen Ländern anzuwenden. Zu diesem Zweck werden in einer eingehenden Literaturrecherche über 500 relevante Studien und Berichte untersucht, die zwischen 1975 und 2020 veröffentlicht wurden. Mithilfe der Ergebnisse werden die relevanten Bedingungen für die Umsetzung von CO_2-Bepreisungsmaßnahmen entlang politischer, rechtlicher, wirtschaftlicher, technischer und regionaler Dimensionen identifiziert. Diese identifizierten Bedingungen wiederum werden zu den Kernkomponenten des analytischen Rahmens, mit dem die Bereitschaft zur CO_2-Bepreisung bewertet werden soll. Für jede dieser Komponenten weist die untersuchte Literatur auf mehrere Aspekte hin, die das Potenzial von CO_2-Bepreisung beeinflussen können und schlägt Variablen und Indikatoren zur Bewertung ihrer empirischen Relevanz vor. Die verschiedenen Komponenten sind eng miteinander verwoben, da Eigenschaften einer Volkswirtschaft das Potenzial für CO_2-Bepreisung über mehrere Kanäle gleichzeitig beeinflussen können. Gleichzeitig kann jede einzelne Komponente des analytischen Rahmens und jeder Aspekt innerhalb der Komponenten wertvolle Informationen zu einer empirischen Bewertung des Potenzials für CO_2-Bepreisung beitragen.

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List of abbreviations

CMC	Carbon market club
CO_2	Carbon dioxide
COP	Conference of the Parties
EU ETS	EU Emissions Trading Scheme
GDP	Gross domestic product
GHG	Greenhouse gas
ISDS	Investor-State Dispute Settlement
NDC	Nationally Determined Contributions (in Paris-Agreement)
SO_2	Sulphur dioxide
UNFCCC	United Nations Framework Convention on Climate Change
WACC	Weighted average cost of capital

Summary

A broad consensus exists that carbon pricing is key for cost-effective emission reductions and that it must play a major role in driving the transition to a climate-neutral economy. However, despite significant progress in wider climate policy uptake in recent years, the vast majority of GHG emissions remain unpriced. Making a success of carbon pricing in individual jurisdictions requires a detailed and methodical understanding of their circumstances. The aim of the current report is to develop an analytical framework that contributes to such an understanding, with a view to applying it later to assess carbon pricing potential in several Asian jurisdictions. To this end, an in-depth literature review picks out over 500 relevant papers and reports published between 1975 and 2020. Their findings are used to identify the relevant conditions for the implementation of carbon pricing policies along political, legal, economic, technical, and regional dimensions, which in turn become the core components of the analytical framework developed to assess carbon pricing readiness. For each component, the literature indicates multiple aspects that can impact carbon pricing potential and suggests variables and indicators for assessing their empirical relevance.

The political component underlines the importance of interest groups, public acceptability, and the role of institutions. Incumbent carbon-intensive industries may resist the introduction of carbon pricing through regulatory capture, while low-carbon industries can leverage support through broad policy coalitions. The level of public support can make or break the success of a carbon pricing policy, particularly in jurisdictions where energy price increases are politically sensitive, where trust in government is low, or where there is general dissatisfaction with transparency and the perceived fairness of the instrument. In these cases, actors may prefer an emissions trading system (ETS) over a carbon tax. The institutional environment, as reflected by the type of political institutions, bureaucratic capacity, and control of corruption, is crucial for the initiation and implementation of climate policies.

The legal component highlights the role of constitutional powers, existing climate laws and channels of arbitration and diffusion. Where central and subnational authorities share environmental and fiscal powers, conditions for regional climate leadership can emerge. Existing climate or low-carbon energy laws can generate expertise and buttress a regulatory infrastructure that facilitates the adoption of carbon pricing policies. Participation in international climate treaties or crediting mechanisms can provide additional rationale. However, interest groups can employ legal strategies to oppose carbon pricing, for instance by disputing climate legislation before international arbitration bodies. The threat of these challenges may curb government support to advance carbon pricing policies, particularly an ETS.

The economic component emphasises income and distributional effects, the role of economic structure and trade, and existing regulations in related markets. Distributional considerations can be significant for the success of carbon pricing, especially in economies where inequality is already prevalent. The level of economic development, often proxied by income per capita, also shapes carbon pricing potential through access to financial resources and the cost of capital. Structural economic factors such as energy sector dynamics, the economic weight of carbon-intensive sectors, international trade flows, and labour market flexibility are among the key aspects that determine the probability of carbon pricing adoption and the instrument's stringency. Moreover, existing energy policy instruments and electricity sector regulations to a large effect mould the potential of the carbon price to deliver its intended effects.

The technical component focuses on the knowledge and institutional capacity across governments, business and civil society. Carbon pricing policies require technical capacity, such as the ability to monitor, report and verify emissions and to draft the technical guidelines and legislation that underlie these activities. They presume technical knowledge of emission reduction pathways to be reflected in the carbon pricing instrument design. Establishing an ETS requires additional institutional capacity to regulate and monitor the allowance market. Business knowledge and capacity may ensure ownership in the design phase and is essential for implementing MRV systems, ensuring compliance obligations are met, and in the case of an ETS, for managing price risks and bolstering a liquid market environment. Capacity building strategies form an important tool to build the required knowledge and capacity along each implementation phase.

The regional and multilateral component shifts the focus to issues related to economic integration, diplomatic context, variance in climate mitigation goals, and the existence of a multilateral architecture. Increased regional cooperation can spur broader carbon pricing uptake. Where trade and financial flows between firms influence the rationale for cross-border cooperation, political trust and diplomatic relations are crucial. Variance in baseline strategies or Nationally Determined Contributions (NDCs) can pose challenges for carbon pricing cooperation. Regional institutions can help in overcoming these challenges; however, they are often limited in their implementation ability.

These different components are deeply intertwined, as features of an economy can operate through multiple channels simultaneously. At the same time, each individual component of the framework, and each aspect within the components, can contribute valuable information to an empirical assessment of carbon pricing potential.

Further work planned under the project will develop an empirical application of the analytical framework developed in this report in the context of emerging Asian jurisdictions. In anticipation of this work, the final section of the report is devoted to providing an overview of actors and pathways for carbon pricing cooperation in the region.

Zusammenfassung

Es besteht ein breiter Konsens darüber, dass die Bepreisung von Treibhausgas (THG)-Emissionen der Schlüssel für kosteneffiziente Emissionsminderungen ist und dass sie eine wichtige Rolle beim Übergang zu einer klimaneutralen Wirtschaft spielen muss. Trotz signifikanter Fortschritte bei der Umsetzung einer umfassenderen Klimapolitik in den letzten Jahren ist der Großteil der THG-Emissionen nach wie vor nicht mit einem Preis belegt. Um die CO_2-Bepreisung in den einzelnen Ländern erfolgreich voranzutreiben, ist ein detailliertes und methodisches Verständnis der länderspezifischen Gegebenheiten erforderlich. Das Ziel des vorliegenden Berichts ist es daher, einen analytischen Rahmen zu entwickeln, der zu einem solchen Verständnis beiträgt und diesen daraufhin zur Bewertung des Potenzials der CO_2-Bepreisung in verschiedenen asiatischen Ländern anzuwenden. Zu diesem Zweck werden in einer eingehenden Literaturrecherche über 500 relevante Studien und Berichte untersucht, die zwischen 1975 und 2020 veröffentlicht wurden. Mithilfe der Ergebnisse werden die relevanten Bedingungen für die Umsetzung von CO_2-Bepreisungsmaßnahmen entlang politischer, rechtlicher, wirtschaftlicher, technischer und regionaler Dimensionen identifiziert. Die identifizierten Bedingungen wiederum werden zu Kernkomponenten des analytischen Rahmens, mit dem die Bereitschaft zur CO_2-Bepreisung bewertet werden soll. Für jede dieser Komponenten weist die untersuchte Literatur auf mehrere Aspekte hin, die das Potenzial von CO_2-Bepreisung beeinflussen können und schlägt Variablen und Indikatoren zur Bewertung ihrer empirischen Relevanz vor.

Die politische Komponente unterstreicht die Bedeutung von Interessengruppen, öffentlicher Akzeptanz und die Rolle von Institutionen. Die etablierten CO_2-intensiven Industrien können sich der Einführung von CO_2-Bepreisung durch *regulatory capture* widersetzen, während CO_2-arme Industrien Unterstützung für CO_2-Bepreisung durch das Organisieren breiter politischer Koalitionen organisieren können. Der Grad der öffentlichen Unterstützung kann über den Erfolg einer CO_2-Bepreisungsmaßnahme entscheiden, insbesondere in Ländern, in denen Energiepreiserhöhungen politisch umstritten sind, in denen das Vertrauen in die Regierung gering ist oder in denen eine allgemeine Unzufriedenheit mit der Transparenz und der wahrgenommenen Fairness der Maßnahme besteht. In diesen Fällen könnten die Akteure ein Emissionshandelssystem (EHS) einer CO_2-Steuer vorziehen. Das institutionelle Umfeld, wie es in der Art der politischen Institutionen, der bürokratischen Kapazitäten und der Einhegung von Korruption widerspiegelt wird, ist zudem entscheidend für die Initiierung und Umsetzung von Klimapolitik.

Die rechtliche Komponente hebt die Rolle der verfassungsmäßigen Befugnisse, der bestehenden Klimagesetze und der Kanäle für Schlichtungen und Verbreitung von politischen Maßnahmen hervor. Wo sich zentrale und subnationale Behörden umweltpolitische und fiskalische Befugnisse teilen, können Voraussetzungen für eine regionale Führungsrolle im Klimaschutz entstehen. Bestehende Klimagesetze oder Gesetze für CO_2-arme Energien können Fachwissen generieren und eine regulatorische Infrastruktur stärken, die die Einführung von CO_2-Bepreisungsmaßnahmen erleichtert. Die Teilnahme an internationalen Klimaverträgen oder Mechanismen für Emissionsgutschriften kann zusätzliche Argumente für die Einführung von CO_2-Bepreisungsmaßnahmen liefern. Interessensgruppen können jedoch rechtliche Strategien anwenden, um sich der CO_2-Bepreisung zu widersetzen, zum Beispiel indem sie die Klimagesetzgebung vor internationalen Schiedsgerichten anfechten. Das Risiko solcher Anfechtungen kann die Unterstützung durch die Regierung bei der Förderung von CO_2-Bepreisung, insbesondere eines EHS, einschränken.

Die wirtschaftliche Komponente betont Einkommens- und Verteilungseffekte, die Rolle der Wirtschaftsstruktur und des Handels sowie bestehende Regulierungen in verwandten Märkten. Verteilungsaspekte können für den Erfolg der CO_2-Bepreisung von Bedeutung sein, insbesondere in Volkswirtschaften, in denen Ungleichheit bereits weit verbreitet ist. Das Niveau der wirtschaftlichen Entwicklung, das oft durch das Pro-Kopf-Einkommen ausgedrückt wird, beeinflusst das Potenzial der CO_2-Bepreisung auch durch das Ausmaß des Zugangs zu finanziellen Ressourcen und die Kapitalkosten. Strukturelle wirtschaftliche Faktoren wie die Dynamik des Energiesektors, das wirtschaftliche Gewicht CO_2-intensiver Sektoren, internationale Handelsströme und die Flexibilität des Arbeitsmarktes gehören zu den Schlüsselaspekten, die die Wahrscheinlichkeit der Einführung von CO_2-Bepreisung und die Stringenz des Instruments bestimmen. Darüber hinaus prägen bestehende energiepolitische Maßnahmen und Regulierungen des Elektrizitätssektors in hohem Maße das Potenzial, mit dem der CO_2-Preis seine beabsichtigten Effekte erzielen kann.

Die technische Komponente konzentriert sich auf das Wissen und die institutionellen Kapazitäten von Regierungen, Unternehmen und der Zivilgesellschaft. CO_2-Bepreisung erfordert technische Kapazitäten, wie z.B. die Fähigkeit, Emissionen zu überwachen, zu berichten und zu verifizieren (*monitoring, reporting, verification* – MRV) sowie die technischen Richtlinien und Gesetze zu entwerfen, die diesen Aktivitäten zugrunde liegen. Die Einführung von CO_2-Bepreisung setzt auch technisches Wissen über Emissionsminderungspfade voraus, das sich in der Ausgestaltung des CO_2-Bepreisungsinstruments widerspiegeln muss. Die Etablierung eines EHS erfordert zusätzliche institutionelle Kapazitäten zur Regulierung und Überwachung des Marktes von Emissionszertifikaten. Wissen und Kapazitäten auf Seiten der betroffenen Unternehmen können deren Mitverantwortungsgefühl in der Planungsphase des CO_2-Bepreisunginstruments sicherstellen und sind wesentlich für die Implementierung von MRV-Systemen sowie die Sicherstellung der Compliance-Verpflichtungen. Im Falle eines EHS sind dieses Wissen und die Kapazitäten außerdem wichtig für das Management von Risiken, die mit der Entwicklung der Zertifikatspreise einhergehen sowie für die Stärkung eines liquiden Umfelds für den Zertifikatsmarkt. Strategien zum Kapazitätsaufbau sind ein wichtiges Instrument zum Aufbau des erforderlichen Wissens und der Kapazitäten in jeder Implementierungsphase der CO_2-Bepreisungsmaßnahme.

Die regionale und multilaterale Komponente verlagert den Fokus auf Fragen, die mit der wirtschaftlichen Integration, dem diplomatischen Kontext, der Varianz der Klimaschutzziele und der Existenz einer multilateralen Architektur zusammenhängen. Eine verstärkte regionale Zusammenarbeit kann eine breitere Akzeptanz von CO_2-Bepreisung anregen. Wo Handels- und Finanzströme zwischen Unternehmen die Gründe für eine grenzüberschreitende Zusammenarbeit beeinflussen, sind politisches Vertrauen und diplomatische Beziehungen entscheidend. Unterschiedliche Baseline-Strategien oder Nationale Klimabeiträge (*Nationally Determined Contributions* - NDCs) können eine Herausforderung für die Zusammenarbeit bei der CO_2-Bepreisung darstellen. Regionale Institutionen können bei der Überwindung dieser Herausforderungen helfen, sind jedoch oft in ihrer Umsetzungsfähigkeit begrenzt.

Diese verschiedenen Komponenten sind stark miteinander verwoben, da Eigenschaften einer Volkswirtschaft das Potenzial für CO_2-Bepreisung über mehrere Kanäle gleichzeitig beeinflussen können. Gleichzeitig kann jede einzelne Komponente des analytischen Rahmens und jeder Aspekt innerhalb der Komponenten wertvolle Informationen zu einer empirischen Bewertung des Potenzials für CO_2-Bepreisungsmaßnahmen beitragen.

Weitere im Rahmen des Projekts geplante Arbeiten werden den in diesem Bericht entwickelten analytischen Rahmen im Kontext aufstrebender asiatischer Jurisdiktionen empirisch anwenden.

Im Vorgriff auf diese Arbeiten ist der letzte Abschnitt des Berichts einem Überblick über Akteure und Wege für eine Zusammenarbeit bei der CO_2-Bepreisung in der Region gewidmet.

1 Background and introduction

The Parties to the Paris Agreement must reduce their greenhouse gas (GHG) emissions quickly and drastically to have a reasonable chance of achieving the Agreement's ambitious targets and to avoid the most serious economic, environmental, and social costs of climate change. The required effort will disrupt existing economic, political, and social arrangements and is sure to face resistance. It is therefore essential to keep the cost of the transition as low as possible for society. A broad consensus now exists that carbon pricing is key for cost-effective emission reductions and that it must play a major role in driving the transition to a climate-neutral economy. Indeed, carbon pricing is now implemented or scheduled for implementation in 61 jurisdictions around the world and covers about 22% of global GHG emissions. At the time of writing, 97 countries responsible for about 58% of global GHG emissions mention carbon pricing in their Nationally Determined Contributions (NDCs) (World Bank, 2020).

While all countries must reduce their emissions or follow a low-emission development path, some regions will play a greater role than others. East and South Asia are regions where many countries simultaneously face development and decarbonisation challenges. Poverty reduction and a shift away from economies dominated by the agricultural sector to ones where industry and services play a more prominent role are high on the political agenda. The regional economies' openness to trade, often motivated by an export-oriented growth strategy, makes them key nodes in global commerce and supply chains. The energy systems of these countries have so far largely been based on fossil fuels. As a result, emissions in East and South Asia have risen faster in the last two decades than in any other part of the world. In many cases, fossil fuel-based energy generation is supported by the inefficient use of public funds and/or state-controlled energy companies.

Carbon pricing is already used at various levels of government in key countries in the region, including China (provisional national / pilot subnational), the Republic of Korea (national), Singapore (national), and Japan (national / subnational) and has promising potential in other regional economies. Yet the near-term deployment of successful emissions trading systems (ETSs) and carbon taxes is not a foregone conclusion, despite the theoretical appeal of these policies and their observed popularity among regional policymakers. Making a success of carbon pricing requires an in-depth understanding of a country's individual circumstances. Specifically, the framework conditions for effective carbon pricing along political, legal, economic, technical and regional dimensions must be identified and assessed. This can help regional policymakers choose between emissions trading and a carbon tax, and then design the instrument well. Furthermore, it can assist regional policymakers in identifying implementation challenges and forging strategies to overcome barriers. It can also inform capacity building efforts in the region of advanced countries, international organizations, and other stakeholders.

This interim report constitutes the first output in a project commissioned by the German Environment Agency on the potential of emissions trading and carbon taxes in East and South Asia. It provides an overview of the results of a review of the relevant academic and grey literature. Specifically, the literature review methodology, which includes both rule-based and discretionary elements, is described next. Sections 3.1 to 3.5 organise the results of the review under five headings. These sections provide the arguments for building an analytical framework around political, legal, economic, technical and multilateral components to assess carbon pricing potential. They also provide a list of the variables and indicators that are most relevant for operationalising the framework in practice. Section 4 synthesises the results and describes the unified framework that has been developed. In anticipation of future work under the project,

Section 5 identifies the key actors and pathways for enabling carbon pricing cooperation in the region.

2 Literature review method

The academic and grey literature on carbon pricing is vast and involves insights from multiple disciplines accumulated over the last three decades. The specific information regarding the conditions that can impede or facilitate the successful implementation of carbon pricing is dispersed within this literature and across different media, including manuals, guides, presentations, etc. In order to distil the most relevant information from this literature to fit within the resources available, the project team has developed a custom methodology inspired by the *integrative review method* in Snyder (2019). The method emphasises examining the key ideas, relationships, and theoretical frameworks that underly the literature. It uses these as the basis for building a new framework. It provides considerable leeway in the steps taken for selecting the literature but must be methodologically transparent. This section starts with a description of the review methodology, which consists of three steps. The methodology is applied along the five dimensions – namely political, legal, economic, technical and regional/multilateral – that are identified as being central to an assessment of carbon pricing potential.

Step 1: Academic literature search

To search in the academic domain, the project team identified five so-called "seed" articles per dimension. In selecting the number of seed articles and in prioritising them, the team had to trade off the better coverage offered by a greater number of seed articles against the time required to perform the task.

Against this backdrop, the seed articles listed in Table 1 below were selected by the subject matter experts in the team for (i) providing a good review of the existing literature citing many articles (hereafter a parent article) and/or (ii) spawning many papers following their publication citing the seed article (hereafter a child article).[1] Not every parent article of a "seed" is relevant for this project. These articles were excluded. Similarly, not all child articles are relevant and were also excluded. The project team has applied expert judgement to make these exclusion decisions and sought to identify only those articles that could inform the construction of the framework in Section 4.[2] In total, the academic literature search identified 291 papers.

Step 2: Grey literature search

While there are powerful search tools for peer-reviewed academic literature, this is not typically true for the research output of organisations outside of the traditional commercial and academic settings. This domain is known as the grey literature and contains many relevant publications for implementing carbon pricing. To conduct the grey literature review, the team first identified the organisations that produced relevant outputs known to the project team. The team then reviewed the publications of these organisations, focusing primarily on the last decade. Table 2 provides the list of organisations whose publications were reviewed. As in Step 1, the project team has applied expert judgement to decide whether a given article published by these organisations is relevant for the project.[3] Using this search method 151, articles were identified.

[1] Google Scholar was used to identify child articles.
[2] Articles were included if they assessed framework conditions for carbon pricing. Articles that identified specific variables and indicators were coded as "high relevance".
[3] See footnote 2.

Table 1: Seed articles for academic literature search

Dimensions evaluated	Seed articles[4]
Political	1. Meckling et al (2015): Winning coalitions for climate policy. Science. 2. Rabe (2015): The Durability of Carbon Cap-and-Trade Policy. Governance. 3. Pahle et al(2018): Sequencing to ratchet up climate policy stringency. Nature Climate Change. 4. Skovgaard et al (2019): Mapping and clustering the adoption of carbon pricing policies: what polities price carbon and why? Climate Policy. 5. Dolphin et al (2020): The political economy of carbon pricing: A panel analysis. Oxford Economic Papers.
Legal	1. Hahn (1990): The political economy of environmental regulation: Towards a unifying framework. Public Choice. 2. Joskow & Schmalensee (1998): The political economy of market-based environmental policy: The U.S. acid rain program. Journal of Law and Economics. 3. Howse & Eliason (2009): Domestic and international strategies to address climate change: An overview of the WTO legal issues. In International Trade Regulation and the Mitigation of Climate Change: World Trade Forum. 4. Boute (2012): Combating Climate Change Through Investment Arbitration. Fordham International Law Journal. 5. Trachtman (2017): WTO law constraints on border tax adjustment and tax credit mechanisms to reduce the competitive effects of carbon taxes. National Tax Journal.
Economic	1. Baranzini et al (2017): Carbon pricing in climate policy: seven reasons, complementary instruments, and political economy considerations. In Wiley Interdisciplinary Reviews: Climate Change. 2. Narassimhan et al (2018): Carbon pricing in practice: a review of existing emissions trading systems. Climate Policy. 3. Prag et al (2018): State-owned enterprises and the low-carbon transition. OECD Environment Working Paper. 4. Best & Burke (2018): Adoption of solar and wind energy: The roles of carbon pricing and aggregate policy support. Energy Policy. 5. Fullerton & Muehlegger (2019): Who Bears the Economic Burdens of Environmental Regulations? In Review of Environmental Economics and Policy.
Technical	1. Anttonen et al (2007): Breathing Life into the Carbon Market. European Environmental Law Review. 2. Duval (2009): A Taxonomy of Instruments to Reduce Greenhouse Gas Emissions and their Interactions. OECD Economics Working Papers. 3. Mehling & Haites (2009): Mechanisms for linking emissions trading schemes. Climate Policy. 4. Mehling (2016): Legal frameworks for linking national emissions trading systems. The Oxford Handbook of International Climate Change Law. 5. Howie et al (2020): Evaluating policy success of emissions trading schemes in emerging economies: comparing the experiences of Korea and Kazakhstan. Climate Policy.
Multilateral	1. Aalto (2014): Energy market integration and regional institutions in east Asia. Energy Policy. 2. Shi & Kimura (2014): The status and prospects of energy market integration in East Asia. In Y. Wu, F. Kimura, & X. Shi (Eds.), Energy Market Integration in East Asia: Deepening understanding and moving forward.

[4] See bibliography for full reference.

Dimensions evaluated	Seed articles[4]
	3. Chang & Li (2015): Renewable energy and policy options in an integrated ASEAN electricity market: Quantitative assessments and policy implications. Energy Policy. 4. Li & Zhang (2018): Regional Cooperation on Carbon Markets in East Asia. Asian Development Review: Asian Development Bank and Asian Development Bank Institute. 5. Gao et al (2019): International carbon markets under the Paris Agreement: Basic form and development prospects. Advances in Climate Change Research.

Table 2: Organisations for grey literature search

ADB	DG Clima	GIZ	MCC	RFF
ASEAN Centre for Energy	DIW	GRI, LSE	Motu Economic and Public Policy Research	Sabin Centre for Climate Law
ASPI	Ecofiscal Commission	ICAP	New Climate Institute	Sino Carbon
CEPS	Ecofys	ICTSD	Nicholas Institute, Duke	Stockholm Environment Institute
CIACA	Ecologic	IEA	OECD	UNFCCC
Climate Analytics	Ecosystem Marketplace	IETA	Öko-Institut	World Bank
Climate Strategies	EDF	IISD	PIK	WRI
DEHSt	Energy Charter Secretariat	IRENA	PMR	ZEW

Step 3: Other literature search

After completing Steps 1 and 2, the project team then assessed the interim results for any remaining gaps. Such gaps are to be expected because, for example, the academic literature search may fail to pick up pieces that are in the peer-review process, or academic articles that are too specialised to be identified by using only a small number of seed articles. Moreover, the websites of the organisations in Table 2 may not provide efficient search functions, or their output may be published in a format that is difficult to find by desk-based research. Therefore, we used the project team's grasp of the broader literature and its soft knowledge gained through participation in conferences, private roundtables and interactions with policymaking practitioners, and networking events on the topic to fill such gaps. This resulted in 95 articles being identified under other literature search.

The application of the methodology above resulted in 537 references being included in the analysis altogether. Each of these references is linked to at least one component of the framework, and many of them are critical for the discussion in the component-specific sections that follow. It is important to note that not every article picked up in the review is discussed in this paper or included in the bibliography below, to limit the length of this report.[5]

[5] The full list of articles is available from the authors upon request and on an as-is basis.

3 Literature review: results and analysis

This section presents the results of the literature review and is organised under five headings corresponding to the dimensions identified above.

3.1 Political Dimension

Political considerations are important for assessing the potential for carbon pricing in a particular jurisdiction because the introduction of an ETS or a carbon tax eventually depends on a political decision to price carbon. The adoption of carbon pricing as part of the national climate change mitigation policy requires overcoming resistance and lobbying from carbon-intensive interest groups[6] and building industrial and popular support for this instrument (Steves et al., 2011). The political bargaining that is needed to overcome resistance from vested interests and to build the necessary support can result in sub-optimal design of carbon pricing and thus "sub-optimal social outcomes" (Geoffroy Dolphin et al., 2020; Rabe, 2018).

Vested interests of carbon-intensive industries (regulatory capture)

The literature identifies vested interests as the most important barrier to the adoption of environmental markets, including carbon pricing (Downie, 2017; Fankhauser et al., 2015a). In their seminal article "The Political Economy of Market-Based Environmental Policy", Joskow and Schmalensee (1998) already discussed the opposition of the industry to the introduction of environmental markets in relation to the creation of the SO_2 trading scheme in the US. Regarding carbon pricing, carbon-intensive industries (e.g. electricity producers from fossil fuels) are expected to oppose policy changes that can negatively affect the value of their assets.[7] Few, but powerful and often well-organised, industrial players can prevent the introduction of carbon pricing (Jenkins, 2014; Meckling et al., 2015) and its successful implementation (Crowley, 2013; Gulbrandsen et al., 2017; Hanatou, 2003).[8] Dolphin et al. (2020, p. 491) found in their analysis in "The Political Economy of Carbon Pricing" that "a larger share of electricity generated from gas and oil-fired power plants lowers the probability of subsequent introduction of a carbon pricing scheme".

The literature is divided on the role of vested interests in the coal, and coal-fired power generation, sector. Lamb and Minx (2020) emphasise the resistance against climate policies in jurisdictions with a high share of coal. By contrast, Dolphin et al. (2020) conclude that the "estimates of the coefficient on the share of coal in the electricity system, however, do not indicate a consistent pattern of influence on the implementation of carbon pricing mechanisms, which runs against the understanding that jurisdictions with coal fired electricity systems would fiercely oppose the introduction of carbon pricing policies". They find little evidence that large manufacturing sectors and export-oriented industries opposed the introduction of carbon pricing policies (ibid). Similarly, Skovgaard et al. (2019) find no evidence that the energy and carbon intensity of the economy relate negatively with the likelihood of adopting carbon pricing. This could possibly be explained by the compensation and exemptions introduced in carbon pricing schemes so far (e.g. the free allocation of allowances) (Geoffroy Dolphin et al., 2020). In addition, coal-fired electricity producers could support carbon pricing to avoid more severe

[6] See, for example, Meckling et al. (2015), Dolphin et al. (2020) and Del Río & Labandeira (2009).

[7] See Jenkins (2014). Moreover, Baranzini et al. (2017) find "there is evidence that lobbying by energy-intensive industries contributed to prevent the implementation of carbon pricing in several countries".

[8] Gulbrandsen et al. (2017) on the temporary suspension of the Kazakh ETS following the opposition to the ETS by operators in the power sector; and Crowley (2013) on the finding that the "objection of the carbon-based industrial lobby to carbon pricing has long been a significant obstacle to the adoption of a carbon tax or an ETS" in Australia.

forms of emission reduction measures, e.g. the forced phase-out of coal-fired power generation. As firms prefer the flexibility offered by carbon pricing over command and control regulation (Meckling, 2011b, 2011a; Paterson, 2012),[9] it could be assumed that carbon pricing instruments could develop in jurisdictions where command and control measures are envisaged. In the same vein, fossil-intensive interest groups are more likely to resist a tax, by comparison to an ETS, and switch to fighting for free allowances under an ETS, potentially making its adoption easier.[10]

Public acceptability

Besides opposition from vested industrial interests, low public acceptability negatively affects the adoption and implementation of carbon pricing (Carattini et al., 2018; Drews & van den Bergh, 2016; Maestre-Andrés et al., 2019). Consumers have shown a low willingness to pay for their carbon emissions (Jenkins, 2014), in particular in jurisdictions characterised by higher energy prices and less purchasing power (Baranzini & Carattini, 2017; Maestre-Andrés et al., 2019). Carbon pricing is also more difficult to introduce in jurisdictions where energy price increases are highly politically sensitive (Boute, 2017). People who are highly dependent on and who spend a significant share of their incomes on energy are less likely to support carbon taxes (Umit & Schaffer, 2020).

Perceived unfairness of carbon pricing and distrust in the government's use of the revenues generated by carbon pricing, as well as dissatisfaction with governmental information about the carbon pricing policy, reduces its public acceptability (Maestre-Andrés et al., 2019; Umit & Schaffer, 2020).[11] Conversely, public support for carbon taxes "improves significantly with higher political trust and efficacy" (ibid; Drews & van den Bergh, 2016). As the perception of corruption negatively affects public trust in the government's use of revenues generated by carbon pricing, jurisdictions with a higher level of corruption are less likely to successfully adopt carbon pricing. (Beuermann & Santarius, 2006; Geoffroy Dolphin et al., 2020; Hsu et al., 2008; Maestre-Andrés et al., 2019; Rafaty, 2018; Umit & Schaffer, 2020). At the same time, public acceptance can be increased through mechanisms such as progressive revenue use (e.g. earmarking carbon tax revenues) and communication on carbon pricing and climate change more generally (Criqui et al., 2019; Gevrek & Uyduranoglu, 2015).

The literature also finds that carbon pricing is more likely to be adopted if it is linked to related energy issues, including energy security (e.g. external energy dependency), national competitiveness, and local air quality (ibid). According to Fankhauser et al. (2015a), "many laws are couched in terms of alternative objectives like green growth, energy security or air pollution". "Issue linkage between climate and synergetic domains such as air pollution may address barriers" (Pahle et al., 2018) to stringent climate policies, e.g. carbon pricing.

Vested interests of green industries

Vested interests of green industries can provide support to the adoption and implementation of carbon pricing policies. According to Paterson (2012), "one of the reasons for the success of carbon markets as a policy project has been their ability to create a political coalition (however loose and informal) capable of legitimising climate policy in the face of what remains significant opposition from both established economic and social interests threatened by GHG cuts". Similarly, Meckling et al. (2015) observe that "green industries are political allies in the

[9] See e.g. the case of the UK, discussed in Paterson (2012, p. 85): "firms were motivated to avoid the possibility of either a carbon tax or (worse, from their point of view) 'command and control' regulations, advocating ET was a way to present themselves as constructive while opposing a carbon tax vigorously."

[10] On "buying in" the support of carbon-intensive producers for an ETS with compensation and exemptions (e.g. grandfathering emissions allowances), see Dolphin et al. (2020).

[11] Umit and Schaffer (2020) find that "the support for taxes improves significantly with individuals' political trust and efficacy".

development of more stringent climate policy that subsequently penalises incumbent polluters. Carrots buy sticks". Besides the renewable energy and energy efficiency industries, the financial sector (including institutional investors) can, according to Paterson (2012), have an interest in the development of carbon markets. Furthermore, consultants working on emission reduction projects (e.g. CDM) have an interest in the development of carbon pricing mechanisms (ibid). In addition to the "green industry" lobby, support of carbon pricing by environmental organisations has proved to be important in the successful adoption of this mechanism (Baranzini et al., 2017). The creation of constituencies (or "coalitions") that provide support for more stringent climate action is thus an important consideration for the introduction of carbon pricing (Aklin & Urpelainen, 2013; Biber, 2013; Jakob et al., 2019; Meckling, 2011a; Meckling et al., 2015; Millar et al., 2019). Attempts have been made to empirically detail how major interest groups form alliances or come into conflict surrounding climate policy in Korea (Yun et al., 2013). Conversely, in the absence of a "sufficiently large supporting coalition", it is more difficult to adopt stringent climate policy (Pahle et al., 2018; Rabe, 2015).

The early adoption of low carbon subsidies (e.g. renewable energy and energy efficiency support schemes) contributes to the creation of supporting coalitions (Jenkins, 2014; Pahle et al., 2018).[12] Pahle et al. (2018) consider that the strategic sequencing of low carbon policies can facilitate the adoption of carbon pricing. Building on institutional path dependency theory, they argue that barriers to carbon pricing can be overcome by the implementation of intermediary policies, including renewable energy support schemes.[13] Similarly, according to Meckling et al. (2015), by contributing to decoupling profits from sales volumes, low carbon subsidies contribute to the acceptability of more stringent climate policies from the perspective of utilities. However, there is a risk that, in jurisdictions where renewable energies are already sufficiently subsidized, the green energy industry may not act as a green lobby for carbon pricing, as it could risk having its subsidies removed. Strong resistance by the industry to changes to renewable energy support schemes in EU countries (e.g. international arbitration claims) illustrates how the green industry can oppose market reforms that affect the level of their subsidies (Dias Simões, 2017).

Institutional environment

The institutional environment is another factor that can influence the introduction of carbon pricing policies. The adoption of climate laws is facilitated by "a strong executive that can take on vested interests" (Fankhauser et al., 2015a). Additionally, democratic institutions are believed to lead to stronger environmental policies (Congleton, 1992) and enable different interest groups (including environmental NGOs) to influence policymaking (Hahn, 1990; Steves et al., 2011). Regarding carbon pricing, Dolphin et al. (2020) find that the level of democracy and institutional capacity positively influence the adoption and implementation of carbon pricing policies. Andersen (2019) emphasises the importance of parliamentary democracies with proportional representation, as these "provide access to government for political parties that pursue carbon taxation" and "these in turn sensitize larger political parties to climate concerns". Levi, Flachsland & Jakob (2020) emphasise the importance of "well governed institutions and public attitudes". This could be explained by the fact that in democratic systems, environmental NGOs (the "green lobby") have some influence on the policymaking process. Once adopted, the independence of the supervisory authority to avoid regulatory capture and insulate policy

[12] Jenkins notes that "minimising energy cost increases (by subsidising low-carbon energy adoption rather than penalising CO_2-intensive fuels, for example) could neutralise opposition from energy-intensive manufacturers who do not directly emit CO_2 during production" and "clean energy deployment subsidies and innovation policies designed to effectively reduce the costs of low-carbon energy alternatives and build stronger political interests around clean energy sectors can potentially launch a self-reinforcing cycle"; Gawel et al., note that "RES-support contributes to a more stringent emission cap and may even increase overall efficiency".

[13] See also Knox-Hayes (2012).

choices from vested interests and political lobbying is also important to protect the integrity of the carbon pricing policy (Brunner et al., 2012; Grosjean et al., 2014; Helm, 2003). Taking allowance markets as an example, the strength of lobby groups has been theoretically, and in the case of the EU ETS empirically, assessed to impact sensitive allocation decisions (Dijkstra, 1999; Hanley & MacKenzie, 2010; Rode, 2013).

Furthermore, as already mentioned, carbon pricing is less likely to occur in countries affected by a higher level of corruption (ibid; Rafaty, 2018). This can be related to the negative impact that people's distrust in the government has on the public acceptability of carbon pricing (Klenert & Mattauch, 2019; Maestre-Andrés et al., 2019). At the same time, according to Helm (2010), processes of rent-seeking and regulatory capture help to explain inefficient choices of policy instruments to address climate change. However, the economic orientation of the government does not play a significant role in the adoption of carbon pricing (Geoffroy Dolphin et al., 2020; Eskander et al., 2020; Sam Fankhauser et al., 2015a). Carbon pricing has been supported by political parties of different orientations, not only left-wing governments. Despite this, jurisdictions with increased voting for green parties are more likely to adopt carbon pricing (Skovgaard et al., 2019).

The literature has suggested different variables/indicators for measuring the effect of vested carbon-intensive interests, public acceptability, the interests of green industries, and the institutional environment on the adoption of carbon pricing. The share of electricity generated from fossil-fired power plants can be used to measure the vested interests of carbon-intensive industries, and the risk of regulatory capture (Geoffroy Dolphin et al., 2020). The level of energy prices and the purchasing power (Maestre-Andrés et al., 2019), in addition to the share of fossil fuel consumption (Levi et al., 2020), domestic energy intensity (Umit & Schaffer, 2020), and the level of corruption (World Bank Control of Corruption) (Geoffroy Dolphin et al., 2020), can be used to evaluate the public acceptability of carbon pricing. The share of the green industry (e.g. renewable energy investments, companies active in energy efficiency services) (Meckling et al., 2015),[14] the size of the financial sector (Paterson, 2012),[15] the number of consultants working/having worked on emission reduction projects (e.g. CDM) (ibid) can be used to evaluate vested interests in support of carbon pricing. Indices on democracy (Variety of Democracy) (Geoffroy Dolphin et al., 2020), institutional capacity (World Bank Government Effectiveness and Regulatory Quality indicators) (ibid) and corruption (World Bank Control of Corruption) (ibid) can be used to determine the institutional capacity of a jurisdiction to adopt carbon pricing. The representation of environmental NGOs (green lobby) (Geoffroy Dolphin et al., 2020)[16] and green parties is relevant both to evaluate interests in support of carbon pricing and their possible influence in the democratic process (Skovgaard et al., 2019).[17]

The vested carbon-intensive interest and public acceptability criteria are not neutral on the choice of carbon pricing instrument. As firms seem to prefer an ETS over taxes,[18] it could be assumed that an ETS could develop in jurisdictions that are more carbon-intensive (e.g. higher

[14] Meckling et al., (2015) note that "the more green industries form or expand, the stronger coalitions for decarbonising energy systems become" (p. 1170).

[15] Paterson (2012) notes that "the success of ET lies in part in its capacity to identify such a sector – finance – that can grow precisely because of climate policy" (p. 89).

[16] Dolphin et al. (2020) suggest that the "green lobby" might be given some weight in the policymaking process.

[17] Skovgaard et al. (2019) note that "increased voting for green parties and green parties in government are common characteristics among second wave developed polities".

[18] See e.g. the case of the UK, discussed in Paterson (2012): "firms were motivated to avoid the possibility of either a carbon tax or (worse, from their point of view) 'command and control' regulations, advocating emissions trading was a way to present themselves as constructive while opposing a carbon tax vigorously". See also Meckling (2011b); Meckling (2011a).

share of coal). Hanatou (2003) and Skovgaard et al. (2019, p. 1179) find that "with few exceptions, it seems that carbon-intensive economies opt for emissions trading rather than carbon taxation, in line with the literature finding that fossil fuel companies have tended to push for emission trading rather than carbon taxes". Similarly, an ETS is more likely to be adopted in jurisdictions where public opposition to taxes is more acute.

In the next table, we summarise the main political considerations for the adoption of carbon pricing, and in particular the relevance of each consideration, the variables and indicators that can be used to measure each consideration, the influence of each consideration on the adoption of taxation versus ETS (or their neutrality regarding the choice of carbon pricing mechanism), and the main support in the literature for each consideration. The assessment with regard to the influence of a consideration on the adoption of a tax or ETS, or its neutrality, is not always directly derived from the literature, but also contains individual assessments by the authors of this paper.

Table 3: Political considerations for adoption of carbon pricing

Aspect	Why relevant?	Variable/ Indicator	Tax/Trade/ Neutral	Related Literature (top 3 studies)
Vested interests of carbon-intensive producers	Resistance against carbon pricing	- Share of electricity generated from fossil-fired power plants	Trade (as industry prefers flexibility offered by an ETS)	Dolphin et al. (2020); Jenkins (2014); Joskow & Schmalensee (1998)
Public acceptability	Low acceptability of taxes and distrust of government use of tax revenues undermines adoption of carbon pricing	- Level of energy prices - Purchasing power - Energy intensity of the population	Trade (given efficiency gains)	Maestre-Andrés et al. (2019); Umit & Schaffer (2020); Dolphin et al. (2020)
		- Level of corruption (World Bank Control of Corruption)	Trade (given lower risk of misallocation of revenues)	
Green lobby	Vested interests in green energy can help overcome resistance to carbon pricing	- Renewable energy investments	Trade (if ETS "merit-order" effect favours renewable energy producers)	Meckling et al. (2015); Pahle, et al. (2018); Skovgaard et al. (2019)
		- Companies active in energy efficiency services	Neutral	
		- Size of the financial sector and development of climate finance	Trade (given greater potential for financial community)	
		- Consultants on emission reduction projects (e.g. CDM)	ETS (given experience with trade in allowances)	
		- Representation of environmental NGOs - Representation of green parties	Neutral	
Institutional environment	Strength of executive and level of democracy, together with green lobby, positively influences adoption of carbon pricing	- Variety of Democracy - World Bank Government Effectiveness and Regulatory Quality Indicators - World Bank Control of Corruption - Climate Laws, Institutions and Measures (CLIM) Index	Neutral	Dolphin et al. (2020); Steves et al. (2011)

3.2 Legal Dimension

Legal considerations are important for assessing the potential for carbon pricing in a particular jurisdiction because the implementation of an ETS or a carbon tax depends on the integration of these mechanisms into national law. As seen in the previous section, a strong executive can facilitate the adoption of carbon pricing, but its sustainable implementation depends on the creation of a sufficiently solid legal basis governing the functioning of the pricing mechanism (Rabe, 2015). A carbon tax can be included in existing fiscal laws, but an ETS requires more sophisticated legal and regulatory intervention. Besides national legal arrangements, international law can either support (e.g. in implementation of the Paris Agreement or trade agreements) or undermine (e.g. international protection of foreign investments in fossil industries) the introduction of carbon pricing.

Existing climate and low-carbon laws

The introduction of carbon pricing is more likely with the presence of a strategic "flagship law" on climate change (Fankhauser et al., 2015a).[19] Flagship climate laws are defined as "wide-ranging pieces of high-profile legislation that fundamentally define a country's approach to climate change. They often (though not always) establish a formal GHG emissions target, set up the necessary institutions, and/or unify earlier climate policies under one umbrella" (ibid).

Furthermore, carbon pricing is more likely if the jurisdiction in question has already adopted renewable energy and energy efficiency laws. As seen in the previous section, the early enactment of renewable energy and energy efficiency support schemes provides strong incentives for green industry groups, contributing to expanding coalitions for low-carbon policy (Meckling et al., 2015). Simultaneously, the literature finds that experience in energy and environmental regulation contributes to the introduction of carbon pricing.[20] Conversely, "a lack of expertise and capacity in a governing agency" is a barrier to the introduction and implementation of carbon pricing (Pahle et al., 2018). The implementation of renewable energy and energy efficiency regulation creates relevant regulatory expertise and thus contributes to carbon pricing. Meckling et al. (2015) discuss the "feedback processes" policymakers have used before implementing carbon pricing and emphasise the regulatory benefits of previous energy and environmental regulation. "Early measures responding to pollution and oil crises led to … the creation of a strong regulatory infrastructure … Those measures created tolerance for regulation and set the stage for the passage of a renewable portfolio standard and GHG reduction legislation that ultimately resulted in an emissions trading scheme" (ibid).

Investment arbitration challenges (regulatory chill)

Besides their political lobbying efforts (see previous section), fossil interest groups can employ legal strategies to oppose the adoption and implementation of carbon pricing (Joskow & Schmalensee, 1998). The literature discusses how international investment protection treaties can be used to block the introduction of climate change mitigation regulation, including carbon pricing (Boute, 2009; Levashova et al., 2014; Schill, 2007; Tienhaara, 2009, 2017; Vinuales, 2015). By entering into bilateral or multilateral investment agreements, a host state gives investors of the other contracting states the right to challenge regulatory measures that interfere with the investors' rights before international arbitration (or Investor-State Dispute

[19] Fankhauser et al. (2015a) note that "the propensity to pass more laws … increases in the presence of a strategic 'flagship law' that sets an overall framework for climate policy".
[20] According to Pahle et al. (2018) "in California, decades of air quality regulation allowed the California Air Resources Board to build technological competence, a strong institutional foundation and a long-term relationship with state legislature that were instrumental for later climate policy". See also M. Hanemann (2008).

Settlement – ISDS). Host states can be exposed to significant compensation claims, including in cases concerning environmental and climate-related regulation (Miles, 2013; Vinuales, 2010). Tienhaara (2017) highlights the "threat posed by the potential use of ISDS by the fossil fuel industry to stall action on climate change". The mere threat of litigation would be sufficient to dissuade states from adopting carbon pricing. Following the "regulatory chill" theory,[21] "fossil fuel corporations do not have to win any ISDS cases for this strategy to be effective; they only have to be willing to launch them" (ibid) in order to convince governments not to adopt climate regulations, although little empirical evidence is provided to support this claim. Accordingly, jurisdictions that have foreign investments in fossil-fuelled electricity generation and that have concluded international investment agreements with the home countries of these investors are less likely to adopt carbon pricing instruments. International investment agreements can contain explicit environmental exceptions, recognising the right of the state to adopt ambitious environmental regulations (Miles, 2013).[22] States that have concluded international investment agreements with environmental carve-outs are less exposed to challenges from foreign investors in fuel industries, and thus more likely to adopt carbon pricing.

International treaty commitments and policy diffusion

International law can also support the adoption of carbon pricing. Skovgaard et al. (2019) find that "diffusion from international level through treaty commitments seems to constitute one constellation of variables (or pathway) leading to the adoption of carbon pricing". This includes binding commitments (e.g. under the Kyoto Protocol)[23] and bottom-up pledges under the Paris Agreement. Besides, previous experience with the implementation of CDM projects can facilitate the adoption of carbon trading at the national level, as it creates regulatory expertise and vested interests (Paterson, 2012).

Furthermore, as will be discussed in more detail below, the influence of international and regional institutions impacts the adoption of carbon pricing (Gulbrandsen et al., 2017; Skovgaard et al., 2019). Dolphin et al. (2020) emphasise the significance of EU membership. The EU ETS has also influenced the adoption of carbon trading schemes outside of the EU ETS, e.g. as part of approximation requirements under Partnership Agreements and other initiatives to export/import the EU *acquis* (Gulbrandsen et al., 2017). More generally, according to Fankhauser et al. (2015b) "countries are encouraged to pass climate legislation by the legislative activities of other countries".

In addition, international trade and the legal architecture governing trade flows can influence the adoption of carbon pricing, based on incentives or constraints (G. Dolphin & Pollitt, 2018; Epps & Green, 2016). "Climate clubs" can incentivise the adoption of carbon pricing by providing preferential access to markets that price carbon (Nordhaus, 2020). States that adopt carbon pricing can seek to ban or tax imports of products from countries that do not regulate (e.g. price) their domestic emissions of GHG. Environmental exceptions under the General Agreement on Trade and Tariffs make it possible to justify measures that "condition market access for imports on the policies of the exporting country," e.g. the pricing of carbon (Howse & Eliason, 2009). An

[21] Tienhaara (2017) notes, "policymakers take into account potential disputes with foreign investors before they even begin to draft a policy, thereby prioritising the avoidance of such disputes over the development of efficient regulation".

[22] For instance, the Dutch Model BIT (2018), Article 2, provides that "the provisions of this Agreement shall not affect the right of the Contracting Parties to regulate within their territories necessary to achieve legitimate policy objectives such as the protection of … environment ... The mere fact that a Contracting Party regulates, including through a modification to its laws, in a manner which negatively affects an investment or interferes with an investor's expectations, including its expectation of profits, is not a breach of an obligation under this Agreement".

[23] Fankhauser et al. (2015b) note that "some evidence of a commitment effect arising from the Kyoto Protocol, but only in countries with binding treaty obligations" (p. 327-328).

alternative is the introduction of carbon border tax adjustments. According to Howse and Eliason (2009), Pauwelyn (2007), Porterfield (2019) and Will (2019), "border carbon adjustments" (BCA) would likely be WTO-compliant, depending on their design.[24] It can be assumed that jurisdictions with high export volumes to countries with carbon-related import restrictions in place are more likely to adopt carbon pricing.

Constitutional powers

The constitutional division of powers can facilitate or complicate the introduction of carbon pricing. This question is particularly important in federal systems. Central/federal powers for carbon pricing can help achieve economies of scale in carbon pricing regulation (Carlson, 2009) and benefit the industry by reducing transaction costs (Sovacool, 2008). However, the central/federal authorities can be unwilling to adopt carbon pricing. Following "iterative federalism" theory, regional authorities can serve as "laboratories" to test these instruments that can later be used at the federal level (Carlson, 2009; Farber, 2008; Klass, 2008; see also discussion on Australia in Crowley, 2013). Subnational climate governance can make an important contribution to the scaling and entrenchment of decarbonisation initiatives (Bernstein & Hoffmann, 2018). "Iterative federalism" assumes the freedom of regional authorities to adopt climate policies that can later spread to other states or federal level. Regional carbon pricing, and its influence on federal carbon pricing, thus depends on the recognition of shared regional-federal environmental and fiscal powers in the constitution.

The successful implementation of carbon pricing depends on sufficiently strong legal institutions that adequately protect the economic rights of market players (Bogojevic, 2013). According to Hahn (1990), "trading, and the nature of trading, is likely to be constrained by the design of political institutions. This includes the design of legislative institutions, the courts, and bureaucracies". An independent judiciary therefore contributes to the implementation of carbon pricing, and in particular ETS.

The literature has suggested different variables/indicators for measuring the influence of the legal component on the adoption of carbon pricing. A "flagship climate law" increases the propensity to pass more laws on climate change (Fankhauser et al., 2015a). Renewable energy and energy efficiency laws, in particular laws establishing green support mechanisms (Hanemann, 2008; Meckling et al., 2015; Pahle et al., 2018) increase the chances of adopting carbon pricing. Steves et al. (2011) have developed a Climate Laws, Institutions and Measures (CLIM) Index.

Furthermore, it can be inferred from the literature on the interaction between international investment law and climate change that a high share of foreign investments in fossil fuel electricity generation and a high number of international investment agreements (UNCTAD, 2020) increase the risk of arbitration disputes concerning carbon pricing, and thus the risk of regulatory chill. A commitment to carbon pricing in an NDC would contribute to the adoption of this mechanism (Skovgaard et al., 2019), as well as WTO membership and trade with countries with BCAs. Shared environmental and fiscal powers contribute to iterative federalism on carbon pricing (Carlson, 2009; Farber, 2008; Klass, 2008). Independent courts – as measured by the World Bank index on judicial independence – are a necessary part of the institutional framework needed for carbon pricing, particularly for ETS (Bogojevic, 2013; Hahn, 1990).

International investment law is not neutral on the choice of carbon pricing instrument. Many international investment treaties include carve-outs for taxation measures, and carbon taxes are

[24] See also Acworth et al. (2020), Cosbey et al. (2019) and Mehling et al. (2019). However, Trachtman (2017) and Ghaleigh & Rossati (2011) highlight the "substantial uncertainties regarding the possibility to defend any import BTA, export BTA, or trade-exposure targeted subsidy".

thus less likely to result in successful arbitration claims than ETS. External regulatory influence and assistance by the EU is likely to contribute to the diffusion of the ETS (Gulbrandsen et al., 2017). Furthermore, independent courts and strong institutions are particularly important for ETS, given the need of a sufficiently robust institutional basis for the reliable functioning of trading (Hahn, 1990).

Table 4: Legal considerations for adoption of carbon pricing

Aspect	Why relevant?	Variable/ Indicator	Tax/Trade/ Neutral	Related Literature (top 3 studies)
Climate and low-carbon laws	Flagship climate laws and renewable energy/energy efficiency laws increase propensity of carbon pricing.	- Flagship climate law - Renewable energy and energy efficiency laws - Climate Laws, Institutions and Measures (CLIM) Index	Neutral	Fankhauser et al. (2015a); Meckling et al. (2015); Pahle et al. (2018); Steves et al. (2011)
International arbitration challenge (regulatory chill)	Threat of international arbitration dispute can stall action on climate change.	- Share of FDI in carbon-intensive industries - Number of international investment agreements	Tax (given taxation exemption clauses under investment agreements)	Schill (2007); Tienhaara (2017); Viñuales (2010)
International diffusion	International pledges contribute to adoption of carbon pricing. Legislative activities of other countries can contribute to the diffusion of carbon pricing. Border tax adjustments can incentivize countries to adopt carbon pricing.	- NDC - EU membership or Partnership Agreement with EU (with environmental approximation commitment) - Exports to countries with border-tax adjustments	Neutral Trade (given export of EU model)	Skovgaard et al. (2019); Fankhauser et al. (2015a); Fankhauser et al. (2015b); Howse & Eliason (2009); Trachtman (2017)
Constitutional powers	Distribution of powers between regional and federal authorities determine scope for "iterative federalism" on carbon pricing. Independent judiciary contributes to implementation of ETS.	- Shared environmental and fiscal powers in Constitution - Judicial independence index	Trade (given centralization of taxation powers) Neutral	Carlson (Carlson, 2009); Farber (Farber, 2008); Hahn (1990)

3.3 Economic Dimension

Carbon pricing is a market-based instrument that relies on economic incentives to deliver cost-effective emissions reductions. The characteristics of the economic environment in which it is deployed are therefore crucial to determining whether and how it can be introduced successfully, and the circumstances under which it must be complemented by other policies.[25] These characteristics relate to the implementing jurisdiction's level of development, economic structure, energy and electricity sector characteristics, and the regulations and policies in these sectors. The last of these is important to consider because carbon pricing does not operate in a vacuum, and existing policies and regulations, particularly in the electricity sector, can greatly influence the effectiveness of carbon pricing following implementation.

Economic development

The crudest yet most commonly used measure of economic development is a country's GDP per capita. As a readily available indicator to assess the general economic circumstances and constraints of a country, it features in several recent studies on carbon pricing. Dolphin et al. (2020) expect that countries' willingness and ability to implement carbon pricing will be positively related to GDP per capita based on the literature on the Environmental Kuznets Curve hypothesis,[26] and confirm this in their econometric analysis. Based on a similar reasoning but using a different dataset and approach, Levi et al. (2020) expect a positive relationship but do not identify one between GDP per capital and carbon pricing implementation.[27] The authors argue that this unexpected result is likely caused by the high correlation between GDP per capita on the one hand, and good governance and belief in anthropogenic climate change (two other variables in their econometric model) on the other. Skovgaard et al. (2019) use GDP per capita, among other variables, to cluster and map polities that price carbon. Their analysis identifies five clusters, which they name heuristically: early adopters; US and Canada; Chinese provinces; developed second wavers; and developing second wavers. The latter two clusters are differentiated primarily by GDP per capita, and the authors point out that the developing second waver cluster is more likely to implement a carbon tax rather than an ETS.

There are several dimensions of economic development that GDP per capita fails to capture. Most importantly, GDP per capita measures *average* income and contains no information regarding how income is distributed across individuals. Distributional considerations matter for the governments' approach to carbon pricing as they can be significant for the success of carbon pricing where the starting point for inequality is unfavourable (Markkanen & Anger-Kraavi, 2019). In addition, the effect of carbon pricing on income distribution is settled neither theoretically nor empirically (Cronin et al., 2017; Dissou & Siddiqui, 2014; Fullerton, 2011; Goulder, 2020; Klenert & Mattauch, 2019). To a large extent it depends on how the revenues from carbon pricing are recycled (OECD, 2019). Moreover, as discussed in Section 3.1, public attitudes to carbon pricing are in part determined by its perceived or expected impact on income and energy poverty.

The level of economic development also has an indirect effect on carbon pricing potential through access to capital (Steckel & Jakob, 2018). This is a particularly important constraint for developing countries that tend not to have the domestic financial resources required for capital-

[25] Campiglio (2016), Tvinnereim & Mehling (Tvinnereim & Mehling, 2018), and Finon, (2019), among others, analyse when it makes sense to complement carbon pricing policies and how best to do so.

[26] According to this hypothesis, richer countries are more inclined to expend resources to address environmental externalities. See Dinda (2004) and Sarkodie and Strezov (2019) for overviews of the vast literature on this topic.

[27] See also the discussion in Section 3.1 on this point. Levi et al. (2020) also highlight Fankhauser et al. (2015a), Lachapelle and Paterson (2013), Edenhofer et al. (2018), Steckel and Jakob (Steckel & Jakob, 2018) and Kartha et al. (2018) as other papers utilising GDP per capita.

intensive abatement options and face a higher weighted average cost of capital, the so-called WACC (Hirth & Steckel, 2016). A higher WACC affects not only the effectiveness of carbon pricing in mitigating emissions but also the development of low-carbon infrastructure to provide for sustainable growth (Egli et al., 2018; Ondraczek et al., 2015; Steckel & Jakob, 2018).

Economic structure and trade

The contributions of the agriculture, industry and service sectors to GDP vary across countries, with agriculture typically contributing a greater share in developing countries.[28] The energy needs for production in and the carbon emissions from these sectors are also different, with industry typically requiring more energy per unit of value added it contributes to GDP. These differences are reflected in a country's overall carbon intensity and the distribution of its emissions across sectors (Doda, 2018). Moreover, emissions from some activities, notably agriculture, are more difficult to mitigate using carbon pricing (Franks & Hadingham, 2012). Against this backdrop, the introduction of carbon pricing will have differential effects on these sectors' cost and production levels, their contribution to GDP and to the extent that the country trades internationally, on its competitiveness. In turn, these effects will determine the odds of adoption and stringency of carbon pricing instruments, if adopted.

The shift in production patterns induced by carbon pricing can have a substantial effect on where the country's labour resources are deployed (Fullerton & Muehlegger, 2019). As carbon-intensive activities decline and release labour, the flexibility of labour markets in re-allocating workers to other sectors is an important consideration for governments contemplating carbon pricing (de Serres et al., 2010). Recent evidence from developed countries suggest flexible labour markets can keep the unemployment cost of climate policies in check (Hafstead & Williams, 2018) and limit the potential adverse impacts on the distributional outcomes mentioned above.

A related issue is the degree of informality in the economy, which tends to decline with the level of economic development (Medina & Schneider, 2018). Studies on the topic find that the costs of carbon pricing are lower when the degree of informality is higher, because carbon pricing allows the government to reach previously untaxed activities while correcting a market failure (Bento et al., 2018; Liu, 2013; Markandya et al., 2013).

From an international trade perspective, it has long been recognised that trade patterns, particularly the volume of trade in emission-intensive basic materials and manufactured goods, is relevant for assessing the risk of carbon leakage from carbon pricing and designing effective responses to mitigate it (Acworth et al., 2020; Droege, 2009). Just like in developed countries, carbon leakage risk can be an important concern for small, open developing countries that wish to pursue export-oriented development strategies. As discussed in Sections 3.2 and 3.5, these countries may be concerned about compromising their place in the global value chains if they introduce carbon pricing when other countries do not. Conversely, pricing carbon can be a way for gaining entry into climate clubs that provide these countries with uninterrupted access to developed country markets that do price carbon (Nordhaus, 2020). These considerations notwithstanding, empirical analyses have uncovered little evidence of carbon leakage so far (Arlinghaus, 2015). This in turn could assuage the concerns of countries considering adopting carbon pricing instruments and increase the odds of adoption.

[28] At this level of aggregation, agriculture includes forestry and fishing while industry includes mining, utilities, construction and manufacturing. See the World Bank's World Development Indicators.

Energy sector characteristics

In most countries, emissions from the combustion of fossil fuels account for a large share of aggregate carbon emissions, and where they exist, carbon prices almost always cover emissions from the energy sector activities upstream at the extraction or import stage, or downstream following combustion for electricity or heat production (World Bank, 2020). The composition of a country's total primary energy supply evolves as the country develops, and its carbon intensity follows an inverted-U pattern, increasing first as the relatively cheap fossil fuels are used more intensively but later falling as renewables and nuclear start to play a more prominent role in the mix. Carbon pricing and the removal of energy subsidies could play a key role in this process, helping countries leapfrog the phase where carbon emissions increase rapidly as they develop (Burke, 2013; Taylor, 2020). Whether the country has fossil fuel reserves and its status as a net energy importer or exporter can influence its attitudes towards carbon pricing, especially if the fossil fuel sector is state-owned and contributes significantly to government revenues (de Serres et al., 2010; Fullerton & Muehlegger, 2019; Röttgers & Anderson, 2018). In this respect, Best and Burke (2020) show that carbon pricing can be effective in breaking the persistence of energy mixes dominated by fossil fuels.

A key component of the energy system is the electricity sector, because along with the transport sector, it typically accounts for most of a country's aggregate carbon emissions. Moreover, this sector will become increasingly relevant for climate policy as parts of transport, heating and industry are electrified, increasing the demand for its output. Burke (2010) shows that a country's energy resource endowments are important for its electricity mix and the evolution of that mix as countries develop. Dolphin et al. (2020) find that countries where electricity generation mixes are dominated by fossil fuels are less likely to implement carbon prices and, when they do, tend to opt for lower carbon prices. The structure of the sector, in terms of the age of the fossil fuel fleet and concentration and ownership of major assets will also impact the cost of stranded assets and hence the resistance to carbon pricing (Röttgers & Anderson, 2018). Cullen and Mansur (2017) show that in the US carbon prices are more effective in reducing emissions when the gas prices are low. A case study of South Africa's coal-dominated electricity sector is offered by Baker et al. (2015) who provide a detailed account of the issues arising on the road to the implementation of the country's carbon tax in 2019.

Electricity sector regulation and policies

Given the electricity sector emissions are often the primary target of climate policy, it is important to have a clear view of electricity market regulation and policies because these interact with the operation of carbon pricing in significant ways. In particular, electricity sector regulation will determine how a carbon price is transmitted through the sector, impacting production, consumption and investment choices (Boute, 2017). As carbon prices rely on market mechanisms to have effect, most literature argues that the implementation of such a policy first requires electricity sector liberalisation fen (Fan et al., 2014; Jotzo & Löschel, 2014; Lo, 2016; Teng et al., 2014). Recognising the challenges associated with the liberalisation-first approach, more recently authors have asked how carbon pricing policies can be designed to operate effectively under different forms of electricity market regulation (Acworth et al., 2019a; Acworth et al., 2019b; Boute, 2017). These studies are more positive about the possible role of carbon pricing even where electricity markets are regulated, but highlight the importance of understanding where barriers to mitigation exist, how much mitigation potential will be lost, and to what extent other regulatory alternatives can limit the losses in efficiency.

As discussed in Section 3.1 and in Meckling et al. (2017), the sequence with which various climate policies are introduced may also determine the odds of the successful implementation of carbon pricing and increase its ambition. In the US, Lee (2020) finds that states that liberalise

their electricity markets first are more likely to adopt emissions trading as a next step and more likely to use a renewable portfolio standard. Best and Burke (2018) present direct evidence that countries with carbon pricing instruments install more solar and wind capacity. Conversely, Wagner et al. (2015) argue that supporting renewable and low carbon technologies by providing them with improved access to a modernised grid and by removing the substantial implicit and explicit fossil fuel subsidies will enhance the effectiveness of carbon pricing through greater competition. Taken together, these studies underline the importance of accounting for the two-way interaction between policies and regulation in the electricity sector on the one hand and the likelihood of adoption and success of carbon pricing on the other.

Table 5: Economic considerations for adoption of carbon pricing

Aspect	Why relevant?	Variable/Indicator	Tax/Trade/ Neutral	Related Literature
Economic development	Richer countries tend to adopt environmental polices more often and can respond to their adverse distributional consequences, if any, more freely	- GDP per capita - Level of inequality	High GDP per capita favours trade Neutral	Levi et al. (2020); Klenert and Mattauch (2019); Steckel and Jakob (2018)
Economic structure and trade	To capture reliance of economy on carbon-intensive activities and its ability to adapt to structural changes induced by carbon pricing	- Carbon intensity of GDP - Distribution of value-added, employment and emissions by sector - Labour market flexibility - Size of informal economy - International trade in manufactured goods	Neutral High industry share favours trade Low flexibility favours trade High informality favours tax Neutral/Trade	de Serres et al. (2010); Bento et al. (2018); Acworth et al. (2020)
Energy sector characteristics	To capture the importance of fossil fuels in the energy system and the alternatives to them	- Share of fossil fuels in total primary energy supply and electricity generation - Fossil fuel reserves and net exports - Fossil fuel subsidies - Age of fossil fuel powered generation fleet	High share favours trade Neutral Neutral Young fleet favours trade	Burke (Burke, 2013); Röttgers & Anderson, (2018); Dolphin et al. (2020)
Electricity sector regulation and policies	To capture the effect of interactions with existing regulation and policies in one of the key emitting sectors	- Ownership of electricity generation fleet (state versus private) - State of liberalization - Electricity market concentration - Support for low-carbon generation	Neutral Liberalized markets are neutral or favour trade High concentration could favour tax Neutral	Boute (2017); Lee (2020); Wagner et al. (2015)

3.4 Technical Dimension

The literature review uncovered a breadth of studies that aim to assess the technical capacity of a jurisdiction to design and implement carbon pricing policies. This literature focuses on the knowledge and institutional capacity across governments, business and civil society (Kreibich et al., 2019; Piris-Cabezas et al., 2019; World Bank, 2016), the specific infrastructure required to operate a carbon pricing policy (Aasrud et al., 2010; Shi et al., 2019), and the political economy and governance aspects of climate regulation (Brunner et al., 2012; de Perthuis & Trotignon, 2014). While some elements of technical capacity are common across carbon pricing mechanisms (e.g. MRV), emissions trading will require additional institutions to create and oversee the allowance market and track allowance trades as compared to a carbon tax (Goulder & Schein, 2013; Parry & Pizer, 2007; Sachs, 2009).

Capacity to monitor and report emissions

Central to technical capacity is the ability to monitor, verify and report emissions (Aasrud et al., 2010; Prag et al., 2012). Sound understanding of the underlying emission sources is important not only to design an effective instrument, but also to establish an inventory and, in the case of an ETS, registry. Trust in the accuracy and integrity of the reported data is therefore a prerequisite for a well-functioning instrument (Oudenes et al., 2019). The status of existing infrastructure and reporting arrangements can provide insight into a jurisdiction's technical ability to collect and report high quality emissions data (World Bank, 2016). For example, under the UNFCCC, emerging economies have been subject to various reporting requirements.[29] Concurrence with UNFCCC reporting as well as the status of national inventory updates can provide insight into existing MRV capacity (Amarjargal et al., 2020; World Bank, 2016). Also important is the existence of MRV regulation that requires mandatory emissions reporting.

Government knowledge and capacity

Policymakers will be required to perform new functions, draft new laws (see 3.2 above) and potentially create new institutions to effectively implement carbon pricing policies. In the design of the policy, they will need information on key emission sources and will benefit from understanding the economic cost of different emission reduction trajectories. Further, design options will need to be assessed against economic and other performance criteria. Once a decision has been taken to establish a carbon pricing policy, capacity to draft legislation, regulation, and technical guidelines, as well as other enabling factors will be required (Aasrud et al., 2010).

For ETS, additional institutional capacity will be required to ensure the smooth operation of the allowance market. For example, allocation methodologies and auction platforms, the creation of market places where firms can buy and sell allowances, and a registry to track allowance transfers and ownership (Goulder, 2020; Kreibich et al., 2019; Parry & Pizer, 2007) will need to be put in place.

As discussed in Section 3.2, existing climate and low-carbon laws can pave the way for carbon pricing. From a technical capacity perspective, Kreibich et al. (2019) find that experience with a broad range of environmental policies[30] can improve e.g. data processing, MRV, and modelling capacity. However, instruments combining mandatory obligations with a trading component (green and white certificate trading schemes) have the greatest overall potential for being used as a basis for ETS development, with the timing and maturity of these instruments ultimately

[29] Prior to Cancun every fourth year, post Cancun biannual update reports (BURs).

[30] The authors assess: white certificates markets (energy efficiency), green certificate markets (renewable energy capacity), nitrogen trading, carbon taxation, and technology and performance standards, in a range of jurisdictions.

determining the actual contribution to building readiness for carbon pricing (ibid). Amarjargal et al. (2020) focus on experience with crediting mechanisms for a country's readiness to participate in international carbon markets. As discussed in Section 3.2. above, previous crediting polices provide regulatory experience and vested interests that could reduce barriers to adopting carbon pricing. However, Amarjargal et al. (2020) point out the differences between crediting mechanisms and mandatory carbon pricing to suggest that direct learnings may be limited. This is particularly true for carbon taxation.

Government knowledge and capacity to implement carbon pricing will also be affected by engaging government officials with programmes that aim to promote climate policy and strengthen technical capacity (Aasrud et al., 2010; Amarjargal et al., 2020). In the best case, a centrally coordinated capacity building strategy will be in place to ensure all relevant stakeholders have the skills and knowledge required for compliance with carbon pricing (Conway et al., 2019). In the absence of a dedicated capacity building strategy, the participation of key government officials in international initiatives dedicated to building capacity will enhance countries' preparedness for carbon pricing (Amarjargal et al., 2020).[31] Some prominent examples include the World Bank's Partnership for Market Readiness (PMR), the International Carbon Action Partnership's (ICAP) ETS Summer Schools, and the German Ministry for Environment's Capacity Building to Support the Establishment of National Emissions Trading Systems programme.

Business knowledge and capacity

To ensure the longevity of the system, regulated entities will need to feel some form of ownership of its design. As such, they will need a fundamental understanding of the various design options and their likely impact on business operations, so that they can constructively engage during the design phase (Partnership for Market Readiness (PMR) & International Carbon Action Partnership (ICAP), 2016). Moving to the implementation phase, regulated entities will require capacity to fulfil their monitoring and reporting requirements, as well as their compliance obligations (Aasrud et al., 2010). Under an ETS, businesses will also require new skills to develop trading strategies and manage allowance price risk.

Business capacity and motivation for carbon pricing policies can be inferred by assessing firms' engagement with industry leadership programmes such as the Carbon Pricing Leadership Coalition (CPLC) or the Business Partnership for Market Readiness (BPMR).[32] Focusing specifically on carbon markets, Piris-Cabezas et al. (2019) propose a set of World Bank and World Economic Forum Indicators that can be used to derive an understanding of businesses' general capacity and readiness for trade. As well as a potentially strong vested interests that can lobby for carbon pricing (see Section 3.1), particularly for emissions trading, the financial sector may be required to provide financial services as well as the provision of risk management strategies for covered firms. Indeed Piris-Cabezas et al. (2019) consider financial market efficiency an indication of carbon market readiness.

[31] Important programmes and initiatives created to support these efforts are outlined in Table 8 in the appendix. See also Section 3.6 below.

[32] See Table 8 in the appendix.

Table 6: Technical considerations for the adoption of carbon pricing

Aspect	Why relevant?	Variable/Indicator	Tax/ Trade/ Neutral	Related Literature
Ability to measure and report emissions	Monitoring, reporting and verification systems (and their predecessors) are an essential element of any carbon pricing approach	- Compliance with UNFCCC emissions reporting obligations - Existence and frequency of National GHG inventory updates - MRV law in place - Defined requirements and a set mechanism for MRV in place	Neutral	World Bank (2016)
Government knowledge and capacity	Capacity to design and implement carbon pricing policy	- Demonstrated use of market-based instruments for other environmental issues (fisheries, air pollution, energy efficiency, renewable energy etc) - Experience with other carbon markets (CDM; JCM; NAMAS) - Existence of a capacity building strategy - Participation in WB initiatives PMR and CPLC - Number of ICAP alumni - Number of members in UNFCCC COP delegation	Trade	Piris-Cabezas et al. (2019); Kreibich et al. (2019); Amarjargal et al. (2020); World Bank (2016)
Business knowledge	Required for covered entities to engage in debate surrounding the design of the system and to later comply with its regulations	- Participation in Carbon Pricing Initiatives - Presence of multinationals with experiences operating in jurisdictions with carbon pricing policies in place - *World Economic Forum Global Competitiveness Index:* Pillar 11 – Business Sophistication - *World Economic Forum Global Competitiveness Index:* Indicator 1.B "Private Institutions" (corporate ethics and accountability)	Neutral	Piris-Cabezas et al. (2019); Amarjargal et al. (2020)
Institutional capacity	Government departments will be required to perform new functions and potentially create new institutions	- Processes for inter-*ministerial* coordination and stakeholder engagement - Independence of regulatory institutions - Strength of independent think tanks	Neutral/ Trade	Amarjargal et al. (2020)

Aspect	Why relevant?	Variable/Indicator	Tax/ Trade/ Neutral	Related Literature
Cooperation across carbon markets	Can enhance ambition and credibility of carbon markets	- Alignment of MRV and other accountability and transparency criteria	Neutral	Santikarn et al. (2018); Hermwille et al. (2017); PMR-ICAP (2016); Burtraw et al. (2013)

3.5 Multilateral Dimension: Purpose, Pathways, and Barriers for Carbon Pricing Cooperation

Transparency and Capacity Building

Multilateral cooperation on carbon pricing increases chances of success for domestic systems, imbues needed transparency across interconnected polities, and creates opportunities for future interactions and links among carbon pricing policy instruments. Architects of domestic systems benefit from learning about designs pursued elsewhere along with their implementation experiences and resulting reforms. Regional examples of such information sharing abound, from established dialogues between the EU and China[33] and the EU and the Republic of Korea (ROK),[34] to more nascent exchanges between Asian countries with carbon pricing experience and those in exploratory phases.[35] Other bodies such as the International Carbon Action Partnership (ICAP), provide a forum for international exchange between policymakers that have implemented or are taking steps toward implementing emissions trading. A degree of carbon pricing transparency is needed across countries, particularly within a given region, in light of economic and trade interconnections. As momentum grows to integrate carbon pricing and accounting fairly in trade relationships (M. A. Mehling et al., 2019), such transparency spreads information on the nature of carbon pricing policies in regional partner and peer countries. Multilateral cooperation that creates the foundations for future links between carbon pricing systems has the highest potential impact and is also the most difficult and time-intensive to achieve.

Linkage

Such linkage can take many forms, from direct exchanges between ETSs to collaboration on international offset projects to indirect and limited connections binding various heterogeneous policy instruments together (Santikarn et al., 2018; Beuermann et al., 2017). Where effective, linkage can create cheaper abatement options by providing firms – and by extension the state agencies that regulate them – access to credits in jurisdictions with lower emission reduction costs than their own (Burtraw et al., 2013; Kachi et al., 2015; M. A. Mehling et al., 2017). Such transactions can match buyers who have exhausted many of their cheap and readily available reduction options with sellers at less advanced phases of their low-carbon transition (Ewing, 2016a). As such, linked markets can also increase liquidity and provide needed capital to developing economies and hasten low-carbon energy and efficiency transitions. Linkage can also reduce the market influence of singular large players such as major utilities and energy firms, which in the absence of linkage could dominate the national carbon market landscape intended to regulate them. In ideal cases, linkage decreases administrative burdens as costs are shared across jurisdictions and the harmonisation of key ETS designs – such as MRV – reduces the effort required from participating countries and avoids duplication (Santikarn et al., 2018). Perhaps most vitally, ETS linkage can better reflect the economic interconnectedness that increasingly defines global – and particularly regional – commerce (Ewing, 2016b; Marcu & Sugathan, 2018), and discourage the leakage of emissions-generating activities to jurisdictions with less stringent climate policies.

Regardless of the precise nature of the impetus to link markets, the overriding goal for finding mitigation value is to reduce decarbonisation costs in ways that enable and accelerate stronger mitigation goals. Linkage takes time to initiate, enact, and mature, and continuing stewardship to

[33] For information on this partnership see: https://www.eu-chinaets.org/

[34] For information on this partnership see: https://ec.europa.eu/clima/news/articles/news_2016070801_en

[35] For information on these efforts see: https://asiasociety.org/policy-institute/events/regional-cooperation-build-asian-carbon-markets

protect, revise, and improve. Linkage efforts add complexity to already complicated ETS formation and execution processes and brings potential political sensitivities, discussed in the Asian context in Section 5.

Despite these difficulties, the potential for linked markets to grow climate ambition and add continuity and symbiosis to carbon abatement policies across boundaries keeps it at the forefront of multilateral carbon pricing cooperation discourse and activity. Experiences beyond Asia demonstrate the value of building the foundation for such connections early during policy formation phases, where years of foundational work facilitate linkages in North American and between the EU and adjacent parties (Ewing, 2016a; Swartz, 2016). Existing foundations of one jurisdiction or group of jurisdictions can likewise be leveraged by new market entrants. By adapting similar market design principles and collaborating closely with early movers to build capacity, new entrants can develop and implement markets relatively quickly, as was visible in the case of Ontario following the lead of the Western Climate Initiative (Wilson, 2018).

The linkage continuum – from basic system harmonisation with indirect links based on offset cooperation and intra-firm manoeuvring, to legally-binding direct links tantamount to a single market (Ewing, 2016a; Kachi et al., 2015) – offers flexibility in approaches to building initial connections, and strengthening links over time. Carbon market clubs (CMCs) are germane here for their conceivable ability to facilitate emissions credit exchanges across different systems. CMCs – like the climate clubs referred to in Sections 3.1 and 3.3 – bring together different countries and potentially non-state actors who volunteer to follow agreed rules in exchange for benefits that are only available to club members. In the case of carbon markets, this entails some acceptance of each other's emission reduction units (Hawkins, 2016). CMCs seek to share the burdens and benefits of cooperation in ways that are deemed sufficiently equitable and attractive by possible entrants in order to incentivise participation and compliance (Brewer et al., 2016). As CMCs mature, they can conceivably reduce competitiveness and leakage concerns while scaling up the scope and ambition of their actions. With clear and ideally not overly onerous requirements for membership – at lease at early stages – CMCs hold promise as venues for carbon market connections that lead to increasingly robust and effective links.

Enablers and Barriers

Wide-ranging factors enable and impede multilateral cooperation on carbon pricing. Economic characteristics such as trade integration, respective levels of industry exposure to carbon pricing, and the potential for symbiotic multilateral carbon pricing arrangements are elemental to whether cooperation is viewed favourably by any given party. Political conditions must provide openness to such cooperation, beginning with potential regional and international carbon market collaborators. For example, Görlach et al. (2015) find that "friendly relations" often exist between linking partners that are explicitly expressed in the preamble to linking agreements.

Technical capacities to enact sophisticated domestic policies in conjunction with foreign policy decisions – an often absent combination – needs to exist throughout potential carbon market collaborators.[36] Regardless of the type of instruments to be linked, a common accounting framework, shared level of ambition and a similar degree of formality in terms of legalisation are required to build trust and ensure the environmental integrity of unit transfer (Hermwille et al., 2017; M. A. Mehling et al., 2017; Santikarn et al., 2018; Beuermann et al., 2017).

Focusing more specifically on the linking of emissions markets, several studies have developed analytical frameworks to understand how differences in ETS design either prohibit or facilitate

[36] See for example, Section 3.4 of this report.

linking (Ahlberg et al., 2013; Beuermann et al., 2017; Burtraw et al., 2013; Hermwille et al., 2017; Partnership for Market Readiness (PMR) & International Carbon Action Partnership (ICAP), 2016; Santikarn et al., 2018). Similar to the conclusions of Görlach et al. (2015), confidence in each partner's monitoring and accountability framework is seen as essential before two markets can be linked. Agreement on the ambition implied by each system's emissions cap is also considered an important pre-condition. Outside of these points, the literature argues that differences in ETS design elements should not be prohibitive to cooperation and ultimately linking.

The existence of multilateral architectures with the ability to facilitate carbon market cooperation and serve as forums for its advancement can influence prospects for success. This section elaborates on these factors, leading to efforts in Section 5 to introduce their relevance for multilateral Asian contexts.

Economic Connectivity

Economically, carbon market connections make the most sense where trade and commercial integration is high, and symbiotic opportunities exist to find lower-cost mitigation options, build capital and technological bases for recipients, smooth out the effects of shocks to market operations, and add liquidity to carbon markets where it would otherwise be lacking (Doda et al., 2019; Doda & Taschini, 2017; Kim et al., 2018). Integration here refers to high volumes of goods and services transiting across borders, firms with operations in multiple jurisdictions, and established financial and currency flows between countries. Such trade is also characterised by a great degree of intermediate and intra-firm trade flows with parts and components being imported for use as inputs in finished goods that are then re-exported to one another and the rest of the world (Marcu & Sugathan, 2018). In each case, widely divergent approaches to pricing – or not pricing – carbon in different jurisdictions creates challenges for firms and countries and amplifies leakage risks (Acworth et al., 2020; Neuhoff et al., 2015).

Political Context

Politically, cooperating countries need levels of trust that partners will proceed in good faith, and implement reliable MRV systems that lend veracity to their carbon accounting (Keohane et al., 2015). Cooperating countries likewise need limited alignment on two forms of ambition: the motivation to reduce their respective GHG emissions through pricing, and the view that there are incentives for them to cooperate multilaterally toward this end. Firstly, substantive cooperation between jurisdictions requires that the existence of pricing, or at least intention to price carbon. However, the spread of ideas, strategies and experiences on carbon pricing among peer countries can increase chances for wider adoption, a position embedded in multilateral capacity building efforts from groups such as the World Bank Partnership for Market Readiness, International Carbon Action Partnership, and the International Emissions Trading Association, among others. Secondly, countries with deep and relatively positive relations may readily fold carbon pricing cooperation into their existing diplomatic landscape. Those with relatively fraught relationships do not have this luxury; however, they may in some cases see climate change cooperation – and by extension carbon pricing exchanges – as potential confidence-building measures and areas of low-hanging diplomatic fruit (Ewing, 2016a).

If cooperation does take root, it will exist on a continuum from basic information sharing and capacity exchange to potential market linkage. The closer to linkage such cooperation goes, the greater the chance for political sensitivity. Governments pursuing potential international market exchanges must be able to sell such policies to their constituencies. Distributional concerns about the 'winners and losers' of carbon pricing and the co-benefits of climate policies are magnified when systems are connected across political boundaries, with particular delicacy

surrounding financial outflows for carbon credits and environmental enhancements on foreign soil (Green, 2017).

Regionalism and the Global Climate Mitigation Landscape

Such challenges are amplified by varied climate change goals, baselines, and means of measuring mitigation progress in the Paris-based climate landscape. These differences create technical issues surrounding the appropriateness of international market exchanges that dovetail with political barriers toward its pursuit. In addition to challenges of co-benefit allocation and distributional justice, technical issues abound surrounding how to exchange mitigation outcomes between or among countries with different baselines, mass-based versus intensity-based targets, and differing sectoral coverages in their NDCs, among other heterogeneities. These differences do not rule out market links (Bodansky et al., 2014; M. A. Mehling et al., 2017), but they do complicate their execution and bring about difficult issues of fairness and implementation.

Specifically, various mitigation instruments, from ETS to carbon taxes to more traditional regulatory standards on efficiency or fuel mix can all theoretically be distilled down to a real or shadow price for carbon (M. A. Mehling et al., 2017). Firms facing a carbon tax obligation under such connections could hypothetically buy credits from firms operating within an ETS and have their tax burden reduced as a result. Firms facing carbon intensity standard regulations could see their outputs translated to a quantity-based result that would be tradeable across markets. In each case, the goal is to converge various systems by increasing the fungibility of their respective efforts. Given intrinsic complexities for such connections, however, it is important to begin with foundational efforts such as MRV harmonisation and system transparency on carbon pricing approach, coverage, timeframes. These are both presently the most valuable avenues for extending the political and technical space for future regional market exchanges, and essential early steps toward more sophisticated and ambitious connections in the future (Ewing & Shin, 2017).

In this era of globally disparate national policies, in which even the relatively institutionalised EU houses wide-ranging climate commitments and strategies, regional cooperation on carbon pricing hinges in part on the (in)effectiveness of multilateral architectures. Regional forums and institutions can lend transboundary carbon pricing dialogue a degree of diplomatic familiarity and context, and provide regular, official settings for their discussion. Similarly, on epistemic and informal diplomatic levels, regional communication and convening can bring together knowledge agents and practitioners with deep knowledge of country-level and regionally specific climate change ambitions and carbon pricing development. However, multilateral forums also often find the lowest common denominator of politically tenable dialogue and cooperation, suffer from poor implementation capabilities, and have little-to-no ability nor appetite to censure non-compliant member states (Archaya, 2017). These shortcomings often manifest in lacklustre responses to transboundary – and in the case of climate, global – environmental challenges (J. S. H. Lee et al., 2016). Countries meanwhile struggle to bridge gaps between domestic environmental policymaking agents (the architects of carbon pricing policy design and execution), and diplomatic apparatuses needed to bring these policy sets into effective regional dialogue (often foreign ministries and offices of heads of state). Discussions of carbon market connections across jurisdictions are ripe for such gaps and require often delicate intra-government cooperation that can be difficult to attain and perpetuate (Rabe, 2018).

As carbon pricing connections touch multiple industries and regulatory bodies and affect core commercial and strategic sectors, they bring a raft of actors that can be difficult to wrangle in ad-hoc groupings and institutional regional bodies. This, however, is the charge of regional carbon

pricing cooperation. Fortunately, there are often few impediments to getting started on epistemic and informal diplomatic levels, particularly on cooperative issues with relatively low levels of political sensitivity. Specifically, early-stage overtures focusing on effective MRV systems and their ultimate harmonisation, transparency on the overarching approaches and goals of different national policies, discussions on linkage opportunities, readiness and possible linkage pilots can find value (Beuermann et al., 2017; Ewing, 2016a; Ewing & Shin, 2017; Santikarn et al., 2018). Regional dialogue on the political process of developing pricing systems and on gaining regulatory and industry support for their execution are also useful, provided they recognise from the outset the myriad differences in political settings and approaches to governance that exist in a given region. Table 7 below captures the key variables on multilateral carbon pricing cooperation discussed in this section, which are applied to the Asian context in Section 3.6.

Table 7: Multilateral and regional considerations for adoption of carbon pricing

Aspect	Why relevant?	Variable/Indicator	Tax/Trade/ Neutral	Related Literature
Economic Integration	Trade and financial flows and intra-firm exchanges across borders affect cooperation impetus and execution, along with leakage risks.	- Trade volumes - Trade agreements - Intra-firm operations in multiple jurisdictions - Leakage risk - Financial system connectivity - Potential for symbiotic carbon market exchanges	Indicators 1-4: Neutral Indicators 5-6: Trade	Marcu & Sugathan (2018); Neuhoff, et al. (2015); Kim et al. (2018)
Diplomatic Context	Political trust and alignment around the use of carbon pricing policies are key to cooperation being possible. Poor diplomatic relationships can lead to climate and/or carbon pricing cooperation being pursued as a confidence-building measure.	- Broad historical and existing diplomatic relationships - Specific historical and existing cooperation on environment and climate - Potential for symbiotic carbon market exchanges	Indicators 1-2: Neutral Indicator 3: Trade	Ewing (2016a); Ewing & Shin (2017); Santikarn et al. (2018)
Variance in Climate Mitigation Goals	Different climate mitigation goals, baselines, and strategies in respective NDCs create political and technical challenges for carbon pricing cooperation.	- Core mitigation goal alignment - Intention to use carbon pricing to achieve NDCs - Heterogeneity of carbon pricing systems	Neutral	Bodansky et al. (2014); Mehling et al. (2017)
(In)effectiveness of Multilateral Architecture	Regional institutions and ad-hoc groupings can be instrumental in advancing carbon pricing cooperation, but often avoid politically sensitive challenges and have limited implementation ability.	- Presence of a regional institution(s) relevant to carbon pricing cooperation - Track-record of regional institution(s) on environmental cooperation - Existence of relevant epistemic and track II communities	Neutral	Acharya (2017); Lee et al. (2016)

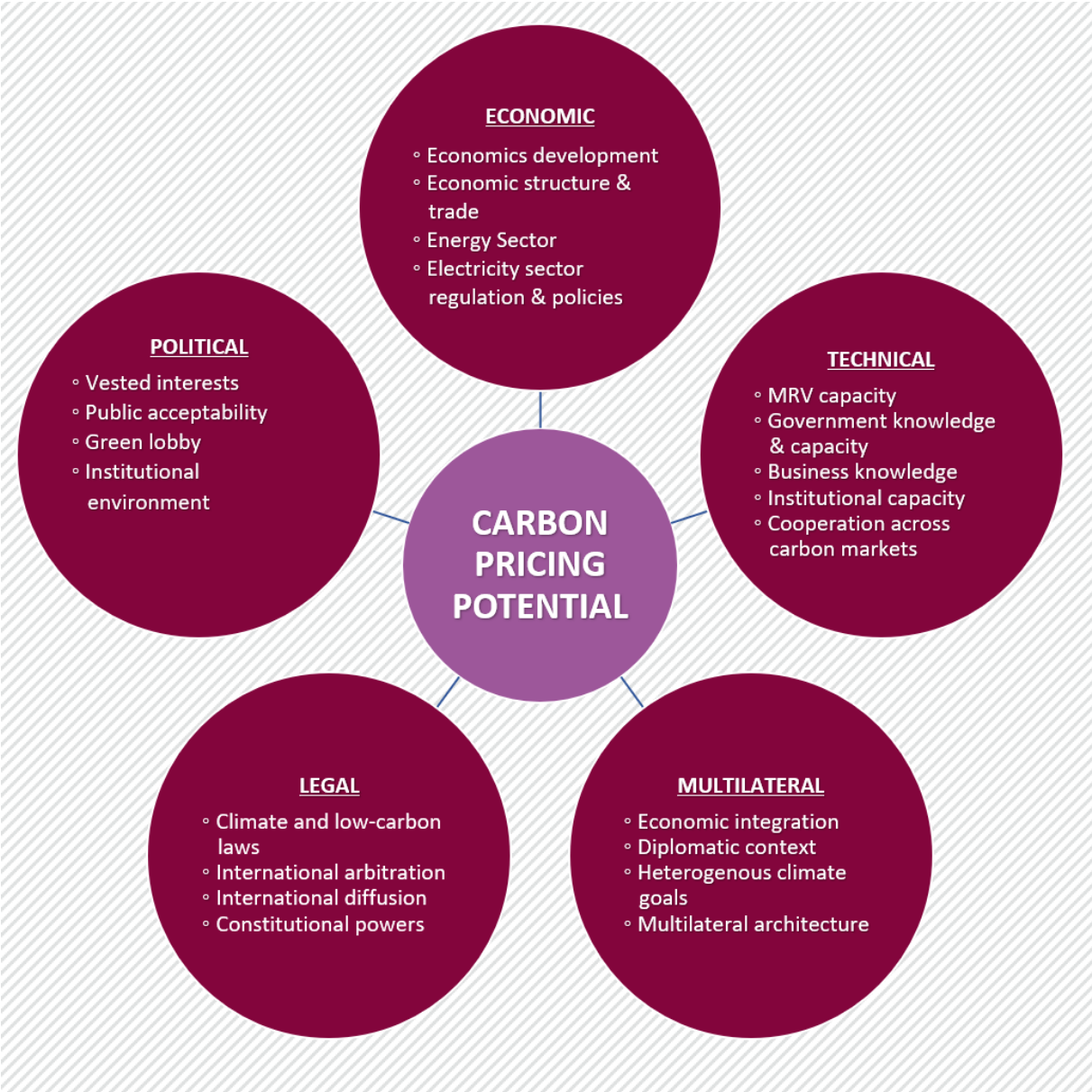
4 Analytical framework

This section synthesises the results of the literature review and analysis in Sections 3.1 to 3.5. Drawing on the summaries in the tables at the end of these sections, a framework to assess the conditions for successful carbon pricing potential is proposed. The framework is illustrated in Figure 1. For each component of the framework, the figure highlights the critical aspects that must be investigated and assessed to obtain an accurate picture of the potential of carbon pricing in a jurisdiction. Specifically,

- the **political** component underlines importance of vested interests opposing carbon pricing and the support that may be expected from existing or emerging green lobbies. Public acceptability of carbon pricing and the broad ability of the political system and institutions to deal with conflicting positions on carbon pricing are also relevant. (See Section 3.1 for details.)
- the **legal** component highlights the role of existing climate laws, any impact through international legal channels of arbitration and diffusion, as well as how the constitutional division of powers may interact with carbon pricing policy adoption. (See Section 3.2 for details.)
- the **economic** component is closely related to the political one. It focuses on the level and distribution of income and the effect of these for access to capital for low-carbon investment, the mix of activities for generating GDP and electricity in the country and the country's broader energy and climate policies. (See Section 3.3 for details.)
- the **technical** component calls for an assessment of the government and business sector's knowledge and capacity and how this can be facilitated or impeded by the country's institutional setup. This component also reviews the technical conditions for the cooperation of carbon pricing initiatives internationally and is therefore linked to the next component. (See Section 3.4 for details.)
- the **multilateral** component emphasises the international dimension where economic integration, diplomatic context and differences across countries' climate goals can play an important role. Moreover, it raises the ability of the multilateral architecture to mediate the arising issues as a relevant aspect. (See Section 3.5 for details.)

A few observations are worth noting regarding the framework in Figure 1. First, each individual component of the framework and each aspect within the components can contribute valuable information to an empirical assessment of carbon pricing potential. Consider the hypothetical example where a fossil fuel rich country has only a few firms in the extraction sector, one of which is owned by the country's government and others by domestic and foreign investors. The firms' vested interests will have an impact through the political component. The sector's contribution to GDP, government and export revenues will make economic considerations crucial. Given the prominent role of the extraction sector, the country's government may already have the requisite technical monitoring and reporting capacity gained through existing environmental regulations. Even if the government is willing to impose carbon pricing, it must assess whether its income- and energy-poor citizens are better served by a carbon tax or an ETS. It may also want to assess how the choice of instrument would affect the likelihood that the firm's foreign investors will challenge the decision and seek compensation through international arbitration. While it can be argued that this example is specific to a fossil fuel rich country, a similar narrative illustrating different considerations through the same components can readily be constructed for a country heavily dependent on fossil fuel imports.

Figure 1: Framework for assessing carbon pricing in Asia



Source: Authors' elaboration

Second, the different components in Figure 1 are deeply intertwined because a feature of an economy can operate through multiple aspects under different components. For example, consider the effect of significant but underdeveloped renewable energy potential in a country. Under the political component, it will affect the green lobby efforts seeking government subsidies. In addition, it will likely support carbon pricing and provide a counterweight to the vested interests of carbon-intensive sectors. It will also operate through the energy sector characteristics under the economic component by providing an alternative source of energy to fossil fuels as the country's energy mix decarbonises, and an alternative source of employment for workers who may be released by the carbon-intensive sectors of the economy. Both aspects can be crucial for the odds of implementation of carbon pricing and its success and durability if implemented.

The third observation relates to instrument choice. While several variables identified under each component and aspect are neutral with respect to this choice, in the context of a specific country,

some may point to a carbon tax while others to an ETS. When such a situation arises, it may well be the case that a specific instrument is still more appropriate overall. In any case, the dichotomy between a carbon tax and emissions trading is less of an issue in practice than in the theoretical analysis because ultimately it is the design features of a given instrument that determines whether the carbon pricing policy is successful.

Finally, the framework described in this report is necessarily abstract and general because it is built on a foundation of academic and grey literature from multiple disciplines and with a global scope. It is a theoretical construct distilling relevant concepts and identifying conditions and relations without excluding variables due to feasibility constraints. Future project work will draw on this framework with a view to applying it in the context of emerging Asian economies. In anticipation of this empirical application, the next section provides an overview of the actors and future pathways for carbon pricing cooperation in the region.

5 Actors and Pathways for Carbon Pricing Cooperation in Emerging Asian Economies

There are multiple pathways, agents, and strategies for accelerating carbon pricing policies in key Asian countries, along with a range of impediments. These variables are both differentiated and, in many cases, connected across the region, as introduced in the following sections. Ultimately the primary actors that will drive carbon pricing development in Asia are political jurisdictions, with interconnected regional architectures, international capacity building efforts, private sector firms, and civil society inputs influencing their trajectory at home and internationally. A selection of Asian jurisdictions is particularly germane to the future of regional carbon pricing and its resulting mitigation value. In this respect, jurisdictions including Bangladesh, India, Indonesia, Malaysia, Mongolia, Myanmar, Pakistan, the Philippines, Russia, Sri Lanka, Thailand, Uzbekistan and Vietnam span the spectrum of carbon pricing readiness. These and potentially a few other jurisdictions in the region will be studied further in future work under the project due to their potential to create and implement the next generation of Asian pricing instruments, and substantially alter regional emissions trajectories in the process. They will be influenced by the following contextual forces, among others.

Regional Integration

The Asia-Pacific is home to high levels of trade integration,[37] and to symbiotic carbon market opportunities. The region is second only to Europe in its share of intraregional trade as a function of total levels, and top-trading partnerships in countries throughout the region are dominated by other Asian countries – with only the US and EU representing relevant non-Asian players (Tonby et al., 2019). There is a myriad of options for symbiotic regional carbon market exchanges, with developed economies in Japan and the Republic of Korea (ROK)positioned to support low carbon transitions in developing Asian countries as a means of lowering mitigation costs at home. Japan's Joint Crediting Mechanism (JCM) is a source of such exchanges, supporting projects in developing South and Southeast Asian countries in exchange for a percentage of resulting carbon offset credits.[38] The ROK likewise views international offset project development as key to reaching its climate mitigation goals, and is investing in turn (Asian Development Bank, 2018; Jung & Sohn, 2016). These efforts notwithstanding, mutually beneficial carbon mitigation policy arrangements in the Asia-Pacific are underdeveloped, with offset exchange volumes low compared to overall emissions profiles (Shi et al., 2019), and no robust prospects for linking ETSs or tax systems in the foreseeable future. Substantial effort will be required to deepen regional exchanges at the intersection of environmental and foreign policymaking in key Asian countries to take better advantage of regional opportunities.

Strong potential exists for politically feasible capacity exchanges, basic transparency around system design, and policy decisions that build a basis for linkage readiness in emerging Asian economies. In Southeast Asia, 2017 UNFCCC-supported sessions in Singapore saw the Association of Southeast Asian Nations (ASEAN) member states agree to explore MRV harmonisation as a step toward regional carbon market collaboration, with second-order goals of spurring investment in the region and lowering mitigation costs (ASEAN, 2017). Since the mid-2010s the Asian Development Bank (ADB) has executed capacity enhancement training in

[37] This is likely to be strengthened with the formation of Regional Comprehensive Economic Partnership in November 2020. For details see https://asean.org/summary-regional-comprehensive-economic-partnership-agreement/.

[38] Current Asian JCM recipient countries are Mongolia, Bangladesh, Maldives, Viet Nam, Lao PDR, Indonesia, Palau, Cambodia, Myanmar, Thailand and the Philippines. For more information on the JCM, including project examples, see: https://www.mofa.go.jp/ic/ch/page1we_000105.html

its developing member states to help them scale up renewable technologies through market means – including via the aforementioned JCM. The Japan Fund for JCM (JFJCM), managed by the ADB, has recently been approved for continuing capitalisation and operation through 2022 (Reklev, 2020). Beyond ASEAN and the ADB, the presence of China, India, Indonesia, Sri Lanka, Thailand and Vietnam as 'implementing participants' in the World Bank Partnership for Market Readiness (PMR), which regularly facilitates capacity exchanges, demonstrates a regional appetite for collaboration along with its political viability (further relevant Asian states act as PMR 'contributing participants' and 'technical partners').[39]

Unmet Potential

However, cooperation toward cross-boundary market links in Asia is a longer-term political and technical prospect than capacity building and transparency exchanges. Emerging Asian countries are no exception to the broader dynamic discussed in Section 3.5 that sees profoundly different levels of climate ambition and strategies for reaching climate goals.[40] Concerns on environmental co-benefits and distributional justice, and on the rights to develop national resources including land and forests, can both impede regional and international cooperation on market-based climate policies – as in fact they have in many Asian countries in the case of REDD+ (McGregor, 2015). Add to this an uneven set of regional architectures, and a story of unfulfilled cooperative potential emerges.

Institutional Architectures

ASEAN is the most institutionalised multilateral body in the Asia-Pacific and pursues environmental and energy cooperation in tangible ways, most notably via streams of work supporting annual ministerial meetings in environmental and energy sectors. It is pursuing still further integration through the creation of the ASEAN Economic Community (AEC), which seeks to reduce tariffs and non-tariff barriers in ways that could accelerate clean energy connectivity and create lower-cost carbon reduction options (ASEAN Secretariat, 2015). However, ASEAN's implementation record is mixed, and the organisation thus far has shown low levels of engagement on regional climate change and carbon pricing connectivity. The South Asian Association for Regional Cooperation (SAARC), meanwhile, has to date not taken up carbon pricing cooperation as an issue for substantive attention. Scarce significant regional architecture exists in Central Asia, with scant evidence that any regional body is well-placed to advance carbon pricing cooperation. The trilateral dialogue of China, Japan and Korea has addressed carbon market cooperation in the past (Ewing & Shin, 2017), but such collaboration in Northeast Asia has had little material bearing on the penetration of carbon pricing to the broader landscape of emerging Asian economies.

International Inputs

As such, there are limitations to originating carbon market cooperation within existing regional architectures in the Asia Pacific. There is greater potential in hybrid approaches that bring existing and prospective international structures and programs that have such cooperation at their core to apt regional dialogues and forums. Existing PMR efforts and future initiatives from the Partnership for Market Implementation (PMI), the successor programme to the PMR at the World Bank may ultimately provide such international structures. The ADB's climate facilities and funds likewise possess market connectivity support that may move carbon pricing

[39] Japan is a contributing participant while New Zealand, the Philippines and Singapore are technical partners.
[40] For comparative analysis on the NDCs of Asian countries see: https://climateactiontracker.org/.

collaboration forward.[41] Civil society brokers at the Asia Society Policy Institute (ASPI), the International Carbon Action Partnership (ICAP), and elsewhere have proved adept at bringing Asian stakeholders together for both capacity building and exchange and diplomatic discussions on future linkage potential, as has the International Emissions Trading Association (IETA) industry group for the private sector. Actors from Europe with deep experiences in developing domestic and regional carbon pricing policies have long been present in the region and have much to offer. These agents and initiatives can have a material impact on facilitating carbon pricing exchanges in the Asia-Pacific as initiating actors and sources of experience and capacity. Bringing them into ASEAN processes on climate policy integration within the AEC, annual ministerial dialogues on energy and environment and the like can meld these external inputs with the regional knowledge and buy-in needed to take them forward. Outside of Southeast Asia, regional forums will be less relevant, and capacity building efforts would do well to target individual countries or small groups with characteristics needed to pursue carbon pricing policies.

Multi-layered Stakeholder Management

Such hybrid efforts must grapple with the complex and unique-to-country dynamics driving carbon pricing policy decisions throughout emerging Asia. Indeed, the current project may be viewed as contributing to these efforts. Carbon pricing policies are typically, but not exclusively, housed in environmental regulatory bodies in the region, while powerful players in industrial, energy, and commerce sectors – along with the visions of heads of state – all hold sway over carbon pricing viability. This ever-present domestic truism is more complicated in the realm of carbon pricing cooperation, where foreign policy decision making apparatuses affect possibilities and outcomes. Figure 2 in Appendix A.1 maps some of these players in developing Asia, offering steerage on where capacity inputs need to focus.

[41] For a summary of ADB climate funds and facilities see: https://www.adb.org/themes/climate-change-disaster-risk-management/funds-facilities

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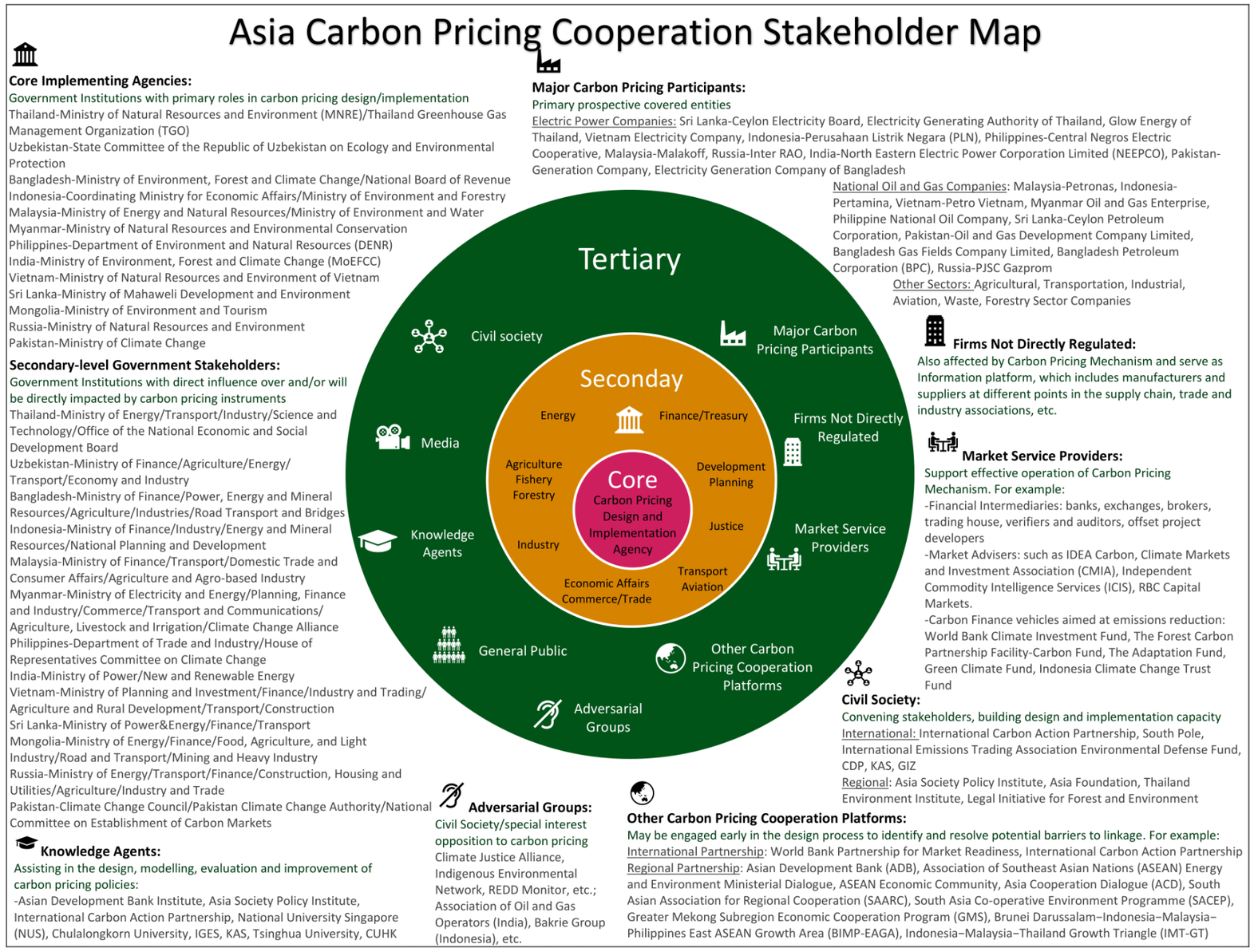
A Appendix

A.1 Asia Carbon Pricing Cooperation Stakeholder Map

Figure 2: Asia Carbon Pricing Cooperation Stakeholder Map



Source: Author's elaboration, Jackson Ewing, Duke University

A.2 Initiatives supporting national capacity building efforts

Initiative	Description	Link to landing page
Partnership for Market Readiness (World Bank)	• Provides support to prepare and implement climate change mitigation policies—including carbon pricing instruments—in order to scale up GHG mitigation • Platform to share lessons, where more than 30 countries, various international organizations, and technical experts work together to shape the future of cost-effective GHG mitigation	World Bank PMR
Carbon Market Program (Asian Development Bank)	• Financing scheme that supports the development of (GHG) mitigation projects in developing countries in Asia and the Pacific that are eligible under the Kyoto Protocol's Clean Development Mechanism • Primary aim: Help developing member countries benefit from market-based instruments to promote sustainable development • Three elements: 1. Upfront carbon financing 2. Technical CDM support 3. Marketing support (for carbon credits)	ADB Carbon Market Program
Regional Collaboration Centers and the Collaborative Instruments for Ambitious Climate Ambition (CiACA) Initiative (UNFCCC)	• Assists parties in the development of carbon pricing instruments for implementing their Nationally Determined Contributions (NDC) under the Paris Agreement; fosters cooperative climate action with other jurisdictions • Builds on existing NDC support projects, promotes awareness of carbon pricing and explore possibilities of joining carbon markets • CiACA projects are implemented with the assistance of the Regional Collaboration Centers	UNFCCC CiACA Initiative UNFCCC Regional Collaboration Centers
International Carbon Action Partnership's ETS Summer Schools	• Courses on emissions trading for developing countries and emerging economies • Intensive ten-day to two-week long introduction to all aspects of the design and implementation of emissions trading systems (ETS) as a tool to mitigate GHG emissions, with between 25 and 30 highly qualified policymakers as well as stakeholders from the non-governmental, academic and private sectors selected for each course	ICAP ETS Summer Schools

Initiative	Description	Link to landing page
	• Instructors: experienced decision makers from the relevant administrative authorities in ICAP member jurisdictions; practitioners and representatives from established educational and research institutions; market analysts; industry representatives	
Carbon Pricing Leadership Coalition (World Bank)	• Voluntary initiative that catalyzes action towards the successful implementation of carbon pricing around the world; managed by The World Bank Group • Brings together leaders from government, business, civil society and academia to support carbon pricing, share experiences and enhance the global, regional, national and sub-national understanding of carbon pricing implementation • Collects the evidence base, uses experience from around the world in designing and using carbon pricing; uses this input to help inform successful carbon pricing policy development and use of carbon pricing in businesses • Increasingly focused on advocacy aimed at contributing towards developing carbon pricing in specific sectors or regions and linking advocacy work to ongoing or planned technical support provided by Coalition partners • Four key elements: 4. Foster stakeholder engagement 5. Mobilize business engagement 6. Enhance knowledge base 7. Communicate carbon pricing	World Bank Carbon Pricing Leadership Coalition
International Emissions Trading Association	• Non-profit business organization started to establish a functional international framework for trading in GHG emission reductions; members include international companies from international companies from across the carbon trading cycle • Aims: balance economic efficiency with environmental integrity and social equity • 2020 aims: promote Article 6 to form effective linkages between carbon pricing systems over time; promote growth of new market initiatives; improve functionality and credibility of existing markets; promote carbon offsetting as transitional tool; support effective models of private sector engagement in climate finance	International Emissions Trading Association
Carbon Disclosure Project	• Non-profit charity that runs the global disclosure system for investors, companies, cities, states, and regions to manage their environmental impacts	Carbon Disclosure Project

Initiative	Description	Link to landing page
United Nations Global Compact Initiative	• World's largest corporate sustainability initiative (non-binding UN pact), calling on companies to align strategies and operations with universal principles on human rights, labor, environment and anti-corruption, and take actions that advance societal goals • Brought together with UN agencies, labor groups and civil society; cities can join the Global Compact through the Cities Program • Aim: mainstream the initiative's 10 principles (see webpage) in business activities around the world, and catalyze actions in support of broader UN goals (e.g. SDGs)	United Nations Global Compact Initiative
We Mean Business Coalition	• Global non-profit coalition working with influential businesses to act on climate change • Mobilizes businesses to set ambitious, science-based emissions reduction targets and commit to transition to 100% renewables; represents forward-looking companies and their achievements to government to shape policy environment	We Mean Business Coalition
BSR (Business for Social Responsibility)	• Global non-profit organization that works with its network of more than 250 member companies and other partners to build a just and sustainable world • Sustainability consulting; collaboration; research, working with multinational companies, government agencies, global and local NGOs	BSR
Ceres	• Sustainability non-profit organization working with investors and companies to build leadership and drive solutions throughout the economy, through networks and advocacy • Areas of focus: climate change, water scarcity and pollution, inequitable workplaces and outdated capital market systems	Ceres
World Business Council for Sustainable Development (WBCSD)	• Global, CEO-led organization of over 200 businesses • Target realization of SDGs through six work programs: 8. Circular economy 9. Cities and mobility 10. Climate and energy 11. Food and nature 12. Redefining value 13. People	WBCSD

Initiative	Description	Link to landing page
Corporate Leaders Group	• Brings together business leaders committed to supporting the transformation to competitive, sustainable, inclusive economies that will deliver net-zero carbon emissions by 2050 • Exchange of evidence-based ideas and discussions with policymakers and peers; advocates for robust business and policy solutions to environmental and sustainability challenges • Range of sectors including energy, transport, retail and consumer goods, communication, finance, infrastructure and the built environment • Convened by University of Cambridge Institute for Sustainability Leadership (CISL)	Corporate Leaders Group
The B Team	• Global business and civil society leaders sharing best practice on confronting climate, workplace equality, and governance challenges	The B Team