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Final report

For our Environment

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How can existing national climate policy instruments contribute to ETS development?

Final report

by

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Abstract

The research project “Perspectives of Linking Emission Trading Systems – Possibilities to Transition National Climate Programmes into an ETS” seeks to analyse and evaluate non-ETS climate policy instruments, such as carbon taxes or green certificate trading schemes, regarding their suitability to serve as a basis for establishing emission trading systems. The analysis proceeded in two steps: first, a generic assessment of prototypical policy instruments was made. In a second step, case studies of real-world implementation in India and Mexico were conducted. Findings from this project are meant to inform ETS development by showing how existing policy instruments could contribute to this process and by illustrating how non-ETS policy instruments could coexist with an emissions trading system, allowing for an effective policy mix.

This report represents the consolidated findings of three work packages within this research project. The first chapter provides some background information while chapter 2 introduces main concepts that represent the basis for the analysis of prototypical policy instruments in chapter 3. In a brief excursus we look at policy instrument’s benefits that could represent a barrier to the introduction of an ETS (chapter 4). the findings from the case studies Mexico and India are presented in the chapters 6 and 7, respectively. In chapter 8 we look at the co-existence of climate and energy policy instruments in the European Union and how the experiences made could inform other regions in terms of operating an ETS in parallel to other policies. Section 9 summarizes the findings providing an outlook on how the development of an ETS could be supported by taking into account existing instruments and how these could synergistically be combined with an ETS allowing for a transition towards a low carbon economy.

Kurzbeschreibung

Das Forschungsvorhaben „Perspektiven des Linking von Emissionshandelssystemen (ETS) - Überführungsmöglichkeiten nationaler Klimaschutzprogramme in ein ETS“ untersucht und bewertet Nicht-ETS-Klimaschutzinstrumente, wie z. B. Steuern oder grüne bzw. weiße Zertifikatshandelssysteme, hinsichtlich ihrer Eignung, als Ausgangsbasis für den Aufbau eines Emissionshandelssystem zu fungieren. Die Analyse erfolgte in zwei Schritten: Zunächst wurde die theoretische Eignung prototypischer Politikinstrumente betrachtet und bewertet. In einem zweiten Schritt wurden Fallstudien zur Anwendungspraxis in Indien und Mexiko durchgeführt. Die Projektergebnisse sollen die Entwicklung von Emissionshandelssystemen fördern, indem sie aufzeigen, wie bestehende Politikinstrumente zu einem solchen Aufbauprozess beitragen und wie sie im Anschluss mit diesem koexistieren können, um einen effektiven Politikmix zu ermöglichen.

Dieser Bericht stellt die konsolidierten Forschungsergebnisse zusammen, die in drei Arbeitspaketen des Projekts erarbeitet wurden. Nach einer allgemeinen Einführung in das Thema im ersten Kapitel führt Kapitel 2 zentrale Konzepte ein, die als Grundlage für die Analyse der prototypischen Politikinstrumente in Kapitel 3 genutzt werden. In einem kurzen Exkurs wird anschließend die Leistungsstruktur der Politikinstrumente betrachtet, die ein Hindernis bei der Einführung des ETS darstellen könnte. Die Ergebnisse der Länderfallstudien Mexiko und Indien werden in Kapitel 6 und 7 dargestellt. In Kapitel 8 wird die Koexistenz von Klima- und Energiepolitiken in der Europäischen Union betrachtet und erörtert, wie andere Regionen die hier gemachten Erfahrungen dabei nutzen können, ein ETS parallel zu anderen Politikinstrumenten zu betreiben. Kapitel 9 fasst die Ergebnisse zusammen und bietet einen Ausblick darauf, wie der ETS-Aufbau durch Berücksichtigung bestehender Politikinstrumente unterstützt werden könnte und wie diese synergetisch mit einem ETS kombiniert werden können, um den Übergang hin zu einer kohlenstoffarmen Wirtschaft zu ermöglichen.

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List of Abbreviations

APL	Clean Production Agreements
BAU	business as usual
BEE	Bureau of Energy Efficiency (India)
C3	Council on Climate Change (Mexico)
CBDR	Principle of Common but Differentiated Responsibilities
CCA	UK's Climate Change Agreement
CCL	UK's Climate Change Levy
CDM	Clean Development Mechanism
CEL	Clean Energy Certificates
CENACE	National Centre for Energy Control (Mexico)
CER	Certified Emission Reduction
CERC	Central Electricity Regulatory Commission
CESPEDES	Commission for Private Sector Studies on Sustainable Development
CFE	Federal Electricity Commission
CFLs	Compact Fluorescent Lamp
CHCP	Commission of Finance and Public Credit
CICC	Inter-Ministerial Commission on Climate Change
CIL	Coal India Limited
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_2e	CO_2-equivalent
COFEMER	Federal Commission for Regulatory Improvement
COP	Conference of the Parties to the UNFCCC
CPA	Component Programme Activities
CPCB	Central Pollution Control Board
CPF	Carbon Price Floor
CPS	UK's Carbon Pricing Support Mechanism
DC	Designated Consumers (Indian PAT Scheme)
DISCOM	Distribution Company
DNA	Designated National Authority
E-PRTR	European Pollutant Release and Transfer Register
EE	Energy Efficiency
EEX	European Energy Exchange
ENCC	National Climate Change Strategy

ERUs	Emission Reduction Units
ESCerts	Energy Saving Certificates (Indian PAT Scheme)
ETS	Emissions Trading System
EU	European Union
EU ETS	EU Emissions Trading System
EUR	Euros
FIT	Feed-in Tariff
G20	Group of 20
G77	Group of 77
GBP	British Pounds
GDP	Gross domestic product
GHG	Greenhouse Gas
GoO	Guarantees of Origin
GST	Goods and Services Tax
IEA	International Energy Agency
IEDT	Indian Efficiency Technology Database
IETA	International Emissions Trading Association
IEX	Indian Energy Exchange
IIP	UK's Institute of Industrial Production
IMG	Inter-Ministerial Group
INDC	Intended Nationally Determined Contribution
INECC	National Institute for Ecology and Climate Change
IPCC	Intergovernmental Panel on Climate Change
IPPs	Independent Power Producers (Indian PAT Scheme)
IT	Information Technology
ITMOs	International transferrable mitigation outcomes
JCM	Joint Crediting Mechanism
JI	Joint Implementation
LED	Light Emitting Diode
LEE	Long-term agreements on Energy efficiency for EU ETS companies
LGCC	General Law on Climate Change
LIEPS	Law on the Special Tax on Production and Services
LULUCF	Land Use, Land Use Change and Forestry
MoEFCC	Ministry of Environment, Forest and Climate Change (India)
MoU	Memorandum of Understanding

MRP	Market Readiness Proposal (in the context of PMR)
MRV	Monitoring, Reporting and Verification
MWh	Megawatt Hour
MXN	Mexican Peso
NAMA	Nationally Appropriate Mitigation Action
NAPCC	National Plan on Climate Change
NCDMA	National CDM Authority India
NCEF	National Clean Energy Fund
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organisation
NLDC	National Load Dispatch Center
NMEEE	National Mission for Enhanced Energy Efficiency (India)
NO_x	Nitrogen Oxide
OECD	Organisation for Economic Co-operation and Development
OTC	Over-The-Counter
PAT	Perform Achieve and Trade Mechanism
PECC	Special Climate Change Programme
PEMEX	Petróleos Mexicanos
PMR	Partnership for Market Readiness Initiative
PoA	Programme of Activity
PV	Photovoltaics
PXIL	Power Exchange India Limited
R&D	Research & Development
RE	Renewable Energy
REC	Renewable Energy Credit System (India)
RECs	Renewable Energy Certificates
RENE	National Registry on Emissions (Mexico)
RPO	Renewable Purchase/Portfolio Obligation
RPS	Renewable Portfolio Standard
S-CEL	System for the Management and Issuance of Clean Energy Certificates (Mexico)
SAT	Tax Administration Service
SEC	Specific Energy Consumption
SEMARNAT	Secretariat of Environment and Natural Resources (Mexico)
SENER	Secretariat of Energy (Mexico)
SERC	State Electricity Regulatory Commission (Mexico)

SHCP	Secretariat of Finance and Public Credit (Mexico)
SLDC	State Load Dispatch Center
SME	Small and Medium Enterprises
SO_x	Sulphur Oxide
SPCB	State Pollution Control Board
SPV	Solar Photovoltaic
TGCs	Tradable Green Certificates
TWC	Italian Tradeable White Certificate scheme
TWh	Terrawatt Hour
UNFCCC	United Nations Framework Convention on Climate Change
USD	US Dollar
TWh	Terrawatt Hour
UNFCCC	United Nations Framework Convention on Climate Change
USD	US Dollar

Summary (EN)

Introduction

If implemented adequately, carbon pricing can be an effective and efficient climate policy instrument that facilitates least cost compliance with climate targets. It can have also have a more 'systemic' effect than other policy approaches, as the carbon price incentive can influence operational and investment decisions throughout the supply chain. One key feature of emissions trading systems (ETS) as one carbon pricing instrument is that they provide certainty regarding the future level of emissions by establishing a cap on emissions.

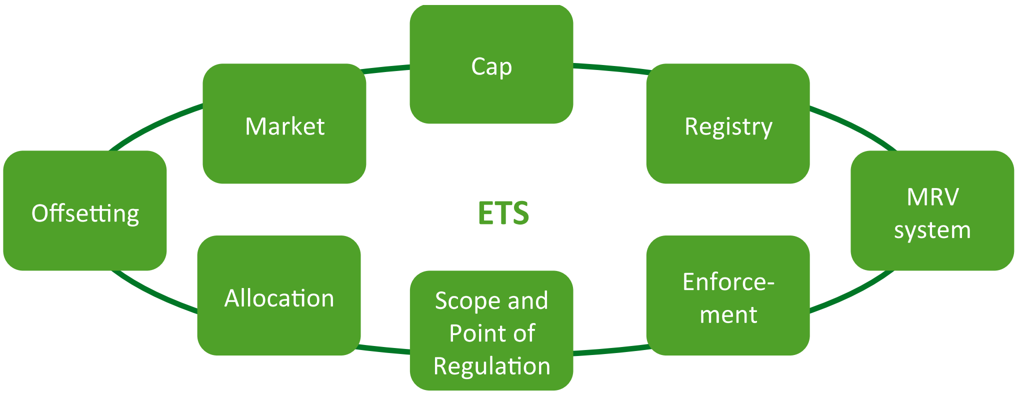
Many countries already have other policy instruments in place, which, in addition to other impacts, reduce GHG emissions, or are in the process of developing such policies, including carbon taxes and other market-based mechanisms, such as green and white certificate systems, or non-market-based policy instruments, such as standards and obligations. With many countries currently aiming at introducing an ETS, the question raises whether elements of such (non-ETS) policy instruments may serve as a basis for establishing an emissions trading system.

Introducing Main Concepts

ETS Building Blocks

To explore this question, we first identified the key components of an emissions trading system, its 'ETS building blocks'. We identified eight of these building blocks (see Figure 1 below). One example of such a building block is the emission cap of the trading system, which defines the maximum quantity of emission allowances issued by the regulator and is thereby one of the key determinants of the mitigation impact of the ETS.

Figure 1: ETS building blocks as key determinants of a functioning ETS



Source: Own illustration

While all building blocks have their own functions and roles in the ETS, they cannot be seen in isolation from each other since building blocks can impact each other (e.g. cap and scope) and/or (steps towards) the establishment of some building blocks might be required for designing or operating others.

Preconditions

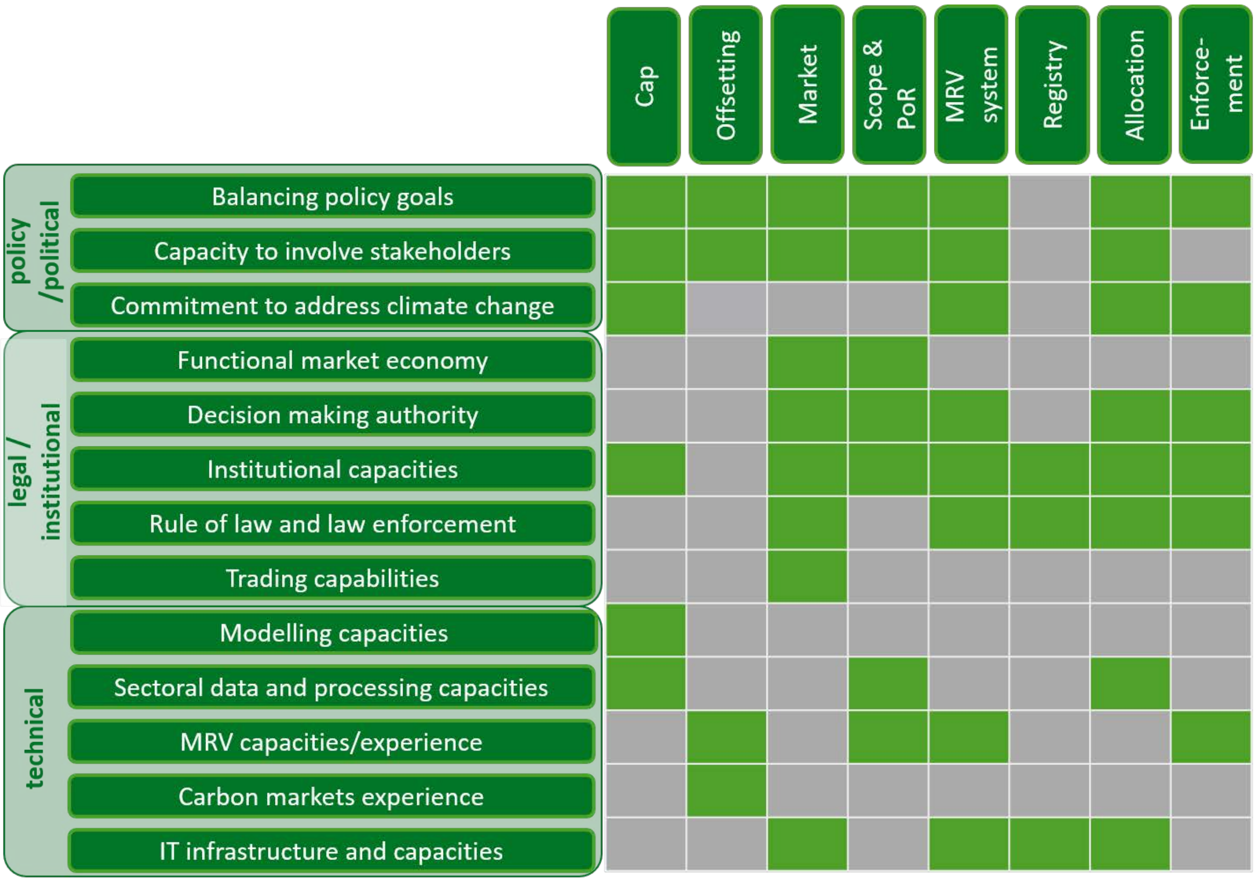
Each of the ETS building blocks requires a specific set of preconditions in order to be established. These preconditions can be structured along three tracks:

The preconditions on the political / policy track inter alia relate to the goals that will be achieved with the ETS as a climate policy instrument, who will be subjected to the instrument, what negative impacts are considered acceptable and how costs and benefits are shared.

The institutional / legislative track covers the preconditions needed for allocating and implementing tasks and responsibilities for establishing and operating the ETS to the different actors and providing a legislative basis for the system. Existing institutions may take on new tasks, and new structures, mandates and knowhow may be required.

The technical track relates to preconditions relevant for establishing the 'technical infrastructure' of the ETS, without which a system could not operate or may be considered unreliable and not credible. Data availability is one key aspect in this regard, but also accessing and safeguarding the market (registry, trading platforms). Figure 2 below illustrates the preconditions on the three tracks and their relevance or the different ETS building blocks. For a detailed description please see section 2 of this report.

Figure 2: Relationship between the preconditions and the ETS building blocks



Source: Own illustration. The table illustrates the relationship between the preconditions (left vertical column) and the different ETS building blocks (upper horizontal row). Green boxes highlight areas where a precondition is particularly relevant for the building block.

Potential Contributions of Different Policy Instruments to the Establishment of an Emissions Trading System

Building on this conceptual foundation, the study analysed policy instruments regarding their potential to contribute to these preconditions and hence support the ETS development process. The analysis proceeded in two steps:

- A generic assessment of prototypical policy instruments;
- Case studies of real-world implementation in India and Mexico.

In the generic policy assessment, we explored how non-ETS policy instruments can prototypically assist the ETS development process. The focus of the analysis was put on economic policy instruments, in particular market mechanisms, while other types of instruments, such as regulatory approaches have also been covered. The assessment's findings indicate that there are significant differences regarding how non-ETS instruments can contribute to the ETS development process. Instruments combining mandatory obligations with a trading component (green and white certificate trading schemes) have generally been found to have the greatest overall potential for being used as a basis for ETS development, followed by carbon taxes and performance standards. While the contributions of these policy instruments could be further increased by adapting their design to the requirements of an ETS, other policy instruments (technology standards, GHG crediting mechanisms and voluntary agreements), in contrast, provide considerably less contributions to the preconditions of ETS development. The analysis further revealed that actual contributions of instruments may be largely contingent on their design and the national situation in which they are implemented. Table 1 below summarizes the main findings of the generic assessment.

Table 1: Overview of instruments' contributions to ETS preconditions and their ranking

Track	Precondition	Green certificates	White certificates	GHG crediting	Carbon Taxation	Technology standard	Performance standard	Voluntary agreements
Policy/ political	Balancing policy goals	3	3	1	3	1-2	3	1-2
	Capacity to involve stakeholders	2-3	2-3	1	2-3	2	2	2
	Commitment to address climate change	2	2	1-2	2	2	2	1-2
Legal/ Institutional	Functional market economy	3	2	1	3	1	1	1
	Decision making authority	2	2	2	3	3	3	2
	Institutional capacities	3	3	1	2	2	2-3	2
	Rule of law and law enforcement	3	3	1-2	3	3	3	1-2
	Trading capabilities	3	3	2	1	1	1	1
Technical	Modelling capacities	2	2	1	2	1-2	2-3	2

Track	Precondition	Green certificates	White certificates	GHG crediting	Carbon Taxation	Technology standard	Performance standard	Voluntary agreements
	Sectoral data and processing capacities	2-3	2-3	2-3	2-3	1	2-3	1-2
	MRV capacities/experience	2-3	2-3	2	2-3	1-2	2-3	2
	Carbon markets experience	1	1	3	1-2	1	1	1
	IT infrastructure and capacities	3	3	1	1	1	1	1
Total score		31-34	31-33	19-21	27-31	20-23	25-29	19-22

Source: Own compilation. The table illustrates the contribution of policy instruments to the individual preconditions. The contributions can either be weak (1), medium (2) or strong (3). In some cases, the contribution depends on how the policy instrument is designed and therefore ranges between two levels (1-2 or 2-3).

The case studies assessed how existing policy instruments in India and Mexico could contribute to an ETS development process. The analysis focussed on three types of instruments: green certificates (named “clean energy certificates” in Mexico and “Renewable Energy Certificates” in India), white certificates (PAT scheme in India) and carbon taxes (carbon tax in Mexico and “coal cess” in India). The findings are based on desktop research, complemented by interviews held in Mexico City, New Delhi and Bonn with representatives from federal ministries, research institutions, the private and public sector as well as civil society. The following section summarizes the main findings from the analysis, ordered by type of instrument. For the in-depth country analysis, please see section 6 for Mexico and section 7 for India.

Mexico’s Clean Energy Certificates

The Clean Energy Certificates (CELs) were introduced in 2014 with the Electric Industry Law, which requires power suppliers and large consumers to hold clean energy certificates according to a certain share of their energy consumed or supplied. 2018 is the first year of compliance. With the CEL system a virtual commodity is created which can be traded among covered entities and clean energy operators on the spot market or by signing bilateral agreements. In addition, long-term auctions are held in order to assign contracts for the disposal and acquisition of CELs.

With its trading component, the CEL system can deliver a particularly strong contribution providing critical political experience and institutional knowledge relevant for establishing some of the ETS building blocks, notably cap setting and market. The CEL system can further deliver relevant sectoral data. The overall CEL requirement was developed on a scientific basis and by taking into account numerous parameters and scenarios. This procedure could inform the process of establishing a cap under an ETS, as it might facilitate the acceptance of the affected entities to introduce a robust instrument. In this regard, the positive experiences made with involving stakeholders may also serve as a blueprint for introducing the ETS. Due to its market nature, the CEL system can provide strong contributions to the market components of an ETS: Institutional capacities of market regulators, operators as well as participants will presumably provide a solid basis for the establishment of allowance trading, while the legal definition of CELs and the treatment of market transactions could be used as a blueprint for defining these aspects under an ETS. Similarly, the S-CEL registry covers several functions needed under an ETS making it a promising starting point for the development of a registry under the ETS. With 2018 being the first compliance year, however, no assessment of the implementation of the CEL system can yet be made. As can be seen from Figure 3 below, the CEL system can provide important contributions to many ETS building blocks and their relevant preconditions.

Figure 3: Contributions of Mexico's CEL system

	Cap	Offsetting	Market	Scope & PoR	MRV system	Registry	Allocation	Enforcement
Balancing policy goals	+		+				+	
Capacity to involve stakeholders	++		++				+	
Commitment to address climate change								
Functional market economy			+	+				
Decision making authority			+++	+				
Institutional capacities	++		+++	+	++	++		+
Rule of law and enforcement								
Trading capabilities			+					
Modelling capacities	+++							
Sectoral data and processing capacities	++							
MRV capacities/experience				+	+			
Carbon markets experience								
IT infrastructure and capacities			+++			+++		

Source: Own illustration. The figure illustrates the relationship between preconditions (left vertical column) and the different ETS building blocks (upper horizontal row) and shows in which areas the CEL system may provide contributions to the ETS development process (green plus signs and yellow circles).

India's REC Mechanism

In 2010, the Renewable Energy Certificate (REC) mechanism was introduced by the Indian Government. REC is a green certificate trading scheme, allowing its participants to trade the environmental value of renewable energy generation without having to physically transfer the associated amount of electricity. Demand for such certificates is generated through renewable portfolio obligations (RPOs). Every Indian State specifies in its RPO what share of electricity supply needs to be met through renewable energy sources. It covers electricity generation installations, electricity suppliers and large electricity consumers.

The REC mechanism has been subject to criticism due to the fact that there is only very limited trading activity. Stakeholders highlighted different reasons for this: one major problem is the lack of compliance of obligated entities and the non-enforcement of obligations. Part of the problem is that enforcement responsibility lies within the hands of individual state governments instead of one centralized entity. State governments, however, shy away from enforcement due to the difficult situation of India's electricity system, where stability of electricity supply already is a huge challenge. Further increasing pressure on electricity supply by imposing RPO obligations in a country where a significant section of the population has no access to electricity is a highly politicized endeavour. This undermines the political support behind the REC scheme. Please refer to the case study on India in section 7 for a more detailed explanation of the current challenges of the REC mechanism.

Nevertheless, several lessons can be learnt from the REC mechanism – also relating to ETS building blocks and preconditions. Most importantly, the institutional set-up and, in particular, the enforcement power of institutions responsible for the implementation and operation of an ETS need to be appropriate. In the Indian context, this means that, if enforcement institutions are placed on the regional level, there needs to be a close cooperation with the national body/ministry.

Other contributions to ETS building blocks include the established technical, legal and institutional processes for trading and MRV. For example, renewable energy generators can apply for issuance of REC on a web-based IT platform that is connected to a registry where the amount of electricity supplied to the grid is specified. Figure 4 below shows which ETS building blocks the experience with the REC mechanism can inform.

Figure 4: Contributions of India's REC mechanism

	Cap	Offsetting	Market	Scope & PoR	MRV system	Registry	Allocation	Enforce-ment
Balancing policy goals	+		+					
Capacity to involve stakeholders	+		+					
Commitment to address climate change								
Functional market economy			+					
Decision making authority				+				
Institutional capacities	+		+	+	+	+		+
Rule of law and enforcement								
Trading capabilities			++					
Modelling capacities	+							
Sectoral data and processing capacities	+							
MRV capacities/experience				+	++			
Carbon markets experience								
IT infrastructure and capacities			++			++		

Source: Own illustration. The figure illustrates the relationship between preconditions (left vertical column) and the different ETS building blocks (upper horizontal row) and shows in which areas the Indian REC mechanism may provide contributions to the ETS development process (green plus signs and yellow circles).

India's PAT Mechanism

The Indian Perform, Achieve and Trade (PAT) mechanism is a market-based mechanism targeting the Specific Energy Consumption (SEC) of energy intensive industries.[1] The SEC-reduction target is defined for each company on the basis of its past energy consumption. If the company exceeds its target (i.e. over-performs), it receives Energy Saving Certificates (ESCerts) for the excess savings achieved, which can be sold on the market. If it fails to meet its target, it needs to buy ESCerts from the market. Over-achievers and under-achievers can trade through specific energy exchanges in order to reach compliance. Non-compliance (after trading) initiates a penalty process.

The experience gained with setting up this country-wide mechanism will be valuable for any future market-based instrument. The PAT scheme is well advanced in terms of the policy, legal/institutional and technical dimension: benchmark methodologies were developed with the required data having been collected for sector-wide baselines and used for setting company-specific targets. Multiple stakeholder consultations were held and IT-infrastructure, registries and a trading platform were set up. All this could directly inform the process of setting up an ETS. The PAT scheme has been announced in 2008, and the first trading activities for the first compliance cycle (2012 – 2015) took place at the end of 2017. The PAT scheme's performance on enforcement cannot be judged yet at the time of writing this report. As can be seen from Figure 5 below, the PAT scheme can provide important contributions to many ETS building blocks and their relevant preconditions.

Figure 5: Contributions of India's PAT scheme

	Cap	Offsetting	Market	Scope & PoR	MRV system	Registry	Allocation	Enforce-ment
Balancing policy goals	+		+					
Capacity to involve stakeholders	++		+					
Commitment to address climate change								
Functional market economy			+					
Decision making authority			++	+				
Institutional capacities	++		+++	+	++	++		+
Rule of law and enforcement								+
Trading capabilities			++					
Modelling capacities	+							
Sectoral data and processing capacities	+++			++			+	
MRV capacities/experience				++	+++			
Carbon markets experience								
IT infrastructure and capacities			+++			+++		

[1] The SEC is defined as net energy use within the plant boundary (energy going into the plant) divided by the total quantity of product output exported from the plant boundary. For further clarifications, please refer to the case study on India.

Source: Own illustration. The figure illustrates the relationship between preconditions (left vertical column) and the different ETS building blocks (upper horizontal row) and shows in which areas the PAT scheme may provide contributions to the ETS development process (green plus signs and yellow circles).

Mexico's Carbon Tax

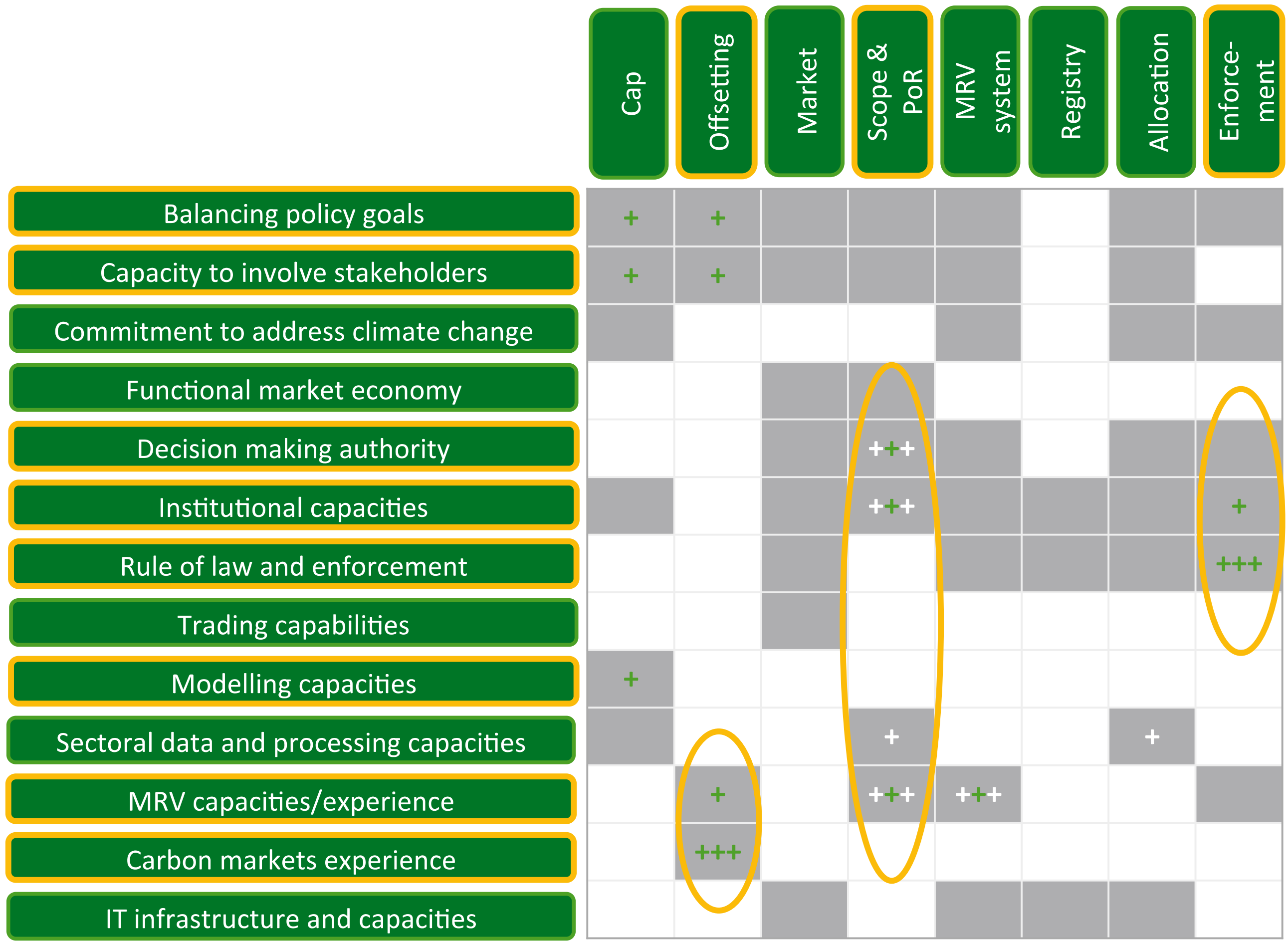
The Mexican carbon tax was established as part of a larger fiscal reform and entered into force in January 2014. The basis for the introduction of the tax was established by the General Law on Climate Change (LGCC). According to the then President Peña Nieto's draft decree from September 2013, the carbon tax has the dual objective to reduce GHG emissions and increase revenue generation while also providing non-climate benefits (Presidencia de la Republica 2013). The political process of introducing the carbon tax was heavily influenced by the fossil fuel industry, resulting in a low overall tax level which exempted natural gas.

The tax is designed as an upstream system and is imposed on the sale and import of fossil fuels. The monitoring and reporting system of the tax is characterized by its simplicity: Tax payers are required to regularly report the price, value and volume for all fossil fuels sold (or imported) and allow physical controls. One peculiarity of the Mexican carbon tax is the offsetting option, which allows tax payers to use CERs from Mexican CDM projects. The implementing rules for this offsetting option were published in December 2017. Hence, there is no experience yet with their application.

As can be seen from Figure 6 below, the carbon tax can provide limited contributions to the ETS development process. The contributions to some building blocks and their preconditions may further depend on the specific design of the ETS envisaged: If an upstream ETS was put in place, the carbon tax could inform the scope of the ETS and its monitoring, reporting and verification (MRV) system, since the point of regulation would coincide. For a mid-stream ETS (i.e. installation- or company-based), in contrast, the carbon tax is too limited in scope.

As the carbon tax does not pose limits on the amount of GHG emissions that can be emitted by the target group, the carbon tax cannot be used directly as the basis for setting a cap for the ETS. The carbon tax's offsetting component could provide a basis for developing an offsetting option under the ETS. However, whether these contributions will be substantial depends on how the regulations will be applied. Due to the fact that the carbon tax is integrated into Mexico's fiscal system, many of the elements on which it is built cannot be used for establishing the institutional and legal structure of the ETS. For instance, the enforcement system of the carbon tax is built into the fiscal system and cannot be directly used to ensure entities' compliance with their ETS obligations. However, experiences made in dealing with attempts of tax evasion could be used when developing the enforcement system of the ETS. In terms of modelling capacities, which are relevant for defining the cap of the ETS, the carbon tax can provide valuable contributions. However, additional capacity development measures are required to apply these capacities in the market context and to process emissions data. As the tax has no trading component, there is no registry with accounts for individual entities and contributions to establishing such a system for the ETS will be limited.

Figure 6: Contributions of Mexico's carbon tax



Source: Own illustration. The figure illustrates the relationship between preconditions (left vertical column) and the different ETS building blocks (upper horizontal row) and shows in which areas the carbon tax may provide contributions to the ETS development process (green plus signs and yellow circles). White plus signs denote the potential expansion of the contribution under certain circumstances. As indicated by the white plus signs, the contributions to the building blocks scope/point of regulation and MRV will be much higher if an upstream system is taken into consideration.

India's coal cess

In 2010, the Government of India introduced a tax on domestically produced and imported coal, formally called "Clean Energy Cess", recently renamed as "Clean Environment Cess", while informally the term "coal cess" prevails.[2] It applies to domestically produced and imported coal, including briquettes, ovoids and similar solid fuels manufactured from coal, and coal derivatives such as lignite and peat.

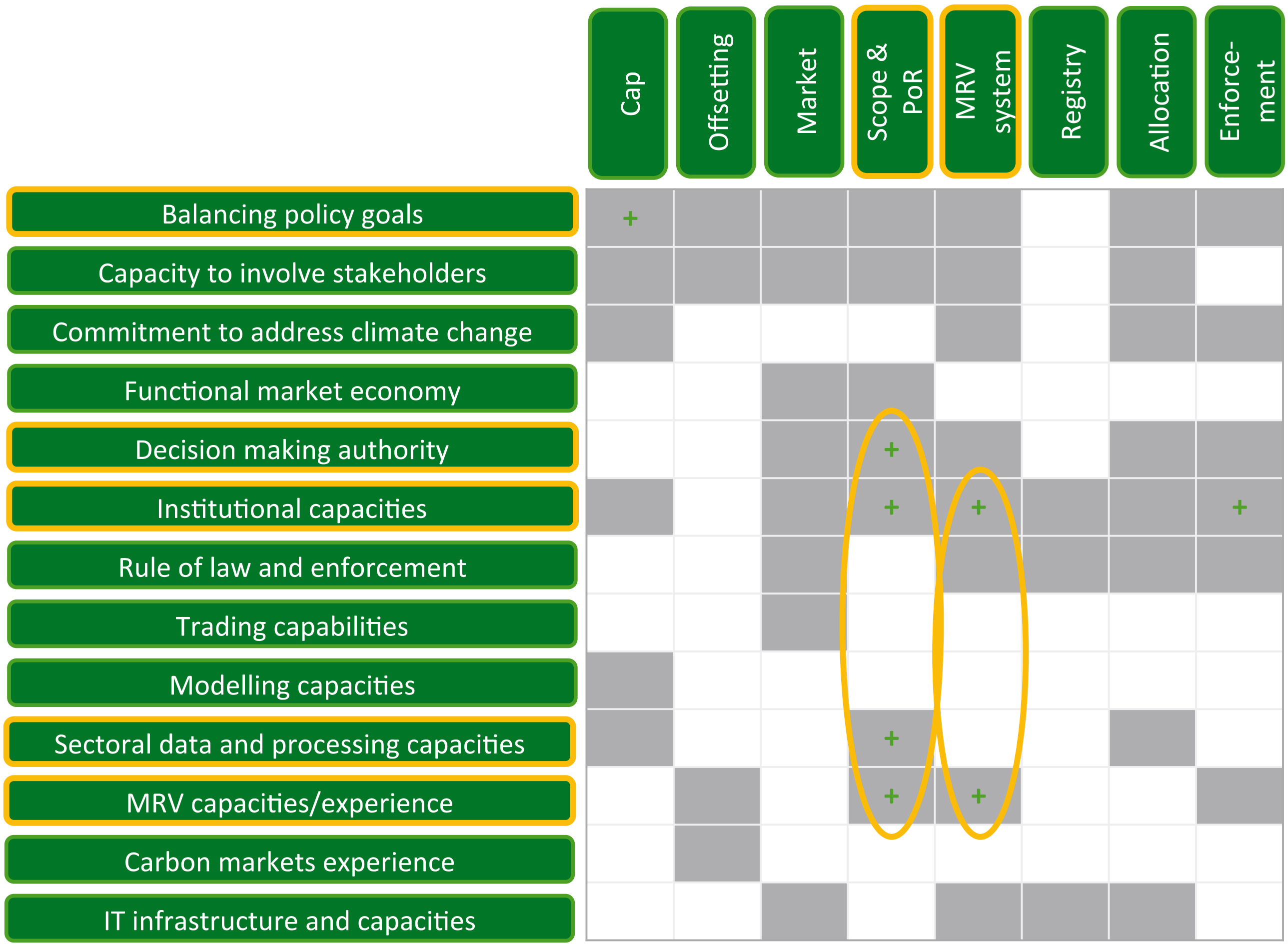
Initially, the coal cess was set at INR 50 (USD 0.75) per ton of coal, but it has been steadily increased over the years and reached INR 400 (USD 6) per ton in 2016. Revenues from the coal cess were initially meant to ensure capitalization of the National Clean Energy Fund (NCEF) that was established in 2010-2011. The NCEF provides financial support to public and private sector entities seeking to invest in research and innovative projects in clean energy technologies. However, almost 50% of the total revenue of INR 54,336 crore (~8.5 billion USD) collected by the coal cess so far has not yet been transferred to the Fund, while only 16% has gone towards financing of projects. It has become evident in

[2] Emanating from the colonial times the term "cess" is common in India and refers to a tax. Usually it is used with a qualifying prefix (education cess, irrigation cess, etc.)

August 2017 that the unutilized revenues have been diverted to state budgets that faced a loss as a consequence of a reform of India's goods and services tax.

The coal cess is not a carbon tax in the narrow sense since it taxes GHG emissions only indirectly through the production 'tons of coal'. Therefore, it does not provide lessons learnt related to MRV of GHG emissions, to setting up trading markets, registries or IT-systems. It neither provides means to inform any cap setting and allocation process, nor does it provide much information of the scope of a potential ETS because the number of (mostly public) entities covered by the coal cess is quite low. However, it can be argued that the coal cess increases legal and institutional readiness due to the requirements for MRV and tax collection. Figure 7 below shows which ETS building blocks the experience with the coal cess can inform.

Figure 7: Contributions of India's coal cess



Source: Own illustration. The figure illustrates the relationship between preconditions (left vertical column) and the different ETS building blocks (upper horizontal row) and shows in which areas India's coal cess may provide contributions to the ETS development process (green plus signs and yellow circles).

Mexico's ETS Development and Reflections on Further Advancing the Process

The Mexican case study's findings indicate that existing policy instruments - the carbon tax and the clean energy certificates (CEL) trading scheme - could provide significant support to the ETS development process in Mexico. This is particularly relevant given the fact that, in political terms, the process of establishing an ETS in Mexico is significantly advanced: With the adoption of the reformed General Law on Climate Change (LGCC) there is now a solid legal basis for establishing a mandatory ETS.

In the process of developing the ETS, the government is now engaging with the private sector and has established a working group to discuss design issues of the ETS. To further advance this process, a strong inter-ministerial cooperation will also be key. These processes could be institutionalised building on existing structures. This could allow to better take into consideration the experiences made by other ministries during the introduction and operation of the CEL system and the carbon tax as well as to deal with the opposition against the introduction of the ETS. Inter-ministerial cooperation could also contribute to properly align the existing policy instruments with the future ETS, since in generic terms, the introduction of the ETS should not be used as an argument for the discontinuation of existing policy instruments. Instead, existing (and future) instruments should be smartly combined to address the different market failures preventing the transition towards a low carbon economy in Mexico.

India's ETS Development and Future Prospects

The case study on India finds that there is limited potential to introduce an ETS in the country in the short to medium term. The political willingness to move towards a policy instrument that specifically focuses on absolute carbon GHG emissions is low given India's political priorities of social and economic development. This has influenced the design of policy instruments. The innovative trading mechanisms, the REC Mechanism for renewable energy quotas and the PAT Scheme for energy efficiency certificates, have deliberately not been denominated in terms of GHG emissions. Also, a tax on coal production and imports that has been increased several times ("coal cess") that could have been labelled as carbon tax officially targets coal as raw material rather than its carbon content. Likewise, India's Nationally Determined Contribution (NDC) does not define absolute but just intensity-based GHG emissions targets.

Nevertheless, the analysed policy instruments – in particular the PAT and REC schemes - are generating valuable lessons that could significantly contribute to the core building blocks of a functional ETS. These mechanisms have created a viable institutional infrastructure for certificate trading and established monitoring, reporting and verification systems throughout different sectors. However, liquidity and trading action in both markets have been disappointing to date. This is due to a generic lack of enforcement under REC scheme, while the coal cess does not have implementation problems. The trading schemes thus suffer from an absence of effective incentives for participation. With regards to other ETS building blocks, such as cap setting and allocation of allowances, the existing policy instruments provide only limited insight.

Still, if India in the next 15 years decides to introduce an ETS either on a national or State level, it can build upon important institutional structures and experiences made with both trading schemes and carbon taxation.

Key Messages and Outlook

The case studies confirmed the findings from the generic analysis: Several of the policy instruments analysed could in principle provide strong contributions to an ETS development process. Actual contributions might, however, depend on the design of the existing policy instrument as well as on how the envisaged ETS will be designed. Other key factors influencing the potential of existing instruments to contribute to an ETS development process is timing and the maturity of the policy instruments. If timing is right and non-ETS policy instruments are sufficiently mature, they could inform the ETS development process. Building the ETS on existing policy instruments might further allow for the generation of synergies and reduce political opposition towards the introduction of an ETS.

Using existing instruments as stepping stones towards an ETS does not automatically mean that existing policy instruments must be abolished. There are several arguments that speak in favour of operating other policy instruments in parallel to an ETS: An ETS cannot address all the different causes that lead to a GHG emissions intense economy and tackling these requires more than one instrument to be in place. Combining the existing non-ETS instrument with an ETS may therefore be considered a more promising way of addressing the different barriers to low-carbon development, assist in achieving multiple non-climate related policy objectives and secure political support from stakeholders. Concerns about double burden and inefficiencies can be addressed by considering the impact of other policies during the design and operation of the ETS, for instance at the moment of defining and readjusting the cap of the system. In this regard, the experiences made in Europe and in other regions where emissions trading systems are operated along other instruments could be extremely valuable for countries now introducing their own ETS, allowing them to achieve an effective policy mix and to transition towards a low carbon economy.

Zusammenfassung (DE)

Einleitung

Bei zweckmäßiger Umsetzung kann Carbon Pricing ein effektives und effizientes Politikinstrument sein, das die Umsetzung von Klimazielen zu möglichst geringen Kosten unterstützt. Es kann zudem einen stärkeren systemischen Effekt haben als andere Politikansätze, da der CO_2-Preis das operative Geschäft sowie Investitionsentscheidungen entlang der Wertschöpfungskette beeinflussen kann. Emissionshandelssysteme als Instrumente zur Bepreisung von CO_2 zeichnen sich dadurch aus, dass sie Gewissheit über das zukünftige Emissionsniveau bieten, indem sie eine Obergrenze auf Emissionen setzen.

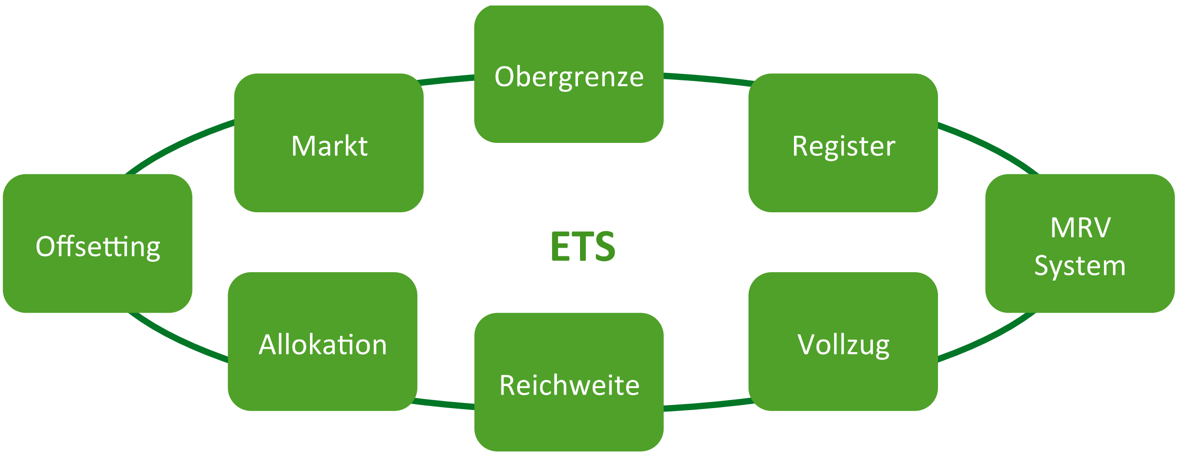
Zahlreiche Länder verfügen bereits über andere Politikinstrumente, die, neben weiteren Effekten auch zu einer Minderung von Treibhausgasemissionen beitragen. Andere Staaten wiederum sind im Begriff, solche Politikinstrumente zu entwickeln. Hierzu zählen neben CO_2-Steuern oder anderen marktbasierten Instrumenten, wie Systeme für den Handel mit grünen oder weißen Zertifikaten, auch nicht-marktbasierte Politiken, wie Standards und Verpflichtungen. Angesichts der Tatsache, dass zahlreiche Länder derzeit die Einführung eines Emissionshandelssystems anstreben, stellt sich die Frage, ob einzelne Elemente dieser nicht-ETS Politikinstrumente zum Aufbau eines Emissionshandelssystems beitragen können.

Einführung zentraler Konzepte

ETS Building Blocks

Um dieser Frage nachzugehen, wurden zunächst die zentralen Bestandteile eines Emissionshandelssystems identifiziert, die so genannten „ETS Building Blocks". Insgesamt haben wir acht dieser Building Blocks identifiziert (siehe Abbildung 1). Ein Beispiel eines solchen Building Blocks ist die Emissionsobergrenze (Cap) des Handelssystems, welches die maximal zulässige Menge an Emissionsberechtigungen definiert, die von Seiten des Regulierers ausgegeben werden kann. Damit ist die Emissionsobergrenze einer der bestimmenden Faktoren für den Minderungseffekt des ETS.

Abbildung 1: Die ETS Building Blocks als Eckpfeiler eines funktionierenden ETS



Quelle: Eigene Darstellung

Während alle Building Blocks ihre eigenen Funktionen und Rollen im ETS besitzen, können sie nicht getrennt voneinander betrachtet werden, da sie sich gegenseitig beeinflussen können, wie beispielsweise die Reichweite des Systems und dessen Emissionsobergrenze. Zudem setzt die Ausgestaltung und Umsetzung mancher Building Blocks voraus, dass andere bereits vollständig oder zumindest teilweise entwickelt sind.

Voraussetzungen

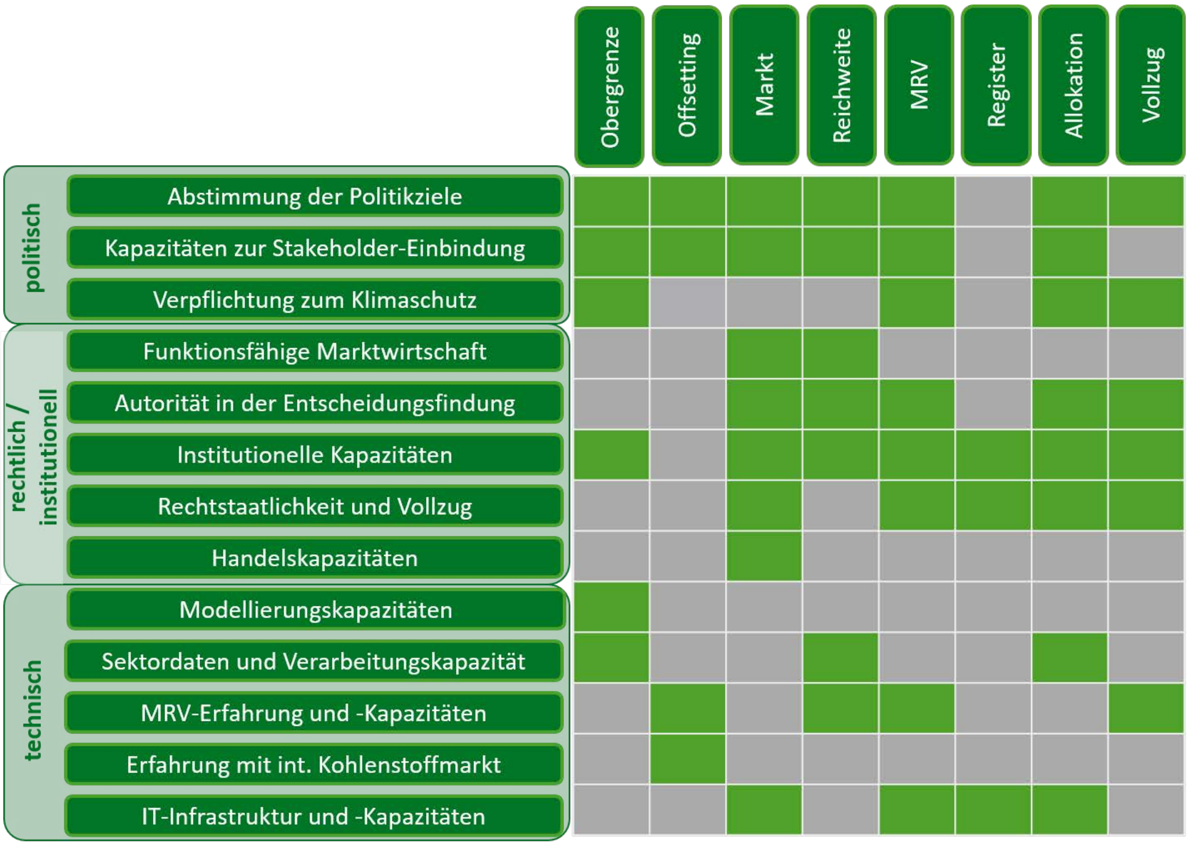
Für die Entwicklung eines jeden der identifizierten Building Blocks ist ein bestimmter Satz an Voraussetzungen erforderlich. Diese Voraussetzungen können anhand von drei Strängen strukturiert werden:

Die Voraussetzungen auf dem politischen Strang beziehen sich unter anderem auf die Ziele, die mithilfe des ETS als Instrument der Klimapolitik erreicht werden sollen. Dabei stellen sich unter anderem die Frage danach, wer von dem Instrument erfasst werden soll, welche negativen Folgen als annehmbar erachtet werden und wie Kosten und Nutzen verteilt werden sollen.

Der rechtlich / institutionelle Strang deckt jene Voraussetzungen ab, die relevant sind, um den verschiedenen Akteuren die Aufgaben und Verantwortlichkeiten zum Aufbau und der Umsetzung des ETS zuzuweisen sowie um die legislative Grundlage des ETS zu schaffen. Bestehende Institutionen könnten neue Aufgaben übernehmen und neue Strukturen, Mandate und auch Expertise könnten erforderlich werden.

Der technische Strang bezieht sich auf jene Voraussetzungen, die bedeutend sind für den Aufbau der technischen Infrastruktur des ETS, ohne die ein solches System nicht funktionsfähig oder unzuverlässig und unglaubwürdig wäre. Die Verfügbarkeit von Daten ist hier von besonderer Bedeutung, doch auch der Zugang zum Markt (über Register und Handelsplattformen) und dessen Sicherheit sind zentral. Abbildung 2 unten zeigt die Vorbedingungen auf den drei Strängen sowie deren Bedeutung für die verschiedenen Building Blocks. Für eine detaillierte Beschreibung siehe Kapitel 2 des Berichts.

Abbildung 2: Verhältnis zwischen den Voraussetzungen und den ETS Building Blocks



Quelle: Eigene Darstellung. Die Abbildung illustriert das Verhältnis zwischen den Voraussetzungen (linke Spalte) und den verschiedenen ETS Building Blocks (obere Zeile). Grüne Kästchen heben jene Bereiche hervor, in denen eine Vorbedingung von besonderer Bedeutung für das Building Block ist.

Potentielle Beiträge unterschiedlicher Politikinstrumente für den Aufbau eines Emissionshandelssystems

Aufbauend auf dieser konzeptionellen Grundlage analysiert die Studie Politikinstrumente hinsichtlich ihrer Eignung, zu den Voraussetzungen beizutragen und somit den ETS-Aufbauprozess zu unterstützen. Die Analyse erfolgte in zwei Schritten:

- Eine allgemeine Bewertung prototypischer Politikinstrumente
- Fallstudien zur Anwendungspraxis in Indien und Mexiko

In der allgemeinen Bewertung wurde untersucht, wie nicht-ETS Politikinstrumente grundsätzlich zum ETS-Aufbauprozess beitragen können. Hierbei wurde der Schwerpunkt auf ökonomische Instrumente und insbesondere auf marktbasierte Mechanismen gelegt, während andere Instrumententypen, darunter regulatorische Ansätze, auch berücksichtigt wurden. Die Ergebnisse der Analyse deuten darauf hin, dass erhebliche Unterschiede darin bestehen, wie nicht-ETS Politikinstrumente zum ETS-Aufbauprozess beitragen können. Instrumente, die verbindliche Verpflichtungen mit einer Handelskomponente verknüpfen (Handel mit grünen oder weißen Zertifikaten) wiesen das größte Gesamtpotenzial auf, als Ausgangspunkt für ein ETS genutzt zu werden, gefolgt von CO_2-Steuern und Leistungsstandards. Während sich die Beiträge dieser Instrumente durch eine Anpassung des Instrumentendesigns an die Anforderungen eines ETS weiter steigern ließen, lieferten andere Politikinstrumente (Technologiestandards, Treibhausgas-Crediting und freiwillige Vereinbarungen) weitaus geringere Beiträge zum ETS-Aufbau. Wie die Analyse zudem offenlegte, ist der tatsächliche Beitrag der Instrumente weitgehend abhängig von deren Ausgestaltung sowie der nationalen Situation, unter der diese umgesetzt werden. Tabelle 1 fasst die zentralen Ergebnisse der Auswertung zusammen.

Tabelle 1: Beiträge der Politikinstrumente zu den Vorbedingung und Ranking

Strang	Vorbedingung	Grüne Zertifikate	Weiße Zertifikate	THG-Crediting	CO2-Steuer	Technologie-Standard	Leistungsstandard	Freiwillige Vereinbarungen
Politisch	Abstimmung der Politikziele	3	3	1	3	1-2	3	1-2
	Kapazitäten zur Stakeholder-Einbindung	2-3	2-3	1	2-3	2	2	2
	Verpflichtung zum Klimaschutz	2	2	1-2	2	2	2	1-2
Rechtlich/ Institutionell	Funktionsfähige Marktwirtschaft	3	2	1	3	1	1	1
	Autorität in der Entscheidungsfindung	2	2	2	3	3	3	2
	Institutionelle Kapazitäten	3	3	1	2	2	2-3	2
	Rechtstaatlichkeit und Vollzug	3	3	1-2	3	3	3	1-2
	Handelskapazitäten	3	3	2	1	1	1	1

Strang	Vorbedingung	Grüne Zertifikate	Weiße Zertifikate	THG-Crediting	CO2-Steuer	Technologie-Standard	Leistungsstandard	Freiwillige Vereinbarungen
Technisch	Modellierungskapazitäten	2	2	1	2	1-2	2-3	2
	Sektordaten und Verarbeitungskapazität	2-3	2-3	2-3	2-3	1	2-3	1-2
	MRV-Erfahrung und -Kapazität	2-3	2-3	2	2-3	1-2	2-3	2
	Erfahrung mit int. Kohlenstoffmarkt	1	1	3	1-2	1	1	1
	IT-Infrastruktur und -Kapazität	3	3	1	1	1	1	1
Gesamtpunktzahl		31-34	31-33	19-21	27-31	20-23	25-29	19-22

Quelle: Eigene Darstellung. Die Tabelle fasst die Beiträge der Politikinstrumente zu den verschiedenen Vorbedingungen zusammen. Die Beiträge können schwach (1), mittel (2) oder stark (3) sein. In manchen Fällen ist der Beitrag stark von der Ausgestaltung des Instruments abhängig, daher bewegt sich hier der Beitrag zwischen zwei Ebenen (1-2 oder 2-3).

Die Fallstudien untersuchten, wie bestehende Politikinstrumente in Indien und Mexiko zum ETS-Aufbauprozess beitragen könnten. Schwerpunkt der Analyse waren die drei folgenden Instrumententypen: Grüne Zertifikate (in Mexiko als „Saubere Energien Zertifikate" bezeichnet und in Indien „Erneuerbare Energien Zertifikate" genannt), weiße Zertifikate (das PAT System in Indien) und CO2-Steuern (Kohlenstoffsteuer in Mexiko und Kohlesteuer in Indien). Die Ergebnisse beruhen auf Auswertungen bestehenden Datenmaterials, welche durch Interviews ergänzt wurde. Die Interviews mit Vertretern von Bundesministerien, Forschungseinrichtungen, des privaten und öffentlichen Sektors sowie der Zivilgesellschaft wurden in Mexiko Stadt, Neu Delhi und Bonn durchgeführt. Der folgende Abschnitt fasst die zentralen Ergebnisse der Analyse nach Instrumententypen geordnet zusammen. Für die Detailanalyse der beiden Länder siehe Kapitel 6 für Mexiko sowie Kapitel 7 für Indien.

Mexikos Zertifikate für Saubere Energien

Die Zertifikate für Saubere Energien (Clean Energy Certificates – CELs) wurden 2014 mit dem Gesetz zur Stromindustrie eingeführt, welches Versorger und große Verbraucher dazu verpflichtet, für einen bestimmten Anteil des zur Verfügung gestellten oder verbrauchten Stroms, CELs vorzuweisen. 2018 ist das erste Verpflichtungsjahr. Mit dem CEL-System wurde ein virtuelles Gut geschaffen, das zwischen verpflichteten Unternehmen und den Erzeugern sauberer Energien auf dem Spot-Markt oder auch durch die Unterzeichnung bilateraler Verträge gehandelt werden kann. Zudem werden langfristige Versteigerungen durchgeführt, die Verträge für den Ver- und Ankauf von CELs festlegen.

Durch seine Handelskomponente kann das CEL-System besonders bedeutende Beiträge liefern, indem es politische Erfahrung sowie institutionelles Wissen bereitstellt, die für einige der Building Blocks zentral sind, insbesondere für „Obergrenze" und „Markt". Das CEL-System kann darüber hinaus bedeutende sektorale Daten zur Verfügung stellen. Die übergeordnete CEL-Anforderung wurde auf wissenschaftlicher Grundlage und unter Berücksichtigung zahlreicher Parameter und Szenarien entwickelt. Diese Vorgehensweise könnte für das Verfahren zur Festlegung der Obergrenze unter dem ETS als Vorlage genutzt werden. Damit könnte die Akzeptanz seitens der vom ETS betroffenen Emittenten erhöht werden, ein robustes Instrument einzuführen. In dieser Hinsicht könnten auch die positiven

Erfahrungen bei der Einbindung von Stakeholdern als Vorlage für die Einführung des ETS dienen. Aufgrund seiner Markteigenschaften kann das CEL-System bedeutende Beiträge zur Marktkomponente des ETS leisten. Die institutionelle Kapazitäten der Marktregulierer und -betreiber sowie dessen Teilnehmer könnten eine solide Grundlage für die Entwicklung des Handels von Emissionsberechtigungen bieten. Zugleich könnten die rechtliche Definition von CELs und die Behandlung von Markttransaktionen als Vorlage für entsprechende Festlegungen unter dem ETS dienen. Das S-CEL Register deckt zahlreiche der unter einem ETS benötigten Funktionen ab. Damit ist es ein vielversprechender Startpunkt zur Entwicklung eines ETS-Registers. Da 2018 das erste Verpflichtungsjahr ist, können zum jetzigen Zeitpunkt jedoch noch keine Aussagen zur Umsetzung des Systems gemacht werden. Wie Abbildung 3 zeigt, kann das CEL-System wichtige Beiträge zu zahlreichen Building Blocks und ihren Vorbedingungen leisten.

Abbildung 3: Beiträge von Mexikos CEL-System

	Obergrenze	Offsetting	Markt	Reichweite	MRV	Register	Allokation	Vollzug
Abstimmung der Politikziele	+		+				+	
Kapazitäten zur Stakeholder-Einbindung	++		++				+	
Verpflichtung zum Klimaschutz								
Funktionsfähige Marktwirtschaft			+	+				
Autorität in der Entscheidungsfindung			+++	+				
Institutionelle Kapazitäten	++		+++	+	++	++		+
Rechtstaatlichkeit und Vollzug								
Handelskapazitäten			+					
Modellierungkapazitäten	+++							
Sektordaten und Verarbeitungskapazität	++							
MRV-Erfahrung und Kapazitäten				+	+			
Erfahrung mit int. Kohlenstoffmarkt								
IT-Infrastruktur und -Kapazitäten			+++			+++		

Quelle: Eigene Darstellung. Die Abbildung illustriert das Verhältnis zwischen den Vorbedingungen (linke Spalte) und den verschiedenen ETS Building Blocks (obere Zeile) und zeigt an, in welchen Bereichen das CEL-System besonders starke Beiträge zum ETS-Aufbauprozess liefern könnte (grüne Pluszeichen und gelbe Kreise).

Indiens REC-Mechanismus

Im Jahr 2010 wurde das Renewable Energy Certificate (REC)-System von der indischen Regierung eingeführt. Es ist ein System für den Handel mit grünen Zertifikaten, das es seinen Teilnehmern ermöglicht, den ökologischen Wert der Erzeugung von erneuerbarer Energie zu handeln, ohne die entsprechende Menge Strom physisch übertragen zu müssen. Die Nachfrage nach solchen Zertifikaten wird durch Portfolioverpflichtungen für Erneuerbare (RPOs) generiert. Jeder indische Staat legt in seinem

RPO fest, welcher Anteil der Stromversorgung durch erneuerbare Energiequellen gedeckt werden muss. Das REC-System umfasst Stromerzeugungsanlagen, Stromlieferanten und große Stromverbraucher.

Der REC-Mechanismus steht in der Kritik, da die Handelsaktivität nur sehr begrenzt ist. Stakeholder haben verschiedene Gründe dafür hervorgehoben: Ein Hauptproblem ist die fehlende Einhaltung der Verpflichtungen durch die teilnehmenden Unternehmen und die mangelnde Durchsetzung der Verpflichtungen. Ein Teil des Problems besteht darin, dass die Verantwortung für die Durchsetzung in den Händen der Regierungen der einzelnen Bundesstaaten statt einer zentralisierten Einheit liegt. Aufgrund der schwierigen Situation des indischen Elektrizitätssektors, in dem die Stabilität der Stromversorgung bereits eine große Herausforderung darstellt, scheuen diese Regierungen jedoch die Durchsetzung. Der zunehmende Druck auf die Stromversorgung durch die Einführung von RPO-Verpflichtungen in einem Land, in dem ein bedeutender Teil der Bevölkerung keinen Zugang zu Elektrizität hat, ist ein hoch politisiertes Unterfangen. Dies untergräbt die politische Unterstützung des REC-Mechanismus'. Abschnitt 7.2.2 erläutert die Herausforderungen des REC-Mechanismus im Detail.

Dennoch können mehrere Lehren aus dem REC-Mechanismus gezogen werden - auch in Bezug auf die Building Blocks und deren Voraussetzungen. Vor allem müssen der institutionelle Aufbau und insbesondere die Durchsetzungsfähigkeit der für die Umsetzung und den Betrieb eines ETS verantwortlichen Institutionen angemessen sein. Im indischen Kontext bedeutet dies, dass, wenn die Vollzugsbehörden auf regionaler Ebene verantwortlich sind, eine enge Zusammenarbeit mit der nationalen Behörde / dem nationalen Ministerium erforderlich ist.

Weitere Beiträge zu den Building Blocks umfassen die etablierten technischen, rechtlichen und institutionellen Prozesse für Handel und MRV. Zum Beispiel erfolgt die Meldung und Ausstellung der erzeugten Mengen erneuerbarer Energie über eine webbasierte IT-Plattform, die mit einem Register verbunden ist. Abbildung 4 visualisiert den Beitrag des REC-Mechanismus zu den Building Blocks.

Abbildung 4: Beiträge des REC-Mechanismus in Indien

	Obergrenze	Offsetting	Markt	Reichweite	MRV	Register	Allokation	Vollzug
Abstimmung der Politikziele	+		+					
Kapazitäten zur Stakeholder-Einbindung	+		+					
Verpflichtung zum Klimaschutz								
Funktionsfähige Marktwirtschaft			+					
Autorität in der Entscheidungsfindung				+				
Institutionelle Kapazitäten	+		+	+	+	+		
Rechtstaatlichkeit und Vollzug								+
Handelskapazitäten			++					
Modellierungskapazitäten	+							
Sektordaten und Verarbeitungskapazität	+							
MRV-Erfahrung und -Kapazitäten				+	++			
Erfahrung mit int. Kohlenstoffmarkt								
IT-Infrastruktur und -Kapazitäten			++			++		

Quelle: Eigene Darstellung. Die Abbildung illustriert das Verhältnis zwischen den Vorbedingungen (linke Spalte) und den verschiedenen ETS Building Blocks (obere Zeile) und zeigt an, in welchen Bereichen das REC-System besonders starke Beiträge zum ETS-Aufbauprozess liefern könnte (grüne Pluszeichen und gelbe Kreise).

Indiens PAT-Mechanismus

Das indische Perform, Achieve und Trade (PAT) - Programm ist ein marktbasierter Mechanismus, der auf den spezifischen Energieverbrauch („specific energy consumption“, SEC) energieintensiver Industrien abzielt.[3] Das SEC-Reduktionsziel wird für jedes Unternehmen auf Basis seines vergangenen Energieverbrauchs definiert. Übertrifft das Unternehmen sein Ziel, erhält es Energiesparzertifikate (ESCerts) für die erzielten Einsparungen, die auf dem Markt verkauft werden können. Wenn das Unternehmen sein Ziel nicht erreicht, muss es ESCerts auf dem Markt kaufen. Unternehmen können ESCerts über spezifische Energiebörsen handeln, um die Einhaltung zu erreichen. Nichteinhaltung (nach dem Handel) leitet einen Strafprozess ein.

Die mit der Einrichtung dieses landesweiten Mechanismus gewonnenen Erfahrungen werden für jedes künftige marktbasierte Instrument wertvoll sein. Das PAT-Programm ist in Bezug auf die politische, rechtliche / institutionelle und technische Dimension weit fortgeschritten: Benchmark-Methoden wurden entwickelt, wobei die erforderlichen Daten für sektorweite Baselines gesammelt und für die Festlegung unternehmensspezifischer Ziele verwendet wurden. Es fanden mehrere Stakeholder-

[3] Die SEC ist definiert als Nettoenergieverbrauch innerhalb der Anlagengrenze (Energie, die in die Anlage einströmt) dividiert durch die Gesamtmenge der von der Anlagengrenze exportierten Produktmenge. Weitere Erläuterungen finden Sie in der Fallstudie zu Indien.

Konsultationen statt und es wurden IT-Infrastruktur, Register und eine Handelsplattform eingerichtet. All dies könnte bei der Einrichtung eines ETS hilfreich sein. Das PAT-Programm wurde 2008 angekündigt, und die ersten Handelsaktivitäten für den ersten Verpflichtungszyklus (2012 - 2015) fanden Ende 2017 statt. Die Durchsetzungsstärke des PAT-Programms kann zum Zeitpunkt der Erstellung dieses Berichts noch nicht beurteilt werden. Wie aus Abbildung 5 hervorgeht, kann das PAT-System wichtige Beiträge zu vielen ETS-Building Blocks und ihren Vorbedingungen liefern.

Abbildung 5: Beiträge des indischen PAT-Systems

	Obergrenze	Offsetting	Markt	Reichweite	MRV	Register	Allokation	Vollzug
Abstimmung der Politikziele	+		+					
Kapazitäten zur Stakeholder Einbindung	++		+					
Verpflichtung zum Klimaschutz								
Funktionsfähige Marktwirtschaft			+					
Autorität in der Entscheidungsfindung			++	+				
Institutionelle Kapazitäten	++		+++	+	++	++		+
Rechtstaatlichkeit und Vollzug								+
Handelskapazitäten			++					
Modellierungskapazitäten	+							
Sektordaten und Verarbeitungskapazität	+++			++			+	
MRV-Erfahrung und -Kapazitäten				++	+++			
Erfahrung mit int. Kohlenstoffmarkt								
IT-Infrastruktur und -Kapazitäten			+++			+++		

Quelle: Eigene Darstellung. Die Abbildung illustriert das Verhältnis zwischen den Vorbedingungen (linke Spalte) und den verschiedenen ETS Building Blocks (obere Zeile) und zeigt an, in welchen Bereichen das PAT-System besonders starke Beiträge zum ETS-Aufbauprozess liefern könnte (grüne Pluszeichen und gelbe Kreise).

Mexikos Kohlenstoffsteuer

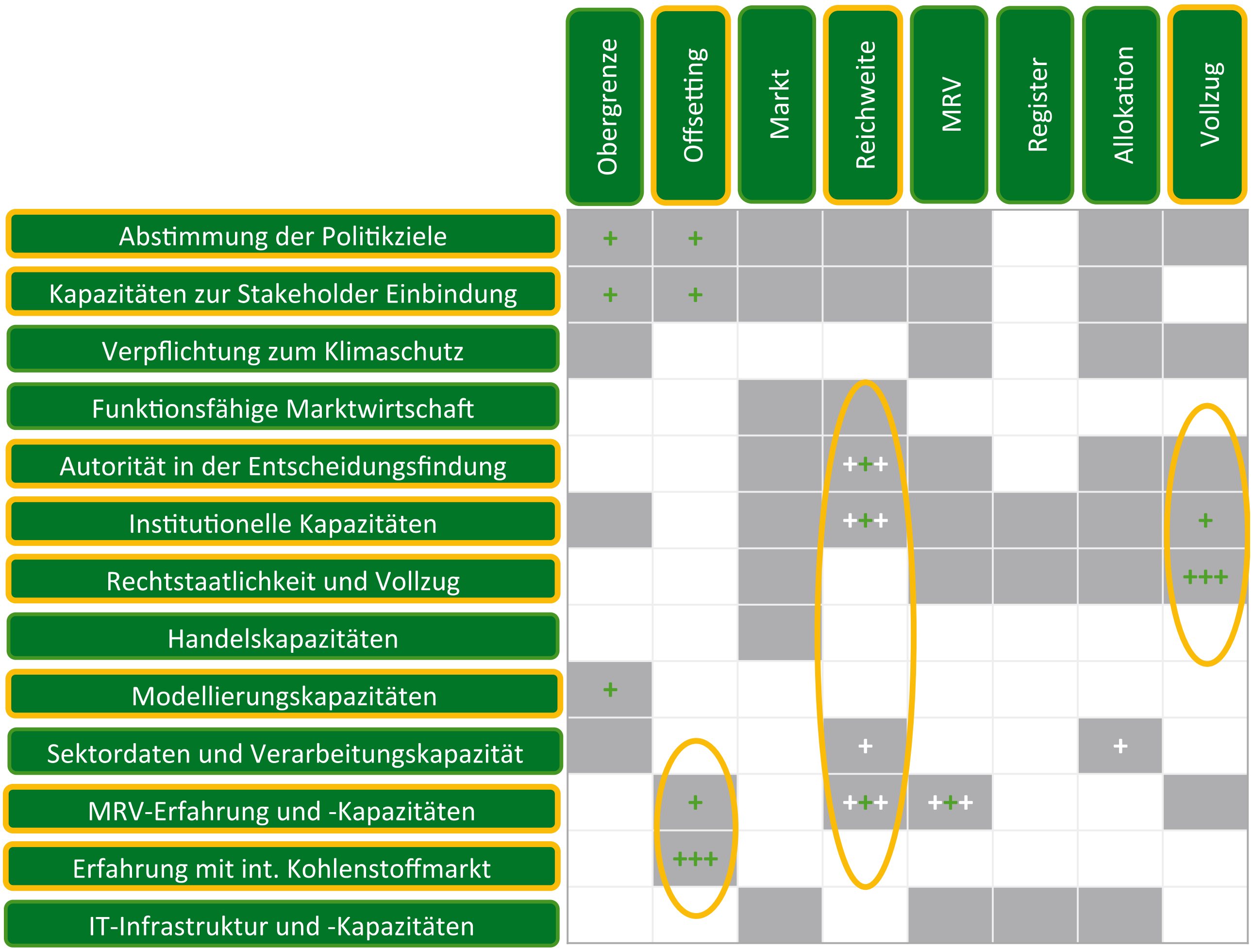
Die mexikanische Kohlenstoffsteuer wurde als Teil einer umfassenden Steuerreform eingeführt und trat im Januar 2014 in Kraft. Die Grundlage für die Einführung der Steuer wurde mit dem Allgemeinen Gesetz zum Klimawandel (LGCC) geschaffen. Laut Entwurf eines Dekrets des damaligen Präsidenten Peña Nieto vom September 2013 sollte die CO_2-Steuer nicht nur THG-Emissionen verringern, sondern auch Haushaltseinnahmen generieren und positive Beiträge jenseits des Klimaschutzes liefern (Presidencia de la Republica 2013). Der politische Prozess wurde stark von der fossilen Brennstoffindustrie beeinflusst, was zu einem niedrigen Steuerniveau sowie zur Ausnahme von Erdgas führte.

Die Steuer ist ein Upstream-System und wird auf den Verkauf und Import fossiler Brennstoffe erhoben. Das System zum Monitoring und Berichterstattung zeichnet sich durch seine Einfachheit aus: Steuerzahler müssen regelmäßig über Preis, Wert und Umfang der verkauften (oder importierten) fossilen Brennstoffe berichten und Vor-Ort-Überprüfungen zulassen. Eine Besonderheit der mexikanischen CO_2-Steuer ist ihre Offsetting-Option, die es steuerpflichtigen Unternehmen ermöglicht, CERs von mexikanischen CDM-Projekten zu nutzen. Die Umsetzungsregeln wurden im Dezember 2017 veröffentlicht, weswegen noch keine Erfahrungen mit der Anwendung dieser Option vorliegen.

Wie Abbildung 6 unten deutlich macht, kann die CO_2-Steuer begrenzte Beiträge für den ETS-Aufbauprozess liefern. Die Bedeutung der Beiträge zu einigen Building Blocks und ihren Vorbedingungen ist zudem abhängig vom Design des geplanten ETS: Wird ein Upstream-System angestrebt, könnte die CO_2-Steuer zur Entscheidung über die Reichweite des Systems und dessen Systems zum Monitoring, Berichterstattung und Verifizierung (MRV) beitragen, da der Regulierungspunkt beider Instrumente übereinstimmen würde. Für ein Midstream-System, das auf Anlagen- oder Unternehmensebene ansetzt, ist die Reichweite der CO_2-Steuer hingegen zu gering.

Da die CO_2-Steuer die Gesamtmenge an THG-Emissionen, die von der Zielgruppe emittiert werden darf, nicht begrenzt, kann die Steuer nicht unmittelbar als Grundlage für die Festlegung der ETS-Obergrenze genutzt werden. Die Offsetting-Option der mexikanischen CO_2-Steuer könnte eine Grundlage für die Entwicklung einer Offsetting-Komponente im ETS bieten. Ob hierdurch ein substantieller Beitrag geleistet werden kann, wird jedoch davon abhängen, wie die Vorgaben umgesetzt werden. Da die CO_2-Steuer in das mexikanische Steuersystem eingebettet ist, können viele Elemente, auf denen diese aufbaut, nicht für die Entwicklung der institutionellen und rechtlichen Struktur des ETS genutzt werden. Das Vollzugssystem der CO_2-Steuer ist Teil des fiskalischen Systems und kann somit nicht unmittelbar genutzt werden, um im ETS die Erfüllung der Vorgaben seitens der Teilnehmer sicherzustellen. Die Erfahrungen im Umgang mit versuchter Steuervermeidung könnten allerdings bei der Entwicklung des Vollzugssystems unter dem ETS genutzt werden. Mit Blick auf die Modellierungskapazitäten, die insbesondere für die Festlegung der Obergrenze von Bedeutung sind, könnte die CO_2-Steuer bedeutende Beiträge liefern. Weitere Maßnahmen zum Kapazitätsaufbau sind jedoch erforderlich, um diese Kapazitäten im Marktkontext anwenden zu können sowie um Emissionsdaten zu verarbeiten. Da die Steuer keine Handelskomponente besitzt, wird kein Register mit Konten für die einzelnen Teilnehmer geführt, wodurch die Beiträge zur Entwicklung eines solchen Systems unter dem ETS begrenzt sind.

Abbildung 6: Beiträge der mexikanischen CO_2-Steuer



Quelle: Eigene Darstellung. Die Abbildung illustriert das Verhältnis zwischen den Vorbedingungen (linke Spalte) und den verschiedenen ETS Building Blocks (obere Zeile) und zeigt an, in welchen Bereichen das PAT-System besonders starke Beiträge zum ETS-Aufbauprozess liefern könnte (grüne Pluszeichen und gelbe Kreise). Weiße Pluszeichen zeigen, dass die Beiträge unter bestimmten Bedingungen größer ausfallen könnten. So könnten die Beiträge zu dem Building Blocks „Reichweite" und „MRV" größer sein, wenn ein Upstream-System angestrebt würde.

Indiens Kohleabgabe

Im Jahr 2010 führte die indische Regierung eine Steuer auf heimisch produzierte und importierte Kohle ein, die formal "Clean Energy Cess" heißt und kürzlich in "Clean Environment Cess" umbenannt wurde, während informell der Begriff "coal cess" vorherrscht.[4] Dies gilt für im Inland produzierte und importierte Kohle, einschließlich Briketts, Ovoide und ähnliche feste Brennstoffe, die aus Kohle hergestellt werden, sowie für Kohlederivate wie Braunkohle und Torf.

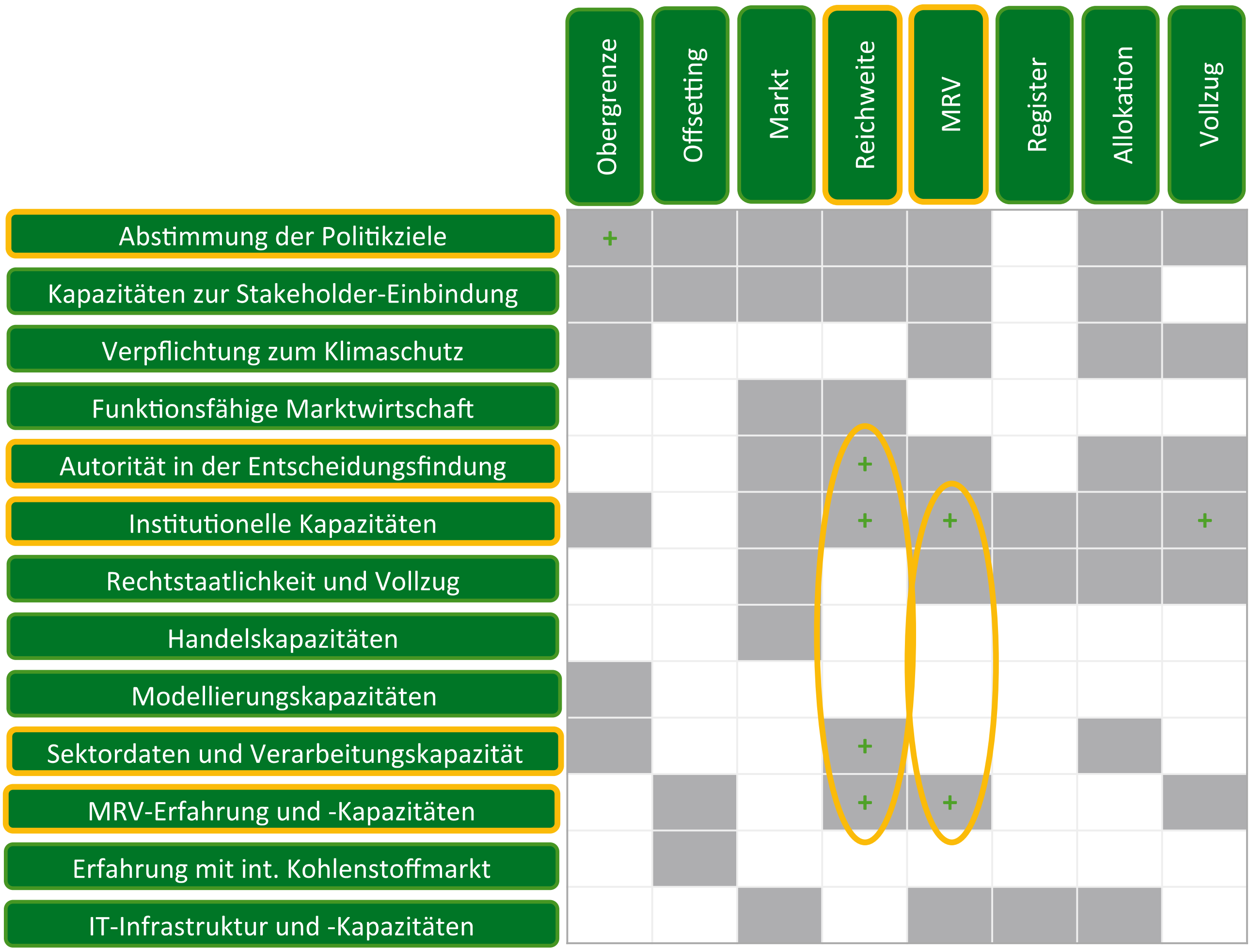
Anfangs wurde die Kohlesteuer auf INR 50 (USD 0,75) pro Tonne Kohle festgelegt, aber im Laufe der Jahre kontinuierlich erhöht und erreichte 2016 einen Wert von 400 INR (6 USD) pro Tonne. Die Einnahmen aus dem Kohleabbau sollten ursprünglich für die Aktivierung des Nationalen Clean Energy Fund (NCEF) genutzt werden, der 2010-2011 eingerichtet wurde. Der NCEF bietet finanzielle Unterstützung für Einrichtungen des öffentlichen und privaten Sektors, die in Forschung und innovative Projekte im Bereich der sauberen Energietechnologien investieren möchte. Allerdings wurde knapp

[4] Der aus der Kolonialzeit stammende Begriff "cess" ist in Indien weit verbreitet und bezieht sich auf eine Steuer. In der Regel wird es mit einem qualifizierenden Präfix verwendet (Bildungs-Cess, Bewässerungs-Cess, etc.)

50% des Gesamteinkommens in Höhe von 54,336 Mrd. Kronen (~ 8,5 Mrd. USD), die bisher durch die Kohleabgabe eingenommen wurden, noch nicht in den Fonds transferiert, während nur 16% in die Finanzierung von Projekten geflossen sind. Im August 2017 wurde deutlich, dass die ungenutzten Einnahmen in Staatshaushalte umgelenkt wurden, die infolge einer Reform der indischen Güter- und Dienstleistungssteuer einen Verlust erlitten hatten.

Die Kohleabgabe ist keine CO_2-Steuer im engeren Sinne, da sie die THG-Emissionen nur indirekt durch die Produktion von "Tonnen Kohle" besteuert. Aus diesem Grund können nur begrenzt Erfahrungswerte im Zusammenhang mit der Überwachung (MRV) von Treibhausgasemissionen, der Einrichtung von Handelsmärkten, Registern oder IT-Systemen genutzt werden. Die Kohleabgabe bietet weder die Möglichkeit, Informationen über den Prozess der Festlegung und Zuteilung von Emissionsrechten zu sammeln, noch liefert sie Informationen über den Umfang eines potenziellen Emissionshandelssystems, da die Anzahl der (meist öffentlichen) Unternehmen, die von der Kohleabgabe erfasst werden, recht gering ist. Es kann jedoch argumentiert werden, dass die Kohleabgabe aufgrund der Anforderungen an die Überwachung (MRV) und die Steuererhebung die rechtlichen und institutionellen Voraussetzungen verbessert. Abbildung 7 zeigt, welche Building Blocks auf die Erfahrungen mit der Steuer zurückgreifen könnten.

Abbildung 7: Beiträge von Indiens Kohleabgabe



Quelle: Eigene Darstellung. Die Abbildung illustriert das Verhältnis zwischen den Vorbedingungen (linke Spalte) und den verschiedenen ETS Building Blocks (obere Zeile) und zeigt an, in welchen Bereichen die Kohleabgabe besonders starke Beiträge zum ETS-Aufbauprozess liefern könnte (grüne Pluszeichen und gelbe Kreise).

Mexikos ETS-Aufbau und Überlegungen zur weiteren Unterstützung des Prozesses

Die Fallstudie zu Mexiko zeigt, dass bestehende Politikinstrumente – die CO_2-Steuer und die Zertifikate für Saubere Energien – bedeutende Beiträge zur Unterstützung des ETS-Aufbauprozesses in Mexiko leisten könnten. Dies ist von besonderer Bedeutung, da der ETS-Aufbau politisch bereits weit vorangeschritten ist: Mit der Reform des allgemeinen Gesetztes zum Klimaschutz (LGCC) besteht nun auch eine solide rechtliche Grundlage zum Aufbau eines verpflichtenden ETS.

Im laufenden Prozess des ETS-Aufbaus tauscht sich die Regierung regelmäßig mit dem Privatsektor aus und hat eine Arbeitsgruppe zur Diskussion von ETS-Designfragen eingerichtet. Um diesen Prozess weiter voranzutreiben, ist auch eine starke interministerielle Zusammenarbeit von zentraler Bedeutung. Dieser Prozess könnte institutionell auf bestehenden Strukturen aufbauen. Zum einen könnten hierdurch die Erfahrungen, die andere Ministerien bei der Einführung und Umsetzung des CEL-Systems und der CO_2-Steuer gemacht haben, stärker berücksichtigt werden. Ein solcher Austauschprozess könnte zudem den Umgang mit dem Widerstand gegen die ETS-Einführung unterstützen. Interministerielle Zusammenarbeit könnte auch dazu beitragen, die bestehenden Instrumente an dem zukünftigen ETS auszurichten, da die Einrichtung des ETS nicht als Argument für ein Ende der Fortführung dieser weiteren Instrumente genutzt werden sollte. Vielmehr sollten bestehende und zukünftige Instrumente klug aufeinander abgestimmt werden, um die verschiedenen Hindernisse anzugehen, die Mexiko bei dem Übergang hin zu einer CO_2-armen Wirtschaftsform im Weg stehen.

Indiens ETS-Bereitschaft und Zukunftsaussichten

Die Fallstudie zu Indien zeigt, dass das Potenzial für die Einführung eines ETS in dem Land kurz- bis mittelfristig begrenzt ist. Die politische Bereitschaft, sich auf ein politisches Instrument zu konzentrieren, das sich speziell auf die absoluten CO_2-Treibhausgasemissionen konzentriert, ist angesichts der politischen Prioritäten Indiens für die soziale und wirtschaftliche Entwicklung gering. Dies hat auch die Wahl und Ausgestaltung der untersuchten politischen Instrumente deutlich beeinflusst. Die innovativen Handelsmechanismen, der REC-Mechanismus für erneuerbare Energiequoten und das PAT-Programm für Energieeffizienzzertifikate, wurden bewusst nicht als THG-Emissionen bezeichnet. Auch eine Abgabe auf Kohleproduktion und -importe, die mehrfach erhöht wurde ("Coal Cess") und welche als Kohlenstoffsteuer hätte bezeichnet werden können, zielt offiziell auf Kohle als Rohstoff und nicht auf dessen Kohlenstoffgehalt ab. In ähnlicher Weise definiert der nationale Beitrag Indiens (NDC) keine absoluten, sondern nur auf Intensität basierende Treibhausgasemissionsziele.

Dennoch liefern die analysierten Politikinstrumente - insbesondere das PAT- und das REC-System - wertvolle Erkenntnisse, die erheblich zu den Building Blocks eines funktionalen ETS beitragen könnten. Diese Mechanismen haben eine tragfähige institutionelle Infrastruktur für den Zertifikatehandel und Überwachungs-, Berichterstattungs- und Verifizierungssysteme für verschiedene Sektoren geschaffen. Die Liquiditäts- und Handelsaktivitäten in beiden Märkten waren jedoch bisher enttäuschend. Dies ist auf einen allgemeinen Mangel an Durchsetzung im Rahmen des REC-Systems zurückzuführen, während die Kohleabgabe keine Umsetzungsprobleme aufweist. Die Handelssysteme leiden somit unter einem Mangel an wirksamen Anreizen für die Teilnahme. In Bezug auf andere ETS-Building Blocks wie die Festlegung der Obergrenze und die Zuteilung von Zertifikaten bieten die bestehenden Politikinstrumente – mit Ausnahme des PAT-Programms - nur eingeschränkte Erkenntnisse.

Wenn Indien jedoch in den nächsten 15 Jahren beschließen sollte, ein ETS entweder auf nationaler oder auf staatlicher Ebene einzuführen, kann es dank der beiden Handelssystemen sowie der Kohleabgabe auf wichtige institutionelle Strukturen und Erfahrungen zurückgreifen.

Kernbotschaften und Ausblick

Die Fallstudien spiegelten die Ergebnisse der allgemeinen Analyse wider. Zahlreiche der untersuchten Politikinstrumente können im Prinzip starke Beiträge zum ETS-Aufbau liefern. Die tatsächlichen Beiträge hängen jedoch sowohl von der Ausgestaltung der bestehenden Instrumente als auch von dem Design des angestrebten ETS ab. Andere Faktoren, die das Potential existierender Instrumente beeinflussen, zum ETS-Aufbau beizutragen, sind Timing und der Reifegrad der Politikinstrumente. Wenn die zeitliche Abfolge stimmt und die nicht-ETS Politiken ausgereift sind, könnten sie wertvolle Beiträge zum ETS-Aufbauprozess liefern. Das ETS auf bestehenden Politikinstrumenten aufzubauen, könnte darüber hinaus die Erzielung von Synergien ermöglichen und den politischen Widerstand gegen die Einführung eines ETS verringern.

Bestehende Politikinstrumente zum Aufbau eines ETS zu nutzen bedeutet nicht automatisch, dass diese mit Einführung des ETS abgeschafft werden müssten. Es sprechen zahlreiche Gründe dafür, ein ETS parallel zu anderen Politikinstrumenten zu betreiben: Ein ETS kann nicht alle Ursachen adressieren, die zu einer treibhausgasintensiven Wirtschaftsform führen und um diese in Angriff zu nehmen, ist mehr als ein Instrument erforderlich. Die bestehenden Instrumente mit einem ETS zu kombinieren scheint daher der weitaus vielversprechendere Ansatz, um die zahlreichen Hürden zu überwinden, die einer kohlenstoffarmen Entwicklung im Weg stehen. Mit diesem Ansatz könnten zudem vielfältige Politikziele jenseits des Klimaschutzes umgesetzt und auch die politische Unterstützung von Stakeholdern gesichert werden.

Bedenken hinsichtlich einer Doppelbelastung und Ineffizienz können ausgeräumt werden, indem die Effekte anderer Politiken bei der Ausgestaltung des ETS und dessen Betrieb berücksichtigt werden, beispielsweise bei der Festlegung und Nachjustierung der Obergrenze des Systems. Besonders hilfreich sind in dieser Hinsicht die Erfahrungen, die in Europa und in anderen Regionen gemacht wurden, in denen Emissionshandelssysteme gemeinsam mit anderen Instrumenten betrieben werden. Für Länder, die derzeit ihr eigenes ETS einführen, könnten diese Erfahrungen außerordentlich hilfreich sein und es ihnen ermöglichen, einen effektiven Politikmix zu erreichen, der den Übergang hin zu einer kohlenstoffarmen Wirtschaftsform ermöglicht.

1 Introduction

Carbon pricing is spreading worldwide: As of April 2018, 45 national and 25 subnational jurisdictions are putting a price on carbon. With the carbon pricing initiatives implemented and those scheduled for implementation, about 20 per cent of the global greenhouse gas (GHG) emissions would be covered by a price on carbon (World Bank et al. 2018). A significant share of the jurisdictions that have implemented carbon pricing initiatives have opted for emissions trading systems (ETSs), with currently 21 systems operational covering 28 jurisdictions (ICAP 2018). Notably, ETSs are not only being established in developed countries but also emerging economies are planning to launch national cap-and-trade programmes (e.g. Mexico and Chile).

The popularity of carbon pricing instruments is due the fact that they are seen as effective and efficient tools to facilitate least-cost compliance with environmental targets. They can have also have a more 'systemic' effect than other policy instruments, as the carbon price incentive can influence operational and investment decisions throughout the supply chain. Substantial amounts of international support has also been available to support the development of an emerging carbon market to achieve this, and at the same time create a level playing field for internationally operating businesses affected by the policies.

Many countries already have other policy instruments in place to address the negative environmental impacts of energy use and/or GHG emissions, or are in the process of developing such policies. This includes other carbon pricing instruments, e.g. carbon taxes, other market-based mechanisms, such as green and white certificate systems, or non-market-based policy instruments, such as standards and obligations. This report has the aim to analyse and evaluate whether elements of such (non-ETS) policy instruments, such as data gathering or institutional setups, may serve as a basis for establishing an emissions trading system with longer-term linking of ETSs and creating a larger international carbon market in mind.

In detail, the research questions are as follows:

- What are the preconditions for establishing a functioning emissions trading system? What are the requirements a country needs to meet?
- How can other policy instruments contribute to these preconditions and thereby assist the process of ETS establishment?
- How can an effective policy mix be achieved? How can an ETS and other climate policy instruments be operated in parallel?

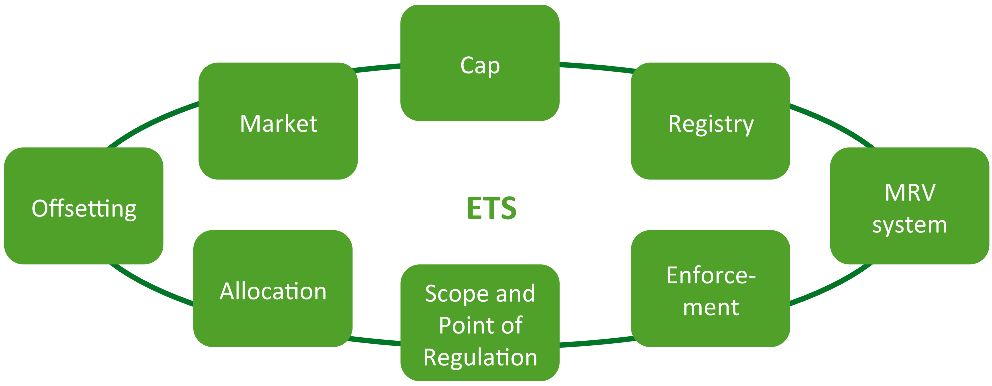
In order to address these questions, this report first explores what is needed for a functional ETS to be implemented: Section 2 of this report introduces the conceptual foundation of the study by presenting the key components of a functional ETS, for which we use the term 'ETS building blocks', as well as the preconditions necessary for the establishment of these building blocks. On this basis, section 3 of the report undertakes a generic assessment of non-ETS policy instruments regarding their potential to contribute to the ETS development process. The theoretical section of this report ends with a brief excursus in chapter 4, which analyses the benefit structure of selected policy instruments in terms of their potential to hinder the ETS development process.

The empirical section of the report is based on two country case studies. Chapter 5 briefly introduces the methodological approach and outlines the selection of case studies. The findings of the case studies India and Mexico are then presented in chapters 6 and 7 respectively. Chapter 8 summarizes the findings from the generic analysis and the empirical case studies and provides an outlook on future research needs.

2 Introducing Key Concepts

In this section, the individual building blocks of an ETS will be outlined together with the preconditions relevant for their establishment. Figure 8 provides an overview on the ETS building blocks which will be discussed in more detail below. One example of such a building block is the emission cap of the trading system, which defines the maximum quantity of emission allowances issued by the regulator and is thereby one of the key determinants of the mitigation impact of the ETS.

Figure 8: ETS building blocks



Source: Own illustration

While all building blocks have their own functions and roles in the ETS, they cannot be seen in isolation from each other since building blocks can impact each other (e.g. cap and scope) and/or (steps towards) the establishment of some building blocks might be required for designing or operating other building blocks. For instance, developing a system for monitoring, reporting and verification (MRV) is not feasible without knowing the sources and gases to be monitored, which will inter alia be defined by the scope of the ETS. So, for some of the building blocks there is a clear and logic sequence of design. Other building blocks can largely be finalized in isolation once a critical decision has been taken. For example, enforcement rules require a decision on the point of regulation and on the MRV system but do not strongly depend on other building blocks. Other building blocks can neither be established in isolation nor consecutively, but in a parallel process with close coordination.

Each of the ETS building blocks builds on a specific set of preconditions in order to be established. As will be shown, there is considerable overlap between the building blocks in terms of the preconditions needed for their establishment and operation. Therefore, section 2.1. first introduces these preconditions before outlining their relevance for the ETS building blocks in section 2.2.

2.1 Preconditions

Each of the ETS building blocks builds on a specific **set of preconditions** in order to be established. These preconditions can be structured along three different ETS tracks.[5] The **political / policy track** relates to making the political or policy-level decisions for establishing an (effective) ETS. The **institutional / legislative track** relates to the activities needed for allocating and implementing tasks and responsibilities for establishing and operating the ETS to the different actors and provides a legislative basis for the system. The **technical track** relates to elements needed for establishing the 'technical

[5] These three *tracks* correspond to the "three main *categories* of market readiness building blocks" defined by Aasrud et al. (2010). Aasrud et al. (2010) use these three categories (technical, institutional/legal, policy/political) to categorize the individual readiness building blocks. In this report, in contrast, single building blocks are not related to only one of the three categories (or tracks) as they are too manifold and require activities on many, if not all of the tracks for being established.

infrastructure' of the ETS, without which a system could not operate or may be considered unreliable and not credible. Figure 9 below provides an overview on the preconditions on the three tracks.

Figure 9: Preconditions on the three tracks

Source: Own illustration

Preconditions on the Policy/Political Track

The preconditions on the policy / political track inter alia relate to the (climate policy) goals to be achieved with the ETS, who will be subjected to the instrument, what negative impacts are considered acceptable and how costs and benefits are shared.

"Precondition 1: Balancing policy goals" refers to the ability and willingness of a country's policy makers to take into consideration the possible impacts of policy decisions and aligning different policy goals before taking a final decision. This precondition is relevant for numerous ETS building blocks, as the decisions on ETS design may not only affect its environmental impact, but will most likely also have economic and social impacts. Experience with other (non-ETS) policy instruments may strengthen the government's ability to align different political goals and adapt the design of policy instruments accordingly. This experience can be fed into the process of ETS development.

"Precondition 2: Capacity to involve stakeholders" relates to the degree to which the policy process allows individuals or institutions that will presumably be affected by the policy instrument to express their views and to take them into consideration when making policy decisions. Doing so will improve the capacity to align policy goals and enhance the acceptability of the policies. Stakeholders can inter alia include companies affected by the policy, civil society organisations as well as research institutions.

"Precondition 3: Commitment to address climate change" (of a country's government) is a precondition for designing and implementing effective climate policy instruments. It is particularly relevant for addressing emissions of economic activities, which may lead to cost increases for these activities.

Preconditions on the Legal/Institutional Track

The institutional / legislative track covers the preconditions needed for allocating and implementing tasks and responsibilities for establishing and operating the ETS to the different actors and providing a legislative basis for the system. Existing institutions may take on new tasks, and new structures, mandates and knowhow may be required.

"Precondition 4: Functional market economy" relates to the structure of the sectors to be covered by an ETS. It describes a sector that is characterized by sufficiently large number of independent

participants (no oligopoly) to allow for competition and liquidity of transactions as well as by the possibility for free price formation. Such a market structure is a prerequisite for an effective ETS because it prevents centralisation of market power, which would undermine ETS effectiveness, and the establishment of an effective carbon price incentive.

"Precondition 5: Decision making authority" refers to the government's (de-facto) authority to develop regulations and that these regulations do have an impact on the sector's activities. Since the ETS establishes a cap on certain emissions, decision making authority in the respective sector(s) is a key precondition. It is particularly relevant when defining the scope of the ETS and its point of regulation.

"Precondition 6: Institutional capacities" is particularly relevant for establishing an ETS because of the large number of tasks that the government must exercise and delegate to other institutions. This precondition further relates to the capacities needed for operating a complex policy instrument and dealing with its (expected) impact.

"Precondition 7: Rule of law and law enforcement" is a necessary precondition for establishing legal provisions, such as monitoring and reporting obligations, market rules, etc. Law enforcement is a key prerequisite for enforcing the compliance with ETS provisions.

"Precondition 8: Trading capabilities" refers to the experiences and capacities of private and public entities in operating on markets and trading. With trading being a key component of an ETS, a strong trading infrastructure is key.

Preconditions on the Technical Track

The technical track relates to preconditions relevant for establishing the 'technical infrastructure' of the ETS, without which a system could not operate or may be considered unreliable and not credible. Data availability is one key aspect in this regard, but also technical 'monitorability'[6], as well as accessing and safeguarding the market (registry, trading platforms).

"Precondition 9: Modelling capacities" (e.g. within the administrations that support the political decision making process) are needed to take (potential) future impacts of a policy into consideration when designing it. Modelling is particularly relevant in the ETS context because the actual economic impact of the ETS depends on various factors, such as economic development, behaviour of market participants, technological progress, import/export flows, etc.

"Precondition 10: Sectoral data and processing capacities" (e.g. within the administrations that support the political decision making process) refers to the availability of high quality data in individual sectors, for instance installation-specific data on GHG emissions, production or fuel consumption. Sector-wide data is relevant for adapting the design of the ETS to the conditions in the sector it is to cover.

"Precondition 11: MRV capacities/experience" of public institutions but also within the private sector is relevant for establishing the ETS-specific MRV system. Existing MRV processes could potentially be used under the ETS limiting the need for additional capacity development measures both at the government level as well as at the level of individual companies targeted by the system.

"Precondition 12: Carbon markets experience" of the administration and private entities is relevant when the use of offsets is being considered for compliance in the ETS. Building on the existing capacities for project development and MRV could facilitate the development of a domestic offsetting scheme in sectors not covered by the ETS.

"Precondition 13: IT infrastructure and capacities" relates to the technical preparedness of the administration to process data electronically. A well functioning IT infrastructure is particularly relevant for establishing a robust ETS registry and functioning auctioning and trading platforms.

[6] Whether a specific gas or source can actually be monitored accurately, given the nature of the source (e.g. methane from rice fields or from enteric fermentation of cows' feed).

2.2 ETS Building Blocks and the Role of Preconditions

2.2.1 Cap

The cap determines the maximum quantity of allowances issued by the regulator and thereby determines the stringency of the ETS and associated costs to a high extent.[7] A cap can be set in absolute terms (absolute cap) or be linked to activity levels, such as production output (relative or intensity-based cap).

Policy / political track

Since a tighter cap will not only increase the mitigation impact of the ETS but also lead to higher costs for the entities regulated by the scheme, policy makers will have to find ways to align different policy goals and manage potential trade-offs **(balancing policy goals –P1)**. A strong **commitment to address climate change (P3)** is one political precondition for setting an ambitious cap. Here, the ambition of national climate change mitigation targets as well as existing national climate change legislation may be important indicators.

The level of the cap is the outcome of a political process, ideally supported by substantial data gathering and analysis efforts (on mitigation potentials and costs) as well as **stakeholder involvement processes (P2)** that allow for a dialogue between private stakeholders, government representatives and environmental or consumer non-governmental organisations (NGOs). Political acceptance among regulated entities can be expected to be higher when the cap is set based on robust data (see technical track below). In practice, political acceptability often shows a strong correlation with specific allocation decisions (generous and/or free allocation, carbon leakage provisions).

In these processes, it is important to see the ETS in the broader (climate) policy context and take into account other policies that impact the emissions profile of regulated entities and related costs. Variables that influence the perceived "adequacy" of the cap are projected future emission levels and estimated mitigation costs for regulated entities which may in turn be influenced by changes in the technological progress and by overcoming other (non-financial) barriers. Further political decisions have an influence on the stringency of a specific cap level, including on whether or not to allow the use of offset credits for compliance (see section 2.2.2 "Offsetting" below), whether to allow banking and/or borrowing of emission allowances between compliance years and/or trading periods, if additional supply or price control mechanisms, such as price floors, price ceilings, market stability reserves are introduced, how often the cap is up-dated, or what the optimal length of the trading period is. Decisions in these other building blocks are of key relevance for the cap setting process.

Legal / institutional track

The cap can either be set directly by policymakers or in collaboration with a regulatory authority. In any case, the type of the cap (absolute, relative) and its level of stringency will have to be defined, requiring significant **institutional capacities (P6)**. Once defined, the cap must be enshrined in the country's legal system to become effective, requiring strong **decision making authority (P5)** and **rule of law (P7)**. However, these two preconditions only become relevant at a later stage of the ETS development process.

Technical track

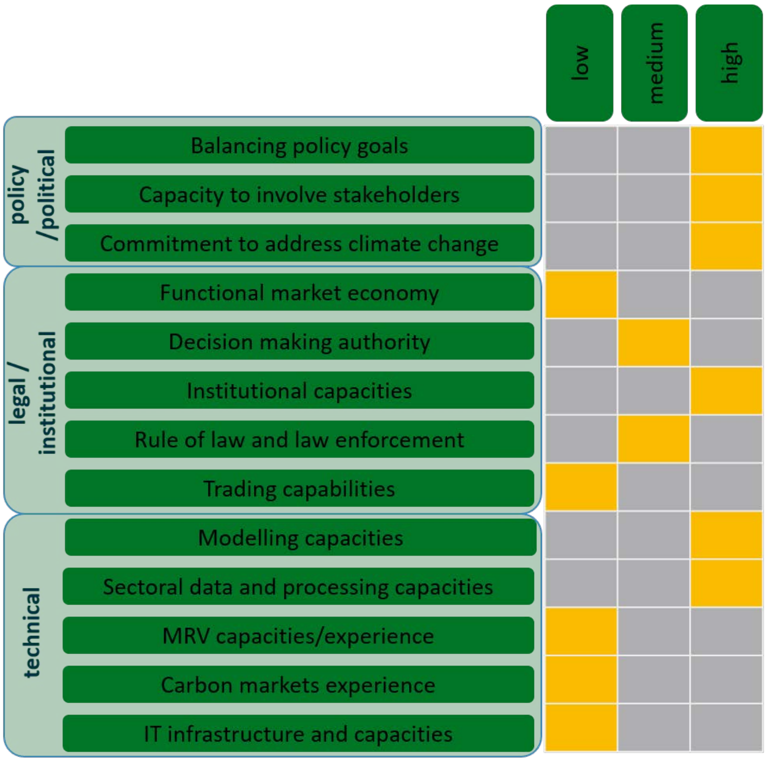
Cap-setting can be done bottom-up (based on data on emissions, reduction potentials and costs of individual sectors and sub-sectors), top-down (based on the ambition level of overall climate or mitigation commitments), or, ideally, through a combination of both. Early data collection and robust

[7] In conjunction with flexibility provisions, such as the use of offset credits and banking/borrowing, and the use of price / supply control mechanisms (reduction/increase of auction volumes through price floors / price ceilings or mechanisms like market stability reserve).

information on historical emissions can inform the process of cap setting and increase fairness as well as transparency. Other types of information, such as emissions projections and estimates of mitigation potential in covered sectors, can further assist policy makers in the process in the early stages of the political decision regarding the ambition level of the cap as well as in the stakeholder consultations. Therefore, economic **modelling capacities (P9)** are crucial to determine the level of the cap, requiring expertise in applying models and interpreting their results, while the availability of adequate models in the country as well as the data needed are also key requirements (**sectoral data and processing capacities - P10**).

In later stages, more detailed information and projections of the ETS impact, completely in line with the agreed scope of the system and the accounting rules agreed for the MRV system, are helpful to finalise the exact numerical level of the cap that will need to be included in the legislation. Figure 10 summarizes the relevance of the different preconditions for the cap setting process.

Figure 10: Setting the cap: Relevance of preconditions



Source: Own illustration

2.2.2 Offsetting

Offsetting allows ETS-regulated entities to fulfil part of their compliance obligations by surrendering mitigation certificates generated in a baseline and credit system outside the scope of the ETS (and any systems it is directly linked with). These can be generated within (domestic offsetting) or outside the country (international offsetting). Policy makers can also use the MRV and governance system of an international offsetting scheme while restricting the eligibility to credits generated within the jurisdiction or to other geographical and technological scopes. Baseline and credit systems may have scopes ranging from projects over programmes to entire sectors.

Policy / political track

Allowing regulated entities to use offsets can be guided by different political considerations: It can be motivated by the wish to limit compliance costs for ETS participants. Establishing a domestic offset programme can also be driven by the desire to expand the ETS price signal beyond the scope of the

ETS without having to place an emissions cap and impose mandatory monitoring and compliance rules on whole sectors outside the scope. The desire to build capacities in uncapped sectors to facilitate a later entry into the ETS can also play an important role (PMR / ICAP 2016). Therefore, a decision on whether offsetting will be allowed in general and whether to establish a domestic offset scheme or make use of existing international schemes must be taken by **balancing different policy goals (P1).**

The final decision on whether the use of offsets will be allowed and on which level ('supplementarity') should be taken at an early point of time in the process. This is because the use of offsets reduces compliance costs for capped entities and will lead to less emission reductions (and less structural change) in the operations of ETS participants themselves, unless the cap is tightened to maintain ambition level. This should therefore be taken into consideration when taking decisions on other design elements, such as cap setting. Here, also the consideration of the need for additionality requirements is relevant, to avoid the risk of increasing emissions within the system without corresponding reductions elsewhere. Policy makers should transparently communicate the intention to consider the use of offsetting and allow stakeholders to express their views (**stakeholder involvement – P2**).

Legal / institutional track

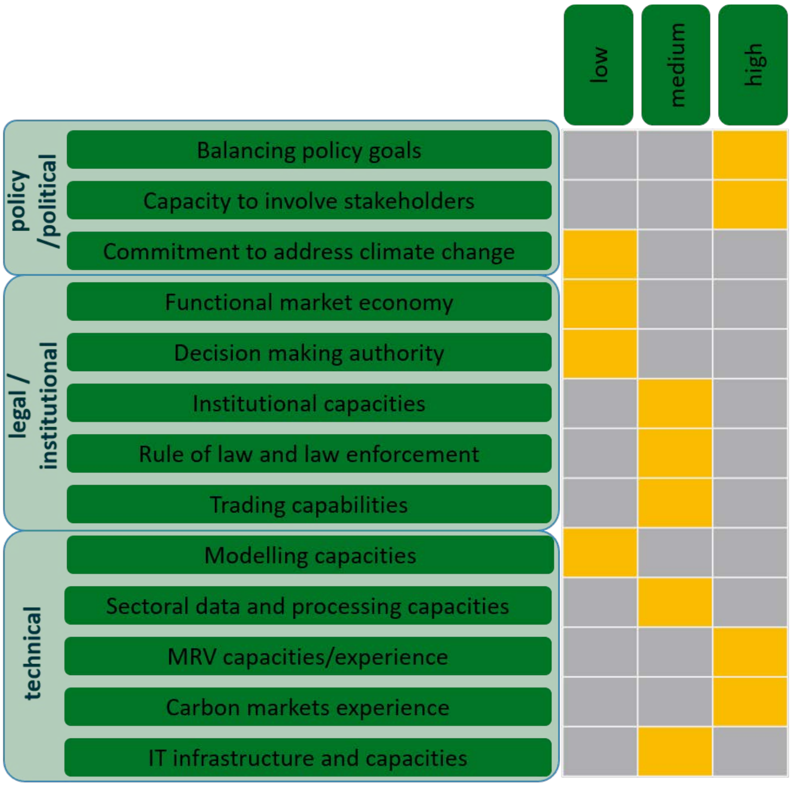
When the development of a domestic offset programme is being considered, policy makers will have to assess domestic **institutional capacities (P6)** of potential offset suppliers, the capacities for administering and governing the programme, and the capacities needed to set up a robust system for assessing additionality and conducting MRV. In terms of quality these processes and provisions must be comparable to those of the ETS to avoid environmental integrity being undermined. Once the decision on setting-up a domestic scheme has been taken, policy makers must introduce the necessary legislative provisions and make choices on the institutional set up. For instance, they will have to establish an institutional framework for the registration of activities and issuance of credits as well as decide on legal issues such as liability in case offsets have not met the quality criteria (PMR / ICAP 2016).

Further decisions must be taken to avoid the different forms of double counting (for an overview on double counting see Schneider et al. 2014 and Kreibich / Hermwille 2016). For instance, the regulator could require the supplier of credits (or the regulator of the international offset scheme) to ensure that the emission reduction achieved in the underlying mitigation activity is not used for compliance purposes by another entity. In the domestic offsetting scheme, overlap between activities covered by the ETS and crediting activities must be avoided, or explicitly accounted for. These and other provisions form part of the legal framework, which is to provide legal certainty for stakeholders (**rule of law and law enforcement – P7)**.

Technical track

When a domestic offset scheme is developed, eligible sector(s), gases and activities must be determined, which can be supported by economy-wide and **sectoral data (P10)** on abatement potential and costs to be in place. However, since participation in the offsetting scheme is voluntary, this data is only relevant to manage expectations and to decide whether establishing sector-specific rules is worthwile. The establishment of an offset scheme with local projects can be motivated by achieving additional social, economic and/or environmental benefits, such as access to clean energy, increased efficiency and reduced energy costs, additional job creation or e.g. health benefits from offset projects that reduce local air pollution. If an international offset system is to be used, legislators may demand a technical assessment of its robustness before approving its use within the ETS. Here, **experience with global carbon markets (P12)** is particularly useful. Figure 11 illustrates the relevance of preconditions for deciding on an offsetting option.

Figure 11: Deciding on an offsetting option: Relevance of preconditions



Source: Own illustration

2.2.3 Market

Emissions trading has the explicit objective to put a price on carbon emissions, thereby providing an incentive for the emitters, as well as their downstream clients, to make decisions that lead to lower emissions in the future. Taking into account the cost of carbon in investment decisions, operational decisions and purchasing decisions should lead to low-carbon alternatives being developed and implemented. Market circumstances or failures that blunt the carbon price incentive will make the ETS less effective. This can include aspects such as the (lack of) liberalisation of the energy market, price subsidies/caps, state-owned enterprises that may not have to respond to market drivers as private parties, as well as the availability of information on price formation.

In addition, emissions trading is in itself a market-based instrument, i.e. it involves the exchange of units (allowances) against monetary values. For such a market to function efficiently, different elements must be in place and political decisions must be made. One such element of a functioning carbon market is to define the legal nature of the allowances and to adopt provisions for regulating the transactions and establishing a market oversight authority. By providing and/or using a trading platform on e.g. regulated markets/exchanges, transparency and market confidence can further be enhanced, which might spur increased market activities. Establishing these market elements requires activities on all three tracks, with the legal/institutional track being particularly relevant.

Policy / political track

From a political perspective, allowing individual companies or installations to trade a commodity requires the fundamental openness of the government towards market-based approaches. Even in cases where there is such openness in general, there might be some reservation towards opening a certain sector to competition, as this is often a highly politicised process. In many countries, for instance, electricity generation is fully or partially state-owned. While opening such sectors to competition may yield cost reductions and efficiency gains by inter alia allowing free price discovery and price formation, the government will also lose a large part of its control over the market, and therefore the possibility to achieve other policy objectives, such as access to energy, security of supply, energy independence and socio-economic or environment and health-related objectives. In some cases it may also lead to a loss of income. Therefore, the capacity to **balance policy goals** (P1) and engage with **stakeholders (P2)** is of utmost importance in order to mobilize a broad political support for having a liberalized market in the sector.

Legal / institutional track

A sector that allows for the participation of private companies is a necessary condition for the establishment of an ETS, it is, however, not a sufficient condition. In order to function effectively, a **functional market economy (P4)** must be in place, allowing for competition, a level playing field between competitors and a pricing structure that allows price signals to be passed on to the final consumer. If, in contrast, (energy) prices for consumers are largely regulated and/or subsidized, the effectiveness of the ETS will be limited: If the additional costs of allowances are not (fully) passed through to the client by the regulated entity (e.g. because energy prices are capped by law, or because there is too strong competition in the market), there will be no (or only a limited) carbon price incentive for downstream sectors. In this case, mitigation may only take place at the point of the regulated entity itself, or through demand-side management programmes it initiates with its customers[8]. Establishing an ETS will also be problematic if the number of market actors is limited and the sector is dominated by one (or a few) large company (-ies). By the same token, transparency and availability of information on market activities including on price formation and trades are important factors for a functional market economy. In order to allow for fair competition among market participants, strong **rule of law and law enforcement (P7)** are also relevant preconditions. Decisions must further be taken on whether unit transfers will be charged with a tax or not, and how to account for units held by market participants in financial terms (for an overview of legal aspects see: PMR / FCPF 2016)

Strong **trading capabilities (P8)** are another relevant precondition for ETS development. This relates to the existence of trading platforms for the primary as well as for the secondary market. The operator of the primary trading platform (in case of auctioning) could be public or private. In any case, the government will have to assign it with the authority required and stipulate the requirements, e.g. to ensure equal access for all market parties or to ensure security and confidentiality where applicable. The secondary market, in contrast, can consist of more than one platform and may include direct over the counter transactions as well as trades through exchanges.[9] Therefore, existing trading platforms might provide a useful basis for allowance trading under the ETS.

In order to regulate these trading activities and establish competitive markets, strong **institutional capacities (P6)** are required. Here, experience with trading of existing financial products will be an asset. Understanding of market forces and how to establish a level playing field for companies will be key for developing competitive markets. If a carbon unit is considered to be subject to the same regulatory treatment as other financial products, policymakers will be able to build on existing frameworks for trading with financial products. Financial regulation enhances confidence in the market and can provide a safe and efficient trading environment. In order to regulate market access, define tradable goods and other rules that affect market safety and robustness legal provisions must be adopted. Establishing or designating the entity responsibly for market oversight and transferring the necessary authority is another key issue. In order to increase market liquidity, policymakers may decide not to limit market access to compliance actors, but also allow other entities, in particular financial actors, to participate in trading. Another relevant aspect for developing a functioning market is companies'

[8] Whether the latter is incentivised in an upstream system depends on the type of allocation approach (auctioning vs free allocation) and the details of updating the allocation over time (will lower sales from DSM activities result in a benefit for the supplier in terms of left-over allowances to sell, or will it result in a lower allocation in future year?).

[9] In addition, trades in the derivatives of allowances are possible.

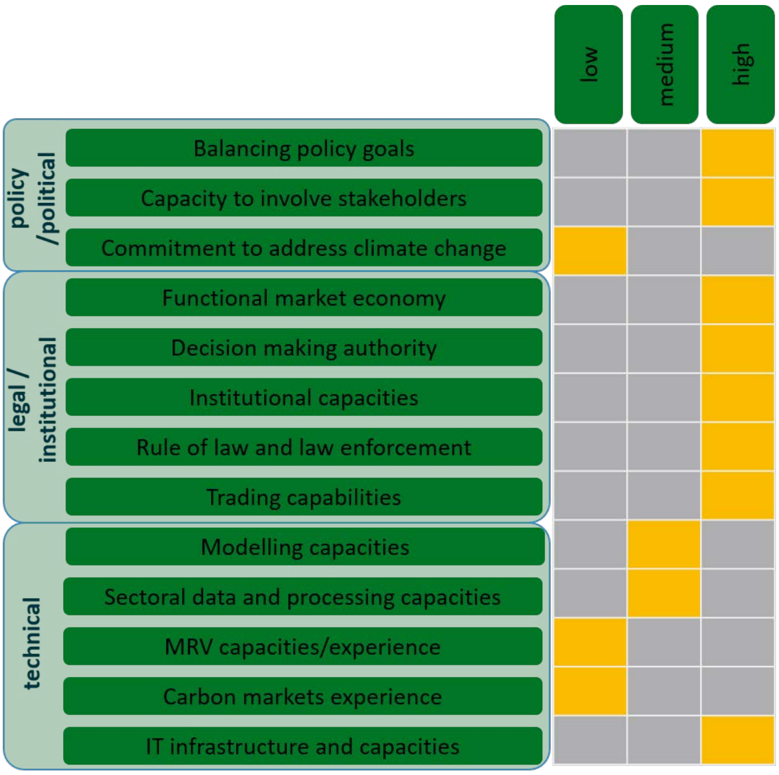
trading capacities. Depending on their current involvement in trading, different support activities might be required in order to strengthen their institutional capacities in trading.

Technical track

On the technical track, a functioning **IT infrastructure and respective capacities (13)** are of key relevance for the establishment of a functioning market. This precondition is relevant for developing trading platforms and to link market activities to the registry. In order to allow for a liquid and transparent market, market participants must be provided with the information relevant for their market decisions. This includes information on market platforms where allowances can be exchanged, current (and future) emissions, the development of demand and supply of allowances and price levels **(sectoral data and processing capacities - P10)**.

The regulator must have a good knowledge and understanding of the market and the drivers of demand for permits. Impact assessments and modelling can further guide policymakers in deciding whether supply control mechanisms are needed or if adapting the cap of the ETS is necessary (see section 2.2.1) **(modelling capacities - P9)**. Modelling capacities are further relevant for companies covered by the scheme, as they can provide the basis for developing effective market strategies allowing for instance to assess in-house mitigation options and costs, weighing costs in investment and operational decisions or weighing long-term vs. short term consequences. Figure 12 summarizes the relevance of preconditions for this building block.

Figure 12: Establishing a functioning market: Relevance of preconditions



Source: Own illustration

2.2.4 Scope and Point of Regulation

The scope defines the coverage of the ETS in terms of sectors, entities, activities and greenhouse gases (GHGs); its definition is thus a necessary condition for embarking on the other building blocks. The point of regulation (or the ‘regulated entity’) defines which entity is responsible for meeting the compliance obligations under the ETS, including the surrendering of allowances.

Policy / political track

In order to define the scope of an ETS, political decisions need to take into account the likely balance of costs across sectors and stakeholders and the impacts of an allowance price on covered entities. More generally, the national government's willingness to tackle emissions from specific sectors or activities will depend on its assessments of the costs and benefits of different degrees of coverage and their impacts on other policy realms (**balancing policy goals – P1)**. This will be influenced by factors that are specific to the national situation such as the power of different interest groups, as well as that of their line ministries in national decision-making. Decision-making on the appropriate sectoral coverage for an ETS should take into account other policy objectives that may exist for the targeted sector (especially for the energy sector), the existence of other policies also affecting the other sectors with potential conflicts or synergies, including a duplication of (compliance and/or reporting) obligations and a risk of double counting.

The political decision on the point of regulation needs to balance the advantages and disadvantages of different approaches, as, for instance, upstream regulation might be easier to implement as the number of market participants will be lower, while downstream regulation could provide a more direct incentive to reduce emissions. The choice of the point of regulation can be informed by the design of existing policies: If existing policies regulate upstream, institutional capacities and data availability could allow using a regulated entity in the ETS that is farther away from the actual release of emissions.

Institutional / legal track

Existing legislation may provide a basis for determining participation thresholds and identifying individual regulated entities to be covered by the system, either in terms of existing institutions that oversee such entities or in terms of the availability of data on the number and size of entities. **Institutional capacities (P6)** established in the operation of existing policies can inform the processes of defining the scope of the ETS and its point of regulation.

For the successful implementation and enforcement of an ETS a certain level of **rule of law and law enforcement (P7)** must be ensured, which allows the regulator to actually enforce the operation of the ETS. This is also relevant at the moment of defining the scope of the ETS, as some sectors may be characterized by low levels of public authority. One example is solid waste management, a sector which in many developing countries is characterized by a large informal engagement.

Other sectors, in contrast, might have a formalised economic structure but lack the characteristics of a **functional market economy (P4)**. In some countries, for instance, the electricity sector may be partially or fully state-owned, making it difficult to pass on the price signals of an ETS. A market dominated by a small number of entities is not likely to result in a competitive and liquid allowance market, as market power of individual entities can be too high. If ETS systems are very small (e.g. only 1-2 sectors with a small number of players), this can be a relevant consideration. Normally, having more and more diverse sectors included will provide market liquidity and prevent market dominance, especially when also non-compliance transactions[10] are allowed in the market (Duwe et al, 2016).

Technical track

When deciding on the sectoral scope, the contribution of a sector to the national GHG emissions profile is an important variable. Robust information on the national emissions profile, the role of the sectors and existing emission reduction potentials and costs will therefore be key to define the broad sectoral reach. At a later stage, where the exact scope in terms of activities, sources and gases is defined, **sectoral data (P10)** with a higher granularity is needed. Here, data that has been collected in the context of other policies can assist this process. It is also important that technical capacity and data are

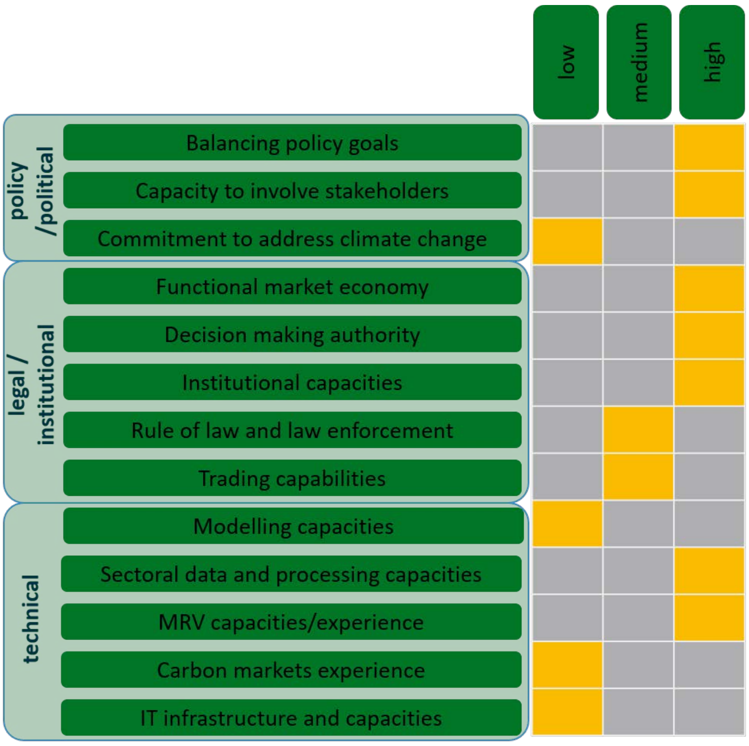
[10] Not just buying for compliance, but also for hedging future risks (forward trades, options, etc.) and for speculative reasons (financial actors).

available to decide on participation thresholds, e.g. in terms of definitions (capacity, production, emissions, which products) and cut-off criteria, and assess the impact of choices on e.g. competition between different types of installations.

Emissions must be regulated at a point that allows for adequate monitoring. Therefore, the decision on the point of regulation is closely related to the question of data monitorability (Pew Center on Global Climate Change 2008). In terms of administrative costs for the regulator, upstream regulation tends in principle to be more cost efficient because of the lower number of entities involved.

A different point related to the monitoring of emissions is the choice between whether to regulate on a company level, the site level or the installation level[11]. Using the installation level gives the highest transparency for verification and enforcement, though sometimes integration between different installations on one site makes monitoring at the installation level complex. Aspects closely related to this are the question of existing regulations and the level at which data is already being collected for those. If data, such as for collecting energy taxes, is collected at the company level, this could be a good reason to decide for the ETS to regulate at company level, too. In contrast, if in the past the information has been collected at the installation level, targeting installations could be more suitable (PMR / ICAP 2016). Therefore, existing **MRV capacities and experiences (P11)** made should be taken into account when deciding on the scope and the point of regulation. Figure 13 illustrates the relevance of preconditions for this building block.

Figure 13: Defining the scope and the point of regulation: Relevance of preconditions



Source: Own illustration

2.2.5 Monitoring, Reporting and Verification (MRV)

The main function of an MRV system is to provide the data needed to assess emission levels of entities covered by the ETS in order to define the amount of emission allowances to be surrendered. A robust MRV system is a key prerequisite for ensuring the environmental integrity of the trading scheme and

[11] Note that in practice, the regulated entity may be the operator of a site, which may include different (types of) installations, especially in integrated processes such as in refining, the chemical industry and the steel sector.

the credibility of the market. Monitoring relates to the quantification of the emissions, either through direct measurement or – in most cases - calculation. This information is then reported in form of emission reports. Subsequently, the content of these reports is verified, usually by independent third parties. In order to ensure consistency and reliability, an MRV system must contain all three of these elements.[12]

Policy / political track

Activities related to MRV are more implementation oriented, and often rather technical. In the policy/political track, the most important aspect is to signal a clear and consistent will to establish a credible ETS, with a corresponding commitment to a robust MRV system, requiring a strong **commitment to address climate change (P3)**. In the design of the MRV system, an optimal balance needs to be found between the conflicting objectives of high accuracy/credibility and low MRV costs **(balancing policy goals - P1).**

Early and transparent communication allows gaining support from stakeholders and can help addressing concerns from those fearing adverse effects (such as increased costs for measuring) from the MRV system. **Stakeholder involvement (P2)** activities are further relevant to get technical input for the process of establishing an MRV system.

Institutional / legal track

Monitoring and reporting will usually be undertaken by the entities covered by the ETS. In order to ensure the required activities are actually carried out, the regulator needs to have the **decision making authority (P5)** to make them legally binding.

In addition, there is also a need to have strong **rule of law and law enforcement (P7)** to ensure compliance with MRV provisions. Primary law will need to specify the consequences on non-compliance and the roles and responsibilities in relation to enforcement (see section 2.2.8 on enforcement below). Primary legislation will further determine which institution is responsible for administering the MRV system. The administrator of the MRV system is usually also responsible for administering the ETS as a whole. It is responsible for ensuring that companies meet reporting deadlines and that emission reports are verified as required. It also determines whether the emissions reported correspond to the number of allowances held by the entity and whether sanctions need to be applied. Depending on the design of the MRV system, it may also be responsible for overseeing the quality of the work of the verifiers. The latter role can also be outsourced to a national accreditation body, if this exists in the country. In terms of the MRV system, this domestic body may further be in charge of developing guidelines that specify how to apply the primary law.

When establishing the monitoring and reporting requirements for an ETS, existing monitoring and reporting obligations should be taken into account, for instance on energy production and consumption. Before developing new provisions, policymakers should assess if the data collected in the context of existing policies can be used for GHG monitoring. Experience with existing policies might also indicate whether incorporating the new provisions into existing law or developing new legislation is deemed more adequate. Using existing legislation may provide some advantages, such as using existing reporting systems, procedures and enforcement measures and building on the **institutional capacities (P6)** established through the operation of other policies. These capacities might serve as a good starting point for establishing processes that ensure accuracy and reliability of the information reported by the regulated entities. While third-party verification is considered to provide high levels of confidence, the decision on which approach to choose should, in addition to the associated costs, take into

[12] Note that often additional steps in the compliance cycle are added, e.g. speaking about MRVA (Accreditation) systems or MRVCE (Compliance & Enforcement) systems. The former includes the accreditation of third party verifiers, while the latter includes issues such as sanctions on non-compliance and the system to ensure sanctions are actually enforced (e.g. collection of fines, blocking allowance trading ability, close down of plants).

consideration the institutional capacities at different levels: Does the regulator (or administrator of the ETS) have the capacities for reviewing the reports? Are there verifiers in the region that can provide adequate levels of accuracy? Is there an existing institution that could function as a national accreditation body? When answering these and other questions the experience made with existing policy instruments can provide relevant insights.

Technical track

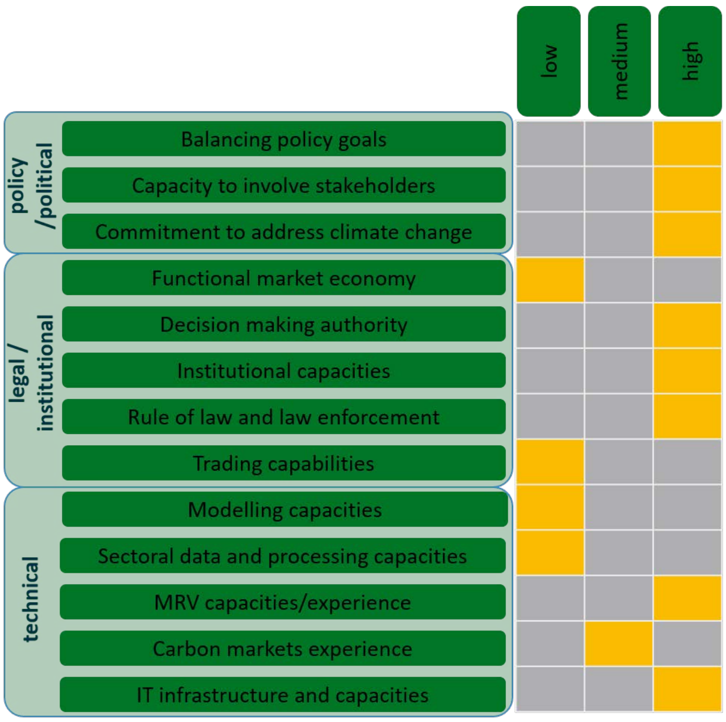
Since monitoring and reporting are related to the gathering and processing of data, technical **MRV capacities and experience (P11)** are particularly relevant when developing the MRV provisions. For monitoring, technical requirements must be developed that provide clear and unambiguous guidance to regulated entities on how to gather data on emissions of sources covered by the ETS. This includes for, example, which gases and sources to include, how to measure or calculate the emissions, the supporting data that need to be provided to allow verification (e.g. production data), which conversion factors to use, what kind of sampling or calibration techniques to use or what levels of accuracy are required for each of the parameters to be monitored.

In terms of reporting, procedures need to be developed that ensure that the information monitored is reported in a standardised form, prescribing the required contents. Potentially, systems for electronic reporting could be developed and used **(IT infrastructure and capacities – P13)**.

For verification, also requirements need to be formulated, e.g. in terms of how to ensure that the data is complete, consistent, and accurate, how to focus on high risk areas and material issues and how to ensure verifiers are competent and impartial. Existing verification experience, e.g. with ISO standards or CDM projects, can provide the technical expertise to deal with these issues in the context of an ETS.

Companies that have gained **carbon markets experience (P12)** might be able to build on these capacities when participating in the MRV system of the ETS. In principle, building on existing information flows can reduce costs while increasing reliability and accuracy of the reporting requirements. Figure 14 illustrates the relevance of preconditions for establishing an MRV system.

Figure 14: Establishing an MRV system: Relevance of preconditions



Source: Own illustration

2.2.6 Registry and IT System

An emissions trading registry is an electronic tool (IT system) that assigns a unique serial number to each allowance issued to identify and track ownership of allowances and the compliance status of its owner. The registry consists of accounts for (at least) each of the regulated entities and contains information on emissions as well as allowances issued, transferred (including to whom) and surrendered. If applicable, it also shows offset credits held and used for compliance. It should indicate whether the holder is in compliance (i.e. whether sufficient allowances have been surrendered in previous years). Though its primary purpose is to ensure compliance and avoid the misuse of allowances (fraud, theft, etc.), a registry can also be an important tool for providing market information and transparency to market participants and the interested public.

Policy / political track

Activities related to the registry are more implementation oriented, and often quite technical. In the policy/political track, the most important aspect is to signal a clear and consistent will to establish a credible ETS, with a corresponding commitment to robust compliance system, and the role of the registry in achieving that (**commitment to address climate change – P3**).

Policy makers should ensure that the design of the registry matches the functions mentioned above and make a political decision on the balance between transparency and confidential treatment of information (**balancing policy goals – P1**). A political decision may also be whether or not to allow registry accounts for non-compliance parties, e.g. environmental NGOs or financial actors.

Legal / institutional track

Establishing the registry requires a legal framework to be in place that defines the functions and requirements of the registry. Primary legislation will be needed to provide the broad legal framework (e.g. on functions, responsible entity, type of accounts, contents, confidentiality), which is then complemented by secondary or enabling legislation. The legal framework for a registry should reflect the nature, scope and scale of the ETS. Inter alia, the regulator will have to allocate respective responsibilities and tasks to the bodies involved. In order for these provisions to become effective, **rule of law and law enforcement (P7)** is a key precondition.

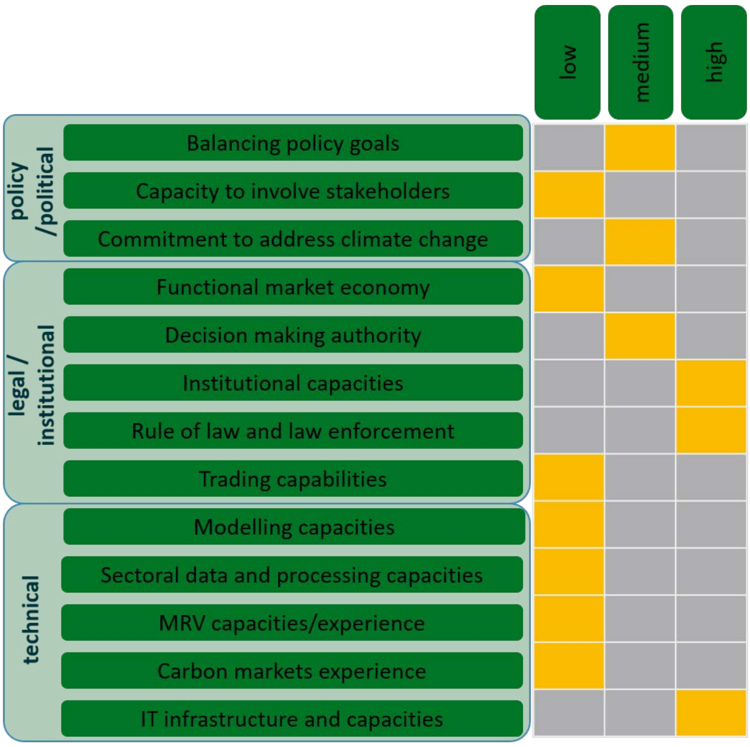
In institutional terms, the regulator will have to charge an entity with administering the registry. The administrator does not necessarily have to be a public government body but can also be a private entity. Tasks and responsibilities of the administrator depend on the complexity of the registry and may, inter alia, include ensuring the registry system is fit for purpose, opening of accounts, check compliance with regulatory obligations, issuance of allowances (PMR /FCPF 2016). The complexity of the registry can be higher if the administrator disposes of the **institutional capacities (P6)** required for its administration. Experiences made with policy instruments that also have registries in place should inform this process.

Technical track

The complexity of the registry depends on the complexity of the ETS: The basic function of a registry is to capture, manage and record all transactions. A scheme with a large number of sectors and participants that aims to link to another system in the future will require a registry that is more elaborate, potentially with much more activities being automatized. Therefore, assessing the actual needs is a key step in the process of setting up the registry by specifying the functional and technical requirements of the registry, the type of data to be managed, the estimated volume of transfers taking place, etc. (PMR / ICAP 2016). If the ETS will allow for the use of offsets, the registry must further be able to include and track these credits. Depending on the type of credit, conversion of credits into allowances might be needed and a link with other accounting systems may need to be made[13].

Once the key functions of the registry are specified, they must be translated into technical specifications and an IT service provider must be mandated to develop the registry. Alternatively, existing registries might be shared among several jurisdictions. Another option is to use existing registry solutions and adapt them to the specific needs. Outsourcing can be another option, where a private company hosts and maintains the servers, database, etc. The **IT infrastructure and capacities (P13)** within government institutions as well as within the private sector should be taken into account in the process of registry procurement, in particular since each of these registry procurement options has its own repercussions in terms of functions, costs, IT security, data ownership, flexibility, etc. (PMR / FCPF 2016). Experience with existing registries or accounting systems can help in the development of an ETS. Figure 15 below summarizes the relevance of preconditions for this building block.

Figure 15: Establishing a registry: Relevance of preconditions



Source: Own illustration

2.2.7 Allocation

Allocation refers to the method used for distributing allowances among the regulated entities. While the allocation approach does not affect the carbon price, it does influence the distribution of costs and behaviour of entities covered by the system. The two fundamental approaches of allocation are auctioning and free allocation. In allocating allowances for free, different approaches can be chosen, with different advantages and disadvantages in terms of the incentives for emission reductions and taking into account early action and mitigation potentials. The different approaches can also be combined.

Policy / political track

[13] For example, in the EU ETS, regulated entities can hold CDM credits in their account. In order to be used for compliance, they need to be converted by the national government into an equivalent amount of EU allowances from its national assigned amount unit, and the CDM credits are then used by the credits for compliance at the national level with UNFCCC obligations.

When designing the allocation approach, different, conflicting considerations will be relevant: The overarching goal of the system is to incorporate the cost of carbon in company (and consumer) decisions, incentivize regulated entities to reduce emissions (environmental impact) and reward early action (environmental impact, fairness, equal treatment). However, these goals need to be balanced against the associated costs to companies and consumers, both for reasons of political acceptability as well as for the existence of other important policy objectives (economic growth/competiveness, employment, access to affordable energy, products and services). In addition, technical reasons (and associated transaction costs) may lead to a choice of less than ideal allocation approaches (grandfathering over benchmarking). On the other hand, the generation of revenues that exist if auctioning is used may also be key, in particular if the ETS replaces policies that have generated revenues in the past, such as carbon taxes. These considerations indicate the strong political nature of this building block and the relevance of **balancing of policy goals (P1**) and a strong **commitment to address climate change (P3)**.

A political decision needs to be made on the allocation approach to be used weighing these different objectives and advantages/disadvantages. Involving different types of stakeholders (business representatives, NGOs, civil society, government representatives, science, etc.) in a transparent process can assist selecting an appropriate allocation approach. The **stakeholder involvement (P2)** process can be facilitated by modelling exercises and impact assessments (see technical track below) of the individual design options and specific topics, such as the risk of carbon leakage. In addition, decisions may be taken to limit potential negative impacts, e.g. through carbon leakage protection provisions cost compensation measures, border tax adjustments for imports/exports or recycling of auctioning revenues. In the case of free allocation, it also needs to be determined how to grant equal access to the market for new entrants, and how to deal with the closure of installations in terms of the ownership of the allowances.

The regulator may initially want to give the regulated entities time to adapt to the new system, without inducing a large economic burden on regulated entities. Indeed, "buying in" emitters by granting free allocation may be a *sine qua non* to achieve political acceptance of the new regulation. However, such an approach can generate a long term path dependency that severely restricts the ability of the ETS to achieve stringent mitigation.

Legal / institutional track

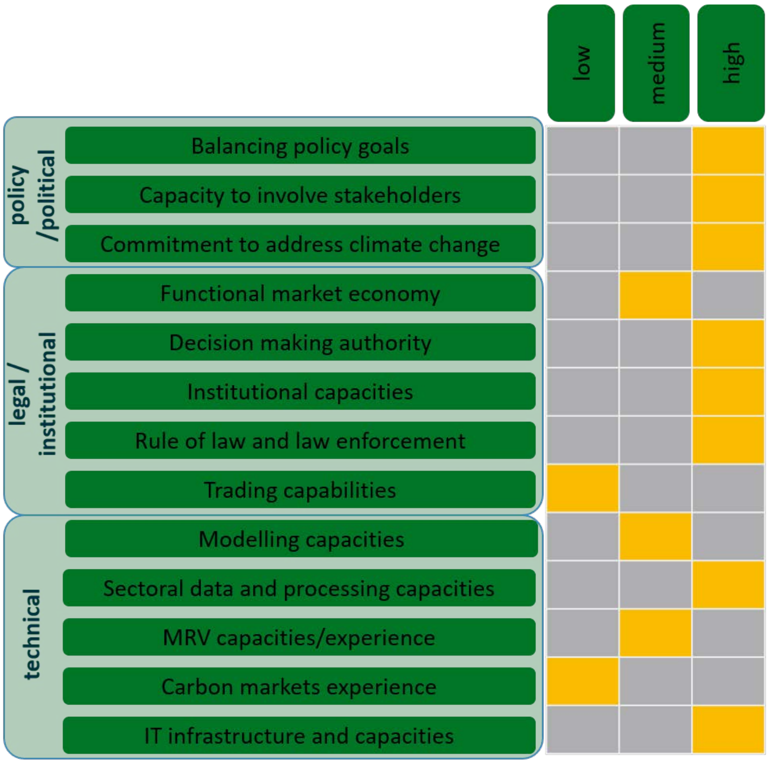
The choice of the allocation approach and its design will presumably be the result of a political process. Given the fact that significant institutional capacities are required to correctly assess the impacts of the allocation, a technical institution could assist in the process. The final decision on the choice of the allocation approach should also take into account whether there are adequate **institutional capacities (P6)** that could be used. This could relate to interpreting modelling results and assessments of impacts of allocation choices, the development and implementation of allocation methodologies (including issuance of free allowance), competition law or the construction, operation and oversight of auctioning platforms.

Once a decision on the allocation approach has been taken, legislation will be needed to define how it will be applied, requiring a strong **decision making authority (P5)** in the sectors affected. Consistency with existing legislation, such as e.g. competition and trade laws (free access to markets, border tax adjustments) need to be taken into account. For free allocation, questions such as how to deal with new entrants/ closures, the exact rules for auctioning and how to oversee these processes will have to be addressed, inter alia. For auctioning, legislation ensuring equal access for all parties and avoiding market manipulation by dominant parties is important. Secondary regulation will have to define the technical specifications of the allocation approach, including the definition of installations, sector boundaries, reference years to be used, the type of benchmarking, etc. While these issues will be explored on a technical level, **rule of law and law enforcement (P7)** is needed to establish mandates, ensure legal certainty in potential legal challenges and enforceability.

Technical track

Free allocation has specific data requirements: It can either be based on historical emissions (grandfathering or grandparenting), or on (usually output-based) benchmarks. The latter can be defined based on different data-sets (different product-, sectors or sub-sectors, or different geographical peer groups). Both require **sectoral data processing capacities (P10)**, but with higher requirements for benchmarking. A well-developed **IT infrastructure and respective capacities (P13)** will further be required for allocation, in particular if a large number of parameters are to be taken into account. Figure 16 illustrates the relevance of preconditions for this building block.

Figure 16: Deciding on an allocation approach: Relevance of preconditions



Source: Own illustration

2.2.8 Enforcement

The enforcement of an ETS ensures the credibility of the market by imposing sanctions on entities that fail to comply with their obligations regarding MRV and submission of trading units.

Policy / political track

Sanctions for entities that fail to comply may range from soft options (notifications) to hard options such as monetary fines, criminal penalties and administrative sanctions barring non-compliant entities from selling allowances or even halting operations. In addition, naming and shaming the entities that failed to comply can be considered. The choice of the type of sanction and their stringency will be based on political, country-specific considerations and should be well balanced against other priorities and objectives (**balancing policy goals – P1**). The effectiveness of sanctions also depends on country-specific circumstances and culture. In some countries, shaming is a robust policy instrument whereas in other countries, there is only limited scrutiny from the public.

In the early stages of introducing the ETS, sanctions may be less strict to account for the lack of experience of the regulated entities with the new instrument. Over time, however, sanctions for non-compliance should become sufficiently strict to incentivise compliance. The process of tightening up the enforcement rules should be agreed at an early point in time and take into consideration progress of ETS implementation, potentially by using pre-defined indicators.

In addition to the definition of rules when to apply sanctions, and their strictness, the most important factor is the political **commitment to address climate change (P3)** in order to actually apply and enforce the sanctions. If no (or insufficient) effort is put in checking compliance, informing non-compliant parties of corrective actions needed and ensuring that such actions are actually taken (e.g. are fines paid?), enforcement will just exist on paper.

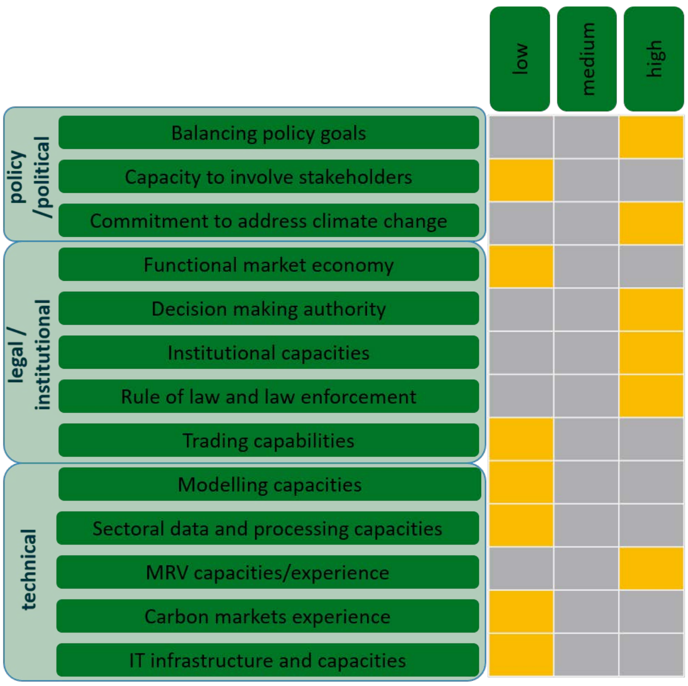
Legal / institutional track

A strong **decision making authority (P5)** is a key precondition of enforcement. Policy makers will have to ensure that the body tasked with enforcing the rules does also have the legal authority to ensure that penalties are applied in the case of non-compliance (Prag et al. 2012) as well as the necessary resources (and political support) to ensure sanctions are actually applied (fines collected, plants closed, etc.) (**rule of law and law enforcement – P7**). When establishing the enforcement rules and assigning the enforcement roles to institutions, the existing legal infrastructure and the **institutional capacities (P6)** must be taken into consideration. Experiences with the enforcement of other policy instruments that have mandatory obligations could inform the development process of the enforcement system of the ETS.

Technical track

In technical terms, clarity on the information needed to impose sanctions and enforce compliance is needed. Within the administration, strong **MRV capacities (P11)** are required to judge whether monitoring reports have been drafted following the agreed rules and to assess in which cases exemption from the rules may be justified. Note that the latter can also be outsourced, e.g. by relying on the judgment of verifiers. Economic analyses on effective financial penalty levels further could facilitate related decisions. Figure 17 below summarizes the relevance of preconditions for this building block.

Figure 17: Establishing an enforcement system: Relevance of preconditions



Source: Own illustration

3 Policy Instrument's Contributions to ETS Development

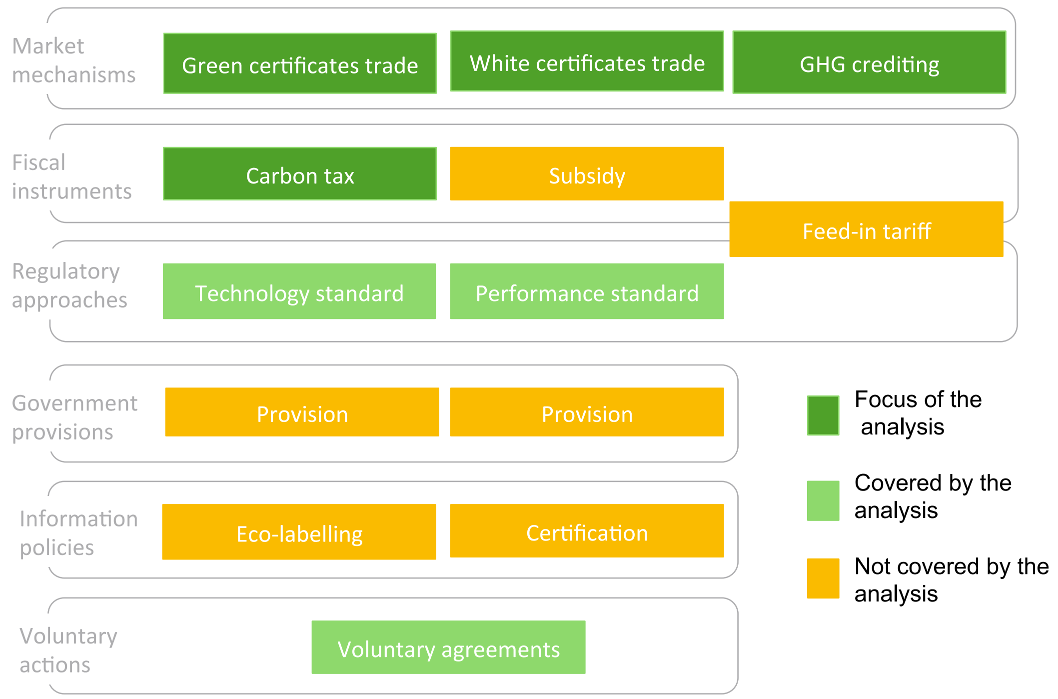
This section is to analyse the value of different climate policy instruments in serving as a basis for ETS development, and how to best shape instruments to serve this purpose. For this purpose, this chapter first categorizes national climate policy instruments that are likely to be a good foundation for ETS development in order to provide the basis for the selection and subsequent analysis of policy instruments.

Building on the categorization of the IPCC Assessment Reports (Gupta et al. 2007, Somanathan et al. 2014), national climate policy instruments can be divided into the following categories:

- market mechanisms,
- fiscal instruments,
- regulatory approaches,
- information policies,
- government provisions of public goods and services and procurements, and
- voluntary actions.

For an in-depth analysis to identify those instruments that provide the best basis for ETS development, the scope of the policy instruments to be analysed in this study has been narrowed down, see Figure 18 below.

Figure 18: Scope of climate policy instruments (apart from ETS) to be considered



Source: Own illustration

The focus will be put on green and white certificates trade, GHG crediting, carbon taxation as well as on technology standard, performance standard and voluntary agreements.

Table 2 below categorizes the initial selection of climate policy instruments according to important characteristics. This includes the coverage of the instrument, which can be restricted to specific project activities, programmes, products or fuels, companies or other entities, sectors, or cover the entire economy. Instruments can either control the price of GHG emissions, the quantity, or neither. While some instruments allow trading to reach compliance, others do not. Furthermore, instruments can be differentiated according to whether participation is voluntary or obligatory.

Table 2: Categorization of selected policy instruments

	Green certifi-cates	White certifi-cates	Crediting instru-ment	Carbon tax	Technology standard	Perfor-mance standard	Voluntary agree-ment
Coverage	Sector	Sector / economy wide	Project ac-tivity / pro-gramme / sector	Energy products / entities / sectors / econ-omy wide	Company / sector	Company / sector	Company / sector / economy wide
Item con-trolled by the instru-ment	Certified amount of renew-able en-ergy	Certified amount of energy savings	Certified amount of emission reductions	Carbon price	Amount or perfor-mance of imple-mented technolo-gies	Perfor-mance	Depend-ing on agree-ment
Trading / non-trad-ing	Trading	Trading	Trading	Non-trading	Non-trading	Non-trad-ing	Non-trad-ing
Voluntary / obligatory participa-tion	Voluntary / obliga-tory	Voluntary / obliga-tory	Depending on policy instru-ment	Obliga-tory	Obligatory	Obligatory	Voluntary

Source: Own compilation

In the following, the policy instruments will be analysed regarding their potential to contribute to the introduction of an ETS. The assessment of non-ETS instruments builds on the analysis of the ETS building blocks and the preconditions identified in section 2. Instruments with a particularly large potential for contributing to the ETS development process will be explored further by looking at whether their contributions could be further increased through design. The options identified are to facilitate the transition towards an ETS at the design stage as well as during implementation of non-ETS instruments. Results are displayed in a table for each policy instrument analysed.

Subsequently, each section contains a brief description of the respective policy instrument with key findings, while the contribution to each of the preconditions is summarized in a table. For instruments analysed in more detail, design options to further improve the instruments' contributions will be displayed in an additional table.

3.1 Analysis of Policy Instrument's Contributions to the ETS Development Process

This section builds on the conceptual foundation elaborated in chapter 2 using the preconditions identified as a basis for analysing the potential contributions of non-ETS policy instruments to the ETS development process. Instruments with a particularly strong potential to contribute to the ETS development process will further be assessed in terms of how they could be designed to best support the ETS development process. The findings of the analysis are discussed in **section 3.2**, providing the theoretical basis for the empirical section of the report.

3.1.1 Green Certificates Trading

A green certificates – also referred to as Renewable Energy Certificates (RECs) or Guarantees of Origin (GoO) – trading scheme allows participants to exchange the environmental value associated to renewable energy generation without also having to physically transfer the respective amount of electricity. Demand for such certificates must, however, be created elsewhere in order for trade to ensue. One source of demand, the so-called voluntary demand, comes from end consumers as well as from companies and other entities wanting to voluntarily improve their carbon footprint. The main source of demand is usually generated through governmental regulation which requires energy generators, energy suppliers and/or large energy consumers to meet a certain quota of the energy they are generating or consuming with renewable energy. In the following, the focus is put on green certificates trading as a compliance tool, and is therefore analysed in conjunction with a renewable energy portfolio standard (RPS)/renewable energy obligations.

If a green certificates trading scheme is used as a compliance tool it can provide important contributions to the ETS development process. The instrument is particularly strong in terms of establishing legal preconditions (rule of law, law enforcement) and institutional aspects, while also indicating a certain commitment to act on climate change as well as experience in involving stakeholders. One key asset of the instrument is its trading component: Regulators and companies alike gain experience in the creation, trading, and tracking of virtual assets, and there are legal/institutional elements (market economy) in place to support those functions. On the technical track, the instrument contributes to numerous preconditions, with the instrument's registry and trading platforms being elements with key relevance for the ETS development process. The functions of a renewable energy certificates registry are similar to those of an ETS registry: It is to allow participants holding an account to transfer and surrender certificates. When deciding on whether to use the registry or elements thereof in the ETS context, specific functional requirements must be taken into consideration.

The scope of the instrument is limited to the power sector. A renewable energy certificates trading scheme can provide relevant sectoral data and processing capacities in terms of current and potential deployment of renewable energies and the associated costs, as well as the future fuel consumption and energy production scenarios for the whole sector. This information and the final decision on the quota level can inform the ETS cap setting process, as it serves as one first indicator on the mitigation potential and costs in the sector. It should be noted, however, that deployment of renewable energies (and the substitution of fossil energy) is only one mitigation activity, while other mitigation options such as energy efficiency improvements might also hold significant potential to be used under an ETS. Hence, while data and data processing capacities can assist the cap setting process, the ambition level of the renewable energy certificates trading scheme cannot be directly used for the ETS cap as the ambition level would have to be calculated using production forecasts and its impact would have to be translated into CO_2e. Table 26 in the Annex summarizes the contribution for each of the preconditions analysed. As shown, green certificate trading schemes provide particularly strong contributions to many of the ETS preconditions, in particular due to their trading component and mandatory nature, with the main drawback being the limited scope of the instrument. Table 27 in the Annex shows how these and other contributions could be further strengthened.

3.1.2 White Certificates Trading

Similar to renewable energy certificates, white certificates trading schemes are combined with regulatory instruments that place energy obligations on specific entities, in this case for energy efficiency improvement, thereby creating demand for white certificates. The energy savings quota can be imposed on different types of entities, usually suppliers or distributors of energy. In terms of sectoral scope, this obligation does not necessarily have to be limited to the power (electricity) sector: In Italy, for instance, where the first white certificates scheme worldwide became operational in 2005, the energy efficiency obligation is not only placed on distributors of electricity but also on natural gas distribution system operators (Di Santo et al 2014). These entities are required to implement or finance energy efficiency measures. Alternatively, they can buy certificates from other (non-obliged) entities that have implemented efficiency measures. The efficiency measures take place at the level of the final energy consumers. The efficiency gains are then certified and used for compliance by the obliged entities.

White certificates trading schemes can make significant contributions to several of the preconditions for ETS introduction. They establish mandatory obligations and do therefore need a legal basis as well as a compliance scheme. Due to their trading component, white certificate trading schemes further establish trading capabilities and infrastructure and a registry with accounts for different kind of participants. Hence, MRV capacities and experiences are developed at two levels and in several sectors. However, data will be limited to energy efficiency improvement activities, as is the price incentive provided by the instrument. Since energy efficiency solutions may be developed in sectors other than the compliance sector, these activities are also affected by other policies. Strong coordination across sectors is therefore needed as well as capacities for modelling the impact of cross-cutting policies. Table 28 in the Annex summarizes the findings. An important difference with ETS is that white certificate schemes deal with relative units (energy efficiency improvements), not absolute units (total emissions). So the system will not result in a cap on energy use or emissions, and as such impact assessment and stakeholder consultation efforts will have to deal less with fears of limiting growth options. Whether data and modelling exercises deal with total energy consumption and emission levels depends on how the energy efficiency targets for the white certificate system are set.

As can be seen, white certificate trading schemes can contribute to many of the preconditions relevant for the implementation of emissions trading systems. To further strengthen these contributions, policymakers could build on the possibility to establish a two-layer structure when developing MRV capacities and gathering data, as well as by making key trading components (institutions, IT infrastructure) compatible with the needs under a future ETS. An overview of options is provided in Table 29 in the Annex.

3.1.3 GHG Crediting

For GHG offset crediting instruments**,** a baseline of what would happen in the absence of an activity is established against which performance is measured. If actual emissions are below the baseline, credits are generated for the difference in emissions. These credits are typically used to offset liabilities under a mitigation target or in an ETS. More recently, some countries (Mexico, South Africa, Colombia) are exploring the use of these credits in the context of carbon taxes. The aim of using such credits for offsetting is to achieve greater cost-efficiency and drive emissions reductions in other sectors or countries not covered by the carbon pricing instrument.

In principle, GHG crediting instruments can be established at the project level (e.g. regular CDM projects) at the programme level (Programmes of Activities under the CDM) as well as at sectoral and policy level (e.g. credited NAMAs). In practice, however, sectoral and policy level approaches have not yet materialised. Therefore, the focus will be put on crediting schemes operating at the project and programme level. GHG crediting schemes can be governed by public or private entities and either be established at the national or at the international level:

In order to participate in an **international crediting instrument**, such as the CDM/JI or the future mechanism under Art. 6.4 of the Paris Agreement, countries are usually required to have specific processes and provisions in place to approve projects/programmes and supervise their operation. The extent to which individual tasks are shared between the international and the national level depends on the programme's design and may even be diverse within one mechanism, as under JI tracks 1 and 2. While key rules and processes will be elaborated at the international level, the sharing of individual functions may lead to the establishment of capacities at the national level that are key for ETS development.

The situation may be similar for **bilateral mechanisms**, where tasks can be shared among the participating countries. Under Japan's Joint Crediting Mechanism (JCM), for instance, host countries do also participate in the operation and management of the scheme.

Voluntary crediting schemes, such as the Gold Standard or the Verified Carbon Standard, are driven by private actors who certify the emission reductions of climate change mitigation activities and issue tradable credits in return. They are usually not linked to national government policies and can therefore not be considered national climate policy instruments as such. However, when installing a national crediting scheme, governments can build on some of the elements of the voluntary crediting scheme or even consider using them as the offsetting mechanism, as has been done in California and is under development in South Africa.

National crediting instruments or offsetting schemes are usually established to allow ETS participants to offset part of their obligations. One example is California's Compliance Offset Programme. National crediting instruments can build on international offset credits or voluntary market standards and are usually established with or after the introduction of a policy instrument that creates the demand for the offsets. National crediting linked to a carbon tax has been introduced in Mexico and is under development in South Africa and Colombia. China allows crediting against parts of the obligations of provincial ETS.

Against this backdrop, the analysis focuses on how the participation in international and bilateral crediting instruments as host countries of crediting activities can contribute to the ETS development process. National crediting instruments, in contrast, will not be considered since they are usually only established after or during the introduction of an ETS for being used as a domestic offsetting scheme. Table 30 in the Annex summarizes the key findings. As the analysis revealed overall medium contributions of GHG crediting instruments, no further exploration of how to adapt the design of the instrument for strengthening the contributions to ETS development was made.

3.1.4 Carbon Taxation

A carbon tax puts an explicit price on carbon emissions by levying a tax relative to the amount of carbon emitted (in contrast to e.g. a fuel tax). It offers emitters the opportunity to choose whether or not to reduce their emissions by weighing the tax expenditure against the (net) cost of emission reduction measures. By putting a price on carbon or other GHGs emissions, each tonne of GHG emitted represents a financial burden for the emitter that can be avoided by emission reductions, potentially triggering investments in low-carbon technologies.

Carbon taxes can provide particularly strong contributions to the political preconditions relevant for ETS introduction. The actual contribution might, however, depend on specific circumstances of the tax introduction (underlying reasons for introduction of the tax) and its final design (coverage and tax rate level). In terms of data and data processing capacities, the contributions of a carbon tax are high, in principle. Their applicability in the ETS context might, however, be highly dependent on the specific design of the tax. The Mexican carbon tax, for instance, taxes the imports and sales of fossil fuels, with individual tax rates for different fuel types not being proportional to their carbon content. In order to use the data from this instrument in the ETS context additional data sets on carbon content and use of fuel would be required as well as respective data processing capacities. The UK's Climate Change Levy, in contrast, is based on the CO_2 emissions and would directly provide relevant data that can be used in the ETS context.

A carbon tax, however, does not prescribe a predetermined policy outcome in terms of emissions, as an ETS would, leaving the level of effort chosen up to the obligated entities. This is in contrast to green and white certificates schemes, where – although expressed in different metrics – such an outcome is present (amount of RE generated, EE improvement achieved). Therefore, there may have been less data gathering and modelling of costs of the policy in its design than for such systems. Impact assessments of different tax levels may, however, still have been done to inform policy formation or stakeholder consultations.

Contributions on the legal/institutional track will be more limited by the fact there is no trading component in place and need for establishment of new institutions is limited if the carbon tax is integrated into the national taxation system. Key findings are summarised in Table 31 in the Annex.

Carbon taxes provide particularly strong contributions to preconditions on the political/policy track, while contributions on the technical and institutional/legal track are somewhat more limited. Several possibilities have been identified to strengthen these contributions, inter alia by defining obligations in terms of emissions-compatible data, adding a trading component (use of offsets/tradable tax credits) and requiring additional data to be monitored and reported (for details see Table 32 in the Annex).

3.1.5 Technology Standard

Technology standards define specific technology or equipment that emitters must use. Alternatively, this instrument can be used to prohibit or phase out specific technologies or equipment. Relatively few regulatory standards that lead to the reduction of GHG emissions have had GHG mitigation as their main purpose (emission standards). Rather, for example standards to increase energy efficiency such as fuel economy standards for vehicles or appliance standards have emissions reductions as a co-benefit. There are, however, also emission standards, especially for vehicles.

Due to their main focus, such standards can only provide limited elements for the development of an ETS. Still, with technology standards, both regulators and companies familiarize themselves with mitigation options, the application of basic MRV methodologies and are subject to legal obligations and enforcement. Even though they significantly lack the comprehensiveness in an ETS in terms of information gathered, having to define and enforce MRV requirements as well as the capacities and knowledge generated by setting technology standards can be useful to some extent for setting up legislation and institutions required for ETS development. Table 33 in the Annex summarises the key findings. As contributions are generally limited, no further analysis on design options for strengthening contributions of the instrument to ETS preconditions has been conducted.

3.1.6 Performance Standard

In comparison to technology standards, which require the use or phase-out of specific technologies, performance standards require a specific performance level to be achieved. Therefore, the latter leave more leeway for emitters to decide how and where to comply with the standard. Thus, their use generally leads to higher cost-effectiveness as compared to technology standards, but also requires greater overall capacities of regulators and emitters. The provision of some direction on how performance standards can be met can further reduce costs for emitters. While most performance standards that lead to the reduction of GHG emissions have been designed for a different purpose (e.g. minimum energy performance standards for appliances), emission performance standards limit the amount of, for example, carbon dioxide (CO_2), nitrogen oxide (NO_x) and sulphur oxide (SO_x) emitted by specific vehicles and/or power plants (e.g. in the USA and the EU, Japan), and GHG emissions from electricity generation (e.g. in California).

Performance standards can provide a starting point for ETS development in certain areas. The information required for the development and operation of a performance standard is more suitable for ETS development than the information from technology standards as its focus is shifted from the exact definition of what has to be done or used to a specified performance to be achieved. Thus, for example, while a technology standard may require a power plant to employ a specific CO_2 capture and storage method, a performance standard would restrict the maximum amount of CO_2 per kilowatt-hour of electricity generated. With information being limited to the requirements for setting and MRVing performance standards as well as to specific companies or sectors, additional information of sectors and plants not covered by the standard will be necessary for decision-making on these issues for an ETS. Capacities established are likely to go beyond those necessary for technology standards and could be of value for the development of legislation and institutions for an ETS, even though they will be less comprehensive than required for the establishment of an ETS.

Table 34 in the Annex summarises the key findings. Performance standards provide strong contributions on the legal /institutional track. If performance standards are defined in terms of emissions, contributions to MRV capacities can be strengthened. While institutions could be designed with functions under a future ETS in mind, there is no possibility to introduce a trading component and respective capacities must be established by other means (see Table 35 in the Annex for details on how to strengthen the contributions of performance standards).

3.1.7 Voluntary Agreements

Voluntary agreements are usually signed on an individual basis between governments and private sector representatives. The scope of the agreement and the individual targets is in that case not defined by the characteristics of a specific sector but rather depends on the willingness of the participants. Note, though, that agreements can also be closed at a sectoral level (or both sectoral and individual company level), and that agreements closed at the individual company level can be declared binding for the whole sector after a certain participation threshold has been reached[14].

Due to the very diverse nature of this policy instrument, the analysis will focus on Chile's Clean Production Agreements (Acuerdos de Producción Limpia – APL) to showcase the functioning and main characteristic of a voluntary agreement in a developing country context. Chile`s APL consist of agreements between a business association of a specific sector and the public entities responsible for the sector. All companies commit to meet certain targets within a specific timeframe, such as to reduce the amount of electricity needed for the production of one tonne of a specific product from 253 kWh to 224 kWh (CPL Website 2017a). Those companies that have met the targets will be certified by the programme and can use this certificate for corporate social responsibility (CSR) purposes (CPL Website 2017b).

Voluntary agreements in the form of Chile's APL provide limited contributions to the ETS development process. Data gathered during the introduction and operation of the agreements will not provide a full picture of the targeted sector nor of the entire economy. Similarly, impact assessments are usually not part of the process of introducing a voluntary agreement and no trading infrastructure is introduced. However, voluntary agreements can build basic MRV capacities and can be considered an indicator of a functional institutional system as well as for a basic commitment to climate change action. Note that in other forms, voluntary agreements can provide a much better basis for an ETS, like in the Netherlands[15]. However, in developing countries, voluntary agreements are more likely to go the 'Chilean route'. Key findings for the Chilean example are summarised in Table 36 in the Annex. Due to the weak overall contribution of voluntary agreements to the ETS development process, no further analysis was undertaken.

3.2 Conclusions

The assessment's findings indicate that there are significant differences regarding how non-ETS instruments can contribute to the ETS development process. Instruments combining mandatory obligations with a trading component (green and white certificate trading schemes) have generally been found to have the greatest overall potential for being used as a basis for ETS development, followed by

[14] All of these options have been used in voluntary (or rather negotiated) agreements in the Netherlands in the past.

[15] In the Netherlands, negotiated agreements are almost sector-wide, and were used as the basis for the Dutch National Allocation Plan for the EU ETS in Phase I-II. The Benchmarking covenant has been instrumental in developing benchmark-based allocation approaches for the EU ETS.

carbon taxes and performance standards. Technology standards, GHG crediting mechanisms and voluntary agreements, in contrast, provide considerably less contributions to the preconditions of ETS development. Table 3 below illustrates these findings. The contributions can either be weak (1), medium (2) or strong (3). In some cases, the contribution depends on how the policy instrument is designed and therefore ranges between two levels (weak-medium or medium-strong).

Table 3: Overview of instruments' contributions to ETS preconditions and their ranking

Track	Precondition	Green certificates	White certificates	GHG crediting	Carbon Taxation	Technology standard	Performance standard	Voluntary agreements
Policy/ political	Balancing policy goals	3	3	1	3	1-2	3	1-2
	Capacity to involve stakeholders	2-3	2-3	1	2-3	2	2	2
	Commitment to address climate change	2	2	1-2	2	2	2	1-2
Legal/ Institutional	Functional market economy	3	2	1	3	1	1	1
	Decision making authority	2	2	2	3	3	3	2
	Institutional capacities	3	3	1	2	2	2-3	2
	Rule of law and law enforcement	3	3	1-2	3	3	3	1-2
	Trading capabilities	3	3	2	1	1	1	1
Technical	Modelling capacities	2	2	1	2	1-2	2-3	2
	Sectoral data and processing capacities	2-3	2-3	2-3	2-3	1	2-3	1-2
	MRV capacities/experience	2-3	2-3	2	2-3	1-2	2-3	2
	Carbon markets experience	1	1	3	1-2	1	1	1
	IT infrastructure and capacities	3	3	1	1	1	1	1

Total score	31-34	31-33	19-21	27-31	20-23	25-29	19-22

Source: Own compilation. The table illustrates the contribution of policy instruments to the individual preconditions. The contributions can either be weak (1), medium (2) or strong (3). In some cases, the contribution depends on how the policy instrument is designed and therefore ranges between two levels (1-2 or 2-3).

Contributions of individual instruments vary across the three different tracks analysed. Some instruments (carbon taxation, white certificates and, to a more limited extent, performance standards) are particularly strong on the policy/political track, as they provide experience and capacities in, inter alia, balancing policy goals, dealing with political opposition and involving stakeholders. Mandatory instruments with a trading component further provide strong contributions to the preconditions on the legal and technical tracks, as obligations are usually legally enshrined and their trading component provides a legal basis in terms of creating an artificial market with intangible assets, and how to deal with transfers of certificates in terms of ownership, tax, etc. Instruments with a trading component provide particularly strong contributions on the institutional track with institutions being in place that could be used to perform similar functions in the ETS context. Furthermore, they also require a sector characterised by a sufficiently large number of participants, low levels of predominant market power and high potential for pass-through of price signals, inter alia. With regards to the technical track, many of the instruments analysed establish MRV capacities which can provide a starting point for developing an MRV system to be used in the ETS context. Usability of structures, processes and capacities may, however, depend on metrics and default factors used, potentially requiring additional data to be monitored and processed. Modelling capacities are particularly strong for instruments that give entities considerable leeway in meeting their obligations. In addition, instruments with a national trading component (green/white certificates trading) provide strong contributions for an IT infrastructure and the capacities needed for establishing an ETS registry. The four instruments with the **strongest contributions to the ETS development process** are **green** and **white certificates** trading as well as **carbon taxes** and **performance standards**.

These instruments have been further analysed to identify design options and implementation aspects that may improve each instrument's contribution to the ETS development process. The analysis indicates that several design and implementation aspects that support the ETS development process are relevant for many of the policy instruments analysed. Several options, such as monitoring and reporting additional data, and recording experiences made in assessing policy impacts, are further associated with additional costs, without necessarily leading to additional benefits in the non-ETS context. Some design options, however, such as using metrics that are compatible with emissions data, designing coverage by taking into account ETS relevant aspects such as market structure, or using an IT infrastructure that is upgrade-compatible, may represent no-loose options with no or limited additional costs. A third type of options, such as establishing solid legal mandates for institutions that strengthen decision-making authorities as well as making available sufficient resources and capital to facilitate compliance checking and enforcement, do not only strengthen the contributions to the ETS development process but may also contribute to increasing the effectiveness of the non-ETS instrument.

4 Excursus: How to Prevent Other Policy Instruments' Benefits from Becoming an Obstacle to ETS Introduction

According to economic textbook the carbon price established by an ETS can ensure that emission reductions are achieved at the lowest possible cost and therefore no other climate policy instruments are necessary. In line with this rationale, in the debate about EU climate policy some economists have argued that the EU-ETS should be sufficient to achieve mitigation targets while other policies would only negatively affect its efficiency (e.g. Sinn 2011). This section builds on the assumption that existing non-ETS instruments in a country are abolished and replaced by an ETS (although in practice, this is usually not the case). The benefits of these instruments might be jeopardized by the introduction of an ETS and therefore become an obstacle to ETS introduction in case the ETS is intended to replace existing instruments. This section analyses the benefits of selected policy instruments and identifies remedies to prevent their loss from becoming an obstacle to ETS introduction. All four instruments with particularly strong contribution to ETS development have been assessed, namely green and white certificates trading, performance standard and carbon taxation. The results are summarised in tables in annex 10.2, which contain the type of beneficiaries and the benefits that are at risk due to the instrument being transitioned into an ETS. The tables further outline how these benefits could be reduced and provide options how the ETS design can address the risk of these benefits being lost.

Green Certificates Trading

Under a green certificate trading scheme, benefits that are at risk due to ETS introduction are related to the revenues from generating and trading of green certificates as well as to the non-climate policy goals and benefits associated to renewables deployment. While the former benefits are key for those involved in the implementation of renewable energy as well as for brokers and green energy validators, the latter benefits are particularly relevant from a government's perspective. In addition, short-term cost optimisation may come at the expense of long-term decarbonisation, in particular if the ETS does not create a reliable long-term price signal. Possibilities for addressing these risks include adapting the scope of the ETS, introducing price control measures and allowing former RECs brokers and validators to participate in trading of allowances. Benefits at risk due to ETS introduction and design options to limit the risk of these benefits being reduced are outlined in Table 37 in the annex.

It is also worth noting that renewable energy targets might be more ambitious in terms of their climate mitigation impact than GHG targets, exactly because renewables deliver multiple benefits above and beyond reducing GHG emissions. Examples are the NDCs of China and India, which include energy targets that are more ambitious than the emission targets (Climate Action Tracker 2016a, 2016b). Abolishing renewable-specific policies in favour of an ETS might thus lead to less emission reductions.

White Certificates Trading

White certificates trading schemes provide multiple benefits to stakeholders that could be jeopardised with the introduction of an ETS. Similar to green certificate trading schemes, some benefits are related to revenues from project implementation and some are linked to the non-climate impacts of these activities. However, in comparison to green certificate trading schemes, the number of entities involved in these activities is significantly larger. With regard to non-climate benefits, the beneficiaries are not only the government but also those companies or individuals whose energy costs have been reduced with the energy efficiency projects. To maintain these benefits, a domestic offsetting scheme could be developed that allows energy efficiency projects to be continued or a share of the revenues from auctioning could be used to support projects. However, without a specific efficiency target - the basis of white certificates trading - the demand for efficiency projects would not necessarily be the same.

One must also note that energy efficiency targets may be more ambitious than GHG targets, exactly because efficiency delivers multiple benefits beyond reducing GHG emissions. Abolishing efficiency-specific policies in favour of an ETS might thus lead to less emission reductions. Table 38 in the annex summarises the benefits at risk and options to address impacts from ETS introduction.

Performance Standard

Performance standards give emitters significant flexibility in how to achieve the standard set by the government. Hence, abolishment of the performance standard would not adversely im-pact the producers of one specific technology but all producers of technologies that are used for achieving the standard. From the government's perspective, a performance standard ensures that all participants in the targeted (sub-)sector do actually meet the level set by the government. With the introduction of an ETS, activities may, however, shift to other sectors, depending on the sectors covered by the ETS. Even when the sec-toral scope and the price level of the ETS are designed to ensure that the performance standard's sector attracts climate change mitigation activities under an ETS, these activities may not lead to the desired performance of the installations as previously regulated by the per-formance standard. This could be particularly relevant if the government aims at achiev-ing a structural change in a specific sector. The benefits at risk due to the introduction of an ETS are included in Table 39 in the Annex together with potential ways to address the risk of benefit reduction.

Carbon Taxation

The distribution of benefits under a carbon tax is significantly different to that of the green and white certificate trading schemes as there are no projects that generate revenues. In contrast, revenues from the carbon tax accrue to the government who redistributes these revenues. These revenues could be reduced with the introduction of the ETS and raise opposition from the government and those benefiting from the redistribution of revenues. The key solution would be using auctioning for allocating allowances and using the revenues in the same way as the former revenues from the carbon tax. Another peculiarity consists in the reduced control by the government of how fossil fuels are being charged. The leeway governments have when designing their carbon tax as a tax on fossil fuels could be significantly reduced with the introduction of the ETS. One possibility consists in using allocation for achieving a similar effect. Table 40 in the annex provides an overview on benefits that are at risk if an ETS is introduced and presents design options to address the risk of benefits being reduced.

Key Findings

The four instruments with the largest potential for assisting the ETS development process have been analysed in terms of their benefit structure by looking at those benefits that may be jeopardized by transitioning them into an ETS, and remedies to prevent these benefits from becoming an obstacle to ETS introduction have been identified. The findings indicate that there are numerous benefits that may be reduced with the introduction of an ETS and different types of stakeholders could be adversely affected by the introduction of an ETS in case its design is not adapted to specific circumstances. While there are options to reduce the loss of benefits, these losses can, in some cases, only be minimized, not entirely avoided. In addition, adapting the design of an ETS to achieve the multiple political objectives that are being pursued by pre-existing non-ETS instruments carries the risk of rendering the ETS overly complex and inefficient.

Combining the existing non-ETS instrument with introducing an ETS can therefore be considered a more promising way of achieving multiple policy objectives. While abolishing non-ETS instruments would endanger the achievement of a broad range of non-climate benefits, potentially negative impacts which the non-ETS instruments may have on the ETS mostly concern the stringency of the cap and the resulting carbon price level. Such negative impacts can be averted by projecting the volume of GHG emission reductions which the non-ETS instruments can be expected to achieve, and setting the ETS cap accordingly. Properly aligning these policy instruments may further allow for synergies, potentially increasing overall ambition in achieving diverse policy objectives.

5 Selection of Case Studies and Methodological Approach

In chapter 3, a selection of non-ETS policy instruments was analysed regarding their potential contributions towards an ETS development process. In the following and as part of the overall research project, these theoretical findings are “tested” and substantiated through case studies. The analysis of real policy instruments that have been introduced recently allows for the evaluation of the generic findings and supports the overall understanding of ETS readiness in the selected case study countries.

In a first step, the case studies were selected based on a structured evaluation of the evolving policy instruments in given countries. The objective was to select countries that have been/are implementing a number of relatively well-advanced policy instruments that show a level of maturity that is above average. This evaluation took into account the level of readiness on three tracks:

- Policy/political readiness,
- legal/institutional readiness,
- and technical readiness.

The following countries were considered for the evaluation: Australia, Brazil, Canada, China, Colombia, Costa Rica, India, Indonesia, Jordan, Mexico, Morocco, Peru, Sri Lanka, South Africa, South Korea, Thailand, Turkey, Taiwan, Ukraine, and Vietnam.

The readiness categories named above have been applied to those countries on two levels: First, the general ETS policy readiness and climate policy approach of the respective country was evaluated. If applicable, i.e. if national policy instruments were in planning or already implemented, we then proceeded to the policy instrument level, for which the same categories were analysed.

On the basis of the evaluation of i) policy instruments and ii) their relevance for ETS readiness, those countries were selected that are most valuable for an in-depth analysis. The selection process led to the choice of countries and policy instruments included in Table 4 below.

Table 4: Countries and policy instruments selected for the case studies

Country	Policy instruments	Key arguments – political	Key Arguments - technical
Mexico	Carbon tax on fossil fuels sales and imports “Clean energy” certificate system	Mexico is a leader in Latin America in international climate policy.	Mexico operates a wide range of national policy instruments that may serve as ETS building blocks.
India	Perform, Achieve and Trade (PAT) scheme Renewable Energy Certificate (REC) trading scheme Carbon tax (on coal) Crediting scheme (CDM/TCAF)	India is a very important player in the international climate regime and has only recently explored ETS, therefore, there is less available pre-existing knowledge than in other countries.	India operates a wide range of national policy instruments that may serve as ETS building blocks.

Source: Own compilation

6 Case Study Mexico

Over the last several years, Mexico has emerged as an active proponent of climate action at the international level. Domestically, the federal government has launched several climate policy initiatives and is in the midst of a fundamental reform of its energy sector. The establishment of an Emissions Trading System (ETS) is one of its most recent projects. Against this backdrop, this case study explores the ETS development process in Mexico and how existing policy instruments may contribute to this. For the analysis, desktop research has been complemented by interviews held in Mexico City and Bonn with representatives from federal ministries, research institutions, the private and public sector as well as civil society.

After presenting the general climate policy framework in Mexico (section 6.1) and the current status of the ETS development process, section 6.2 analyses two main policy instruments, the carbon tax and the clean energy certificates scheme (CEL system) regarding their contributions to the ETS development process. In section 6.3, we contemplate on selected aspects of ETS development in Mexico. In section 6.4, we discuss options of how an ETS could be integrated into the Mexican policy landscape in order to achieve an effective policy mix. Section 6.5 finally summarizes the key findings from the Mexican case study.

6.1 Climate Policy Framework in Mexico

As the first major developing country, Mexico submitted its intended **Nationally Determined Contribution** (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) in March 2015. Within its NDC, Mexico committed to an unconditional greenhouse gas (GHG) reduction target for 2030 of 22% below business as usual (BAU), implying emission reductions of approximately 210 $MtCO_2e$ compared to the BAU in the target year (Government of Mexico 2015a, 2015b)[16]. With the ratification of the Paris Agreement and its entry into force on 4 November 2016, Mexico's NDC became (politically) binding.

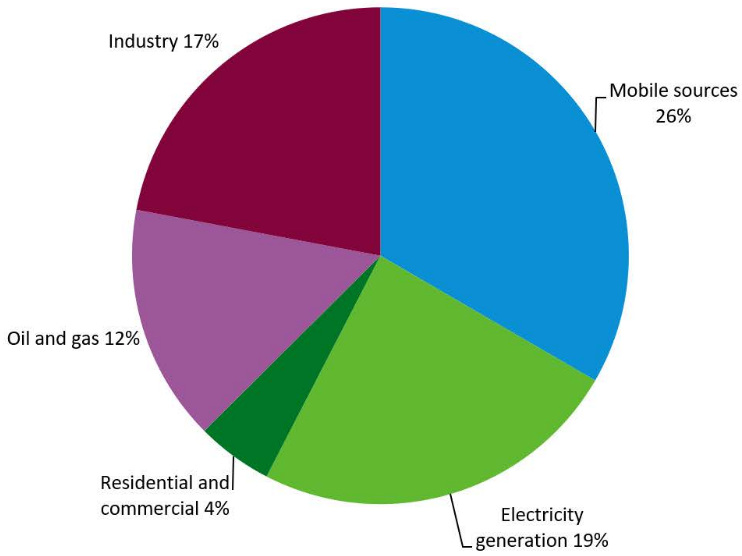
The 22% reduction target below BAU by 2030 implies a net emissions peak in 2026 and a reduction of the emissions intensity per unit of GDP by around 40% from 2013 to 2030 (Government of Mexico 2015a). In its NDC, Mexico further adopted a conditional target to reduce GHG emissions 36% below BAU if a global agreement is adopted that addresses key topics, such as an "international carbon price, carbon border adjustments, technical cooperation, access to low-cost financial resources and technology transfer" (Government of Mexico 2015a: 2). The emission reduction goals have not been broken down into different sectors at the time of their publication.

6.1.1 Mexico's GHG Emissions and Energy Profile

Mexico's total GHG emissions in 2013 were 665 $MtCO_2e$ (Government of Mexico 2015b). With 2014 **per-capita CO_2 emissions** of around 3.8 tons, emissions from Mexico are well below those of other OECD member countries, amounting on average to around 9.5 tCO_2/capita in the same year. However, emissions are higher than the regional average of around 3 tCO_2/capita in the Latin American and Caribbean region (World Bank 2017). In terms of sectoral distribution, transport is the largest GHG emitter in Mexico, with 174 $MtCO_2e$ in 2013, followed by electricity generation (126 $MtCO_2e$) and industry (115 $MtCO_2e$) (INECC 2016). Figure 19 below shows the distribution of GHG emissions across sectors.

[16] This implies emissions at 763 Mt CO_2e in 2030 compared to 665 Mt CO_2e in 2013.

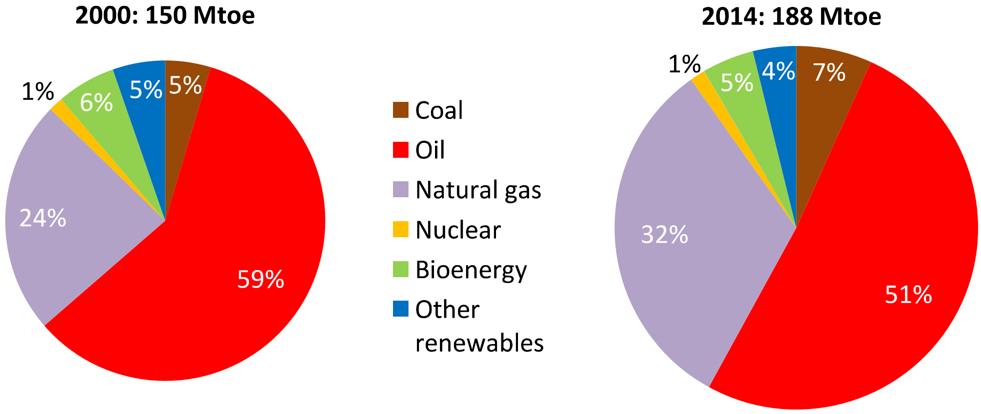
Figure 19: Mexico's GHG emissions per sector in 2013



Source: Government of Mexico (2015b: 11)

Primary energy demand, which has increased by 25% since the year 2000, is dominated by fossil fuels, accounting for about 90%. Over the last decade, there has been a shift from oil towards natural gas, in particular in power generation. This has decreased the share of oil in total primary energy demand, though it still accounts for about 51% in 2014 (see Figure 20), making it one of the highest shares in the world (IEA 2016).

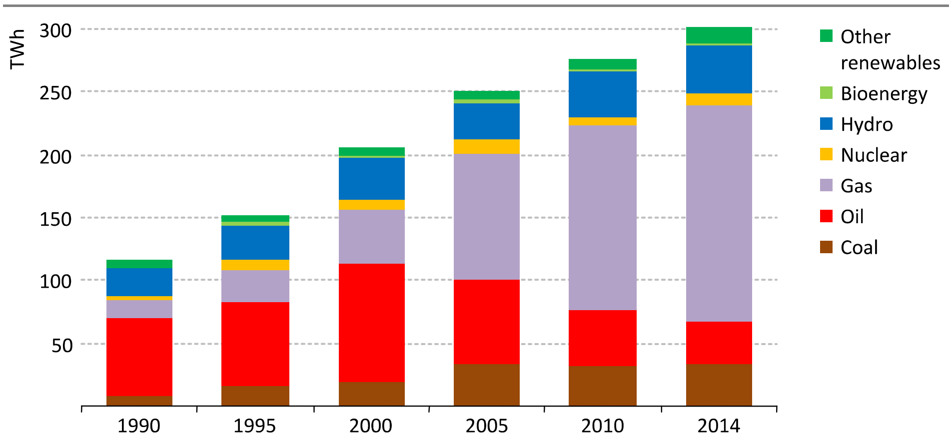
Figure 20: Primary energy demand in Mexico by fuel



Source: IEA (2016: 17)

The **power sector** is also largely dominated by fossil fuels. Over the last decade, gas replaced oil as the main fuel for power generation. Nuclear power is playing a minor role, with Mexico only having one nuclear power plant, the 1.5 GW Laguna Verde site (IEA 2016). Renewable energy is a relevant source for electric energy, in particular hydropower. While growth of renewables has been limited until the year 2014 (see Figure 21), their role will presumably become more relevant with the unfolding of Mexico's Energy Reform approved in 2013 (see below). In 2016, two successful long-term tendering processes were launched, resulting in investment commitments of more than USD 6 billion and representing an increase in new installed renewable energy capacity of more than 5,000 MW, mainly solar and wind power (REN21 2017). A third tender was launched in November 2017. The results indicate that the projects selected have a generation capacity of 2,562 MW (CENACE 2017). In March 2018, CRE and CENACE announced the launch of a fourth tender. In contrast to the three previous tenders which were organised by SENER, CRE will be tasked with carrying out this tender (SENER 2018).

Figure 21: Electricity generation by fuel



Source: IEA (2016: 21)

Over the last 20 years, **electricity demand** in Mexico has more than doubled, accounting for around 18% of total final energy consumption in 2014. While per-capita consumption is relatively low, industry accounts for well over 50% of final electricity consumption (IEA 2016). According to national projections, electricity demand will increase by an annual rate of around 3.5% from 2015 to 2029 and reach 472 TWh in 2029 (IEA 2017a), putting substantial pressure on the national power system.

Electricity tariffs are still heavily subsidised for small consumers in Mexico. According to the IEA, subsidies on electricity cover up to 70% of the total costs in some of the residential tariff categories (IEA 2017a). Such subsidies counter efforts to increase energy efficiency and avoid raising consumer's awareness. Subsidised electricity tariffs are particularly challenging in terms of carbon pricing, as they prevent the pass-through of the carbon price signal. A stepwise reduction of subsidies could be possible with the new regulatory framework introduced as part of the energy reform (see below), which gives the Energy Regulatory Commission (CRE) the competence to determine the tariffs for specific activities. However, during the first years of introducing the new regulatory framework, the Secretariat of Finance and Public Credit (SHCP) can override CRE's tariffs, which has been the case for most tariffs (IEA 2017a).

6.1.2 Overview of Relevant Policy Instruments and Processes

In light of rising GHG emissions, an increasing demand for electricity and the strong economic and population growth expected for Mexico, carefully designed policies are needed to tackle these interlinked challenges. Over the last couple of years, Mexico initiated some major political reforms and processes in the climate and energy realm, some of which are of utmost relevance for the ETS development process as well as for the policy instruments explored by this report.

6.1.2.1 Climate Policy Development

In the climate policy realm, one major achievement was the adoption of the General Law on Climate Change (LGCC) in 2012. The law, one of the first of this type in the world, contains two aspirational emission reduction targets: For 2020, emissions are to be reduced by 30% below baseline emissions, the latter being 960 $MtCO_2e$ (DOF 2012; Government of Mexico 2013). For the year 2050, the LGCC stipulates the goal to reduce emissions to 50% in comparison to 2000 levels (DOF 2012). With the reform of the LGCC in 2018, these two aspirational targets were complemented by a reference to the non-conditional NDC target of reducing emissions by 22% in 2030 compared to BAU (DOF 2018, Artículo transitorio segundo).

As can be seen from Table 5 below, which compares Mexico's mitigation targets along their key characteristics, the targets which were already contained in the General Climate Change Law from 2012 seem more ambitious than the target adopted under Mexico's NDC. It must be noted, however, that they were derived from different data and a different baseline. The reformed climate change law entered into force on 14 July 2018. With this, the non-conditional NDC target becomes legally binding domestically.

Table 5: Comparison of Mexico's mitigation targets

Instrument	Adoption / Publication	Goal	Target type	Target year	Baseline emissions	Target level (absolute)	Reduction (absolute)
LGCC	2012	-30% below 2020 BAU emissions	BAU	2020	960 $MtCO_2e$	672 $MtCO_2e$	288 $MtCO_2e$
NDC	2015	-22% below 2030 BAU emissions	BAU	2030	973 $MtCO_2e$	(763 $MtCO_2e$)	210 $MtCO_2e$
LGCC	2012	-50% compared to 2000 levels	Historic	2050	664 $MtCO_2e$	320 $MtCO_2e$	(344 $MtCO_2e$)

Source: Own compilation based on: DOF (2012) and Government of Mexico (2013, 2015a, 2015b, 2015c). Figures in brackets are based on own calculations.

The LGCC is Mexico's main federal policy instrument to address climate change, laying the foundation for the development and implementation of policy planning instruments to reduce GHG emissions and adapt to the adverse impact of climate change.

The LGCC envisages two fundamental planning instruments for climate action:

- The **National Climate Change Strategy (ENCC)** is a long-term planning tool that defines a long term vision and which is to serve as a point of orientation guiding national climate action (Government of Mexico 2013).
- The **Special Climate Change Programme (PECC)**, in contrast, serves as a short-term planning tool, depicting the government's climate priorities in a specific period of time (Government of Mexico 2014).

The current PECC has a planning horizon from 2014 to 2018. PECC lays out five objectives with subsets of strategies and indicators for each objective. In terms of economic instruments, Strategy 5.3 is of key relevance for our analysis, as it envisages the development and use of economic, fiscal and financing tools to consolidate the national climate change policy, including carbon taxes as well as trading instruments (Government of Mexico 2014).

As part of the institutional structure established by the LGCC, the Inter-Ministerial Commission on Climate Change (CICC), the National Institute for Ecology and Climate Change (INECC) and the Council on

Climate Change (C3) were established. The CICC is a permanent mechanism to coordinate the climate actions of the public administrative entities. 14 of 18 Secretariats of the Federal Government participate in the CICC. Its key task is to develop and implement national climate policies. It further has to approve the National Climate Change Strategy (ENCC) and participate in the development of the Special Climate Change Programme (PECC). INECC is a national agency created by the General Law on Climate Change to coordinate and implement scientific studies related to climate change. This institution is responsible for implementing research and elaborating climate change strategies, plans, programmes and instrument. **C3** is the permanent advisory body of the CICC and is composed of members from the social, private and academic sector (Government of Mexico 2013).

With the adoption of the General Law on Climate Change the **National Registry on Emissions (RENE)** was established (DOF 2012, Art. 87-90). The data base consists of two parts:

- Part 1: Mandatory reporting on emissions from sources which emit more than 25,000 tCO_2e per year;
- Part 2: Voluntary reporting on emission reduction projects.

The data base on emissions contains data on direct and indirect emissions of entities with annual emissions above 25.000 tCO_2e. Reporting entities, so called "*establecimientos sujetos a reporte*" are defined as a group of stationary and mobile sources that develop a productive, commercial or service activity that generates direct or indirect GHG emissions (DOF 2014a).

The regulatory document contains a list of the sectors and subsectors with activities that are covered by RENE and have reporting obligation if their emissions are above 25,000 tCO_2e/year. Sectors covered are industry, energy, transport, waste, agriculture and the commercial and service sector. Reporting started in 2015 with covered entities having to report on 2014 emission levels. In the period between 1 March and 30 June of each year, reporting entities will have to submit their report on GHG emissions generated the preceding year (1 January to 31 December). Reporting entities have the possibility to develop own methodologies to quantify their emissions, if they consider these to be better suited than the methodologies proposed by the government, which are mainly based on activity data and emission factors. Once approved by SEMARNAT, these alternative methodologies will be published on the website and can be used by other reporting entities. The information is then submitted to RENE via an electronic reporting platform called COA web (DOF 2014a; Interview 11 2017).

Verification of the reports takes place every three years, with the year of verification depending on the size of the emitter: Reporting entities with emissions above 1,000,000 tCO_2e were to submit a first verification verdict together with their emissions report for the year 2016. For smaller entities, other years have been agreed (see Table 6 below).

Table 6: Verification periods

Threshold	Reporting period that is verified
above 1,000,000 tCO_2e/year	2016
100,000.1 to 999,999.99 tCO_2e/year	2017
25,000 to 100,000.09 tCO_2e/year	2018

Source: DOF 2014a

Verifying entities must be accredited by an accreditation committee and approved by SEMARNAT. The registry features a second, voluntary part where those implementing mitigation activities can voluntarily provide information on their projects. Information required inter alia relates to emissions trading transactions, date of verification, revenues received and source of financing (DOF 2014a). Table 7 summarizes key features of the registry.

Table 7: Key features of RENE

Key features of RENE	
Sources	Stationary and mobile
Emission categories	Direct and indirect
Sectors	Industry, energy, transport, waste, agriculture and commercial and services
Gases	CH_4, N_2O, SF6, HFC, HCFCs and black carbon
Thresholds	25.000 tCO2e/year
Verification	Third party verification to take place every three years by independent accredited entities

Source: Own compilation

Interviewees displayed a wide range of views regarding the current status of RENE. Some interviewees indicated that the data base has flaws in terms of coverage and accuracy, criticising for instance the lack of common methodologies for estimating the emissions and application of thresholds (Interview 6 2017; Interview 7 2017). Others, in contrast, maintain that the data base has already improved significantly and is delivering strong results. While RENE is far from including all companies, the number of companies reporting to RENE is steadily increasing. In addition, a true verification infrastructure is emerging as the number of accredited verification entities rises (Interview 4 2017; Interview 11 2017).

Despite these different perceptions, there seems to be a common understanding that RENE will be the starting point for the future ETS. In addition, SEMARNAT is in the process of further improving the registry, for instance, making annual verifications a requirement (Interview 11 2017). The reformed General Law on Climate Change requires SEMARNAT to make the data base publicly available in an aggregated form (Cámara de Diputados 2017).

6.1.2.2 Energy Reform

In parallel to these climate policy developments, the Mexican government initiated an energy reform in 2013 which is to fundamentally change the Mexican energy sector, which has so far been characterised by a monopoly-driven energy market. It is to attract investments, increase transparency and improve energy security while reducing the environmental impact of the sector. The comprehensive energy reform was initiated as a constitutional reform in 2013 with a decree that reformed existing and added new dispositions to the Mexican constitution related to energy (DOF 2013a).

The energy reform was urgently needed in light of Mexico's rising energy demand and is part of the Government's efforts to modernise and diversify the country's economy. Political action in the area was further fostered by the investment crisis of the state-owned oil company Petróleos Mexicanos (PEMEX) and increasing inefficiencies in the power system dominated by the Federal Electricity Commission (CFE), whose monopolies are now stepwise removed. With the energy reform, a new regulatory and institutional framework has been created, transforming in particular Mexico's oil, gas and power sector.

The Energy Transition Law and the Electricity Industry Law provide the legal framework for the renewed power sector. The Electricity Industry Law aims to create a liberalized and competitive electricity market, by disaggregating the vertical structure of CFE who formerly had a monopoly on transmission and distribution and controlled power generation and retail sales. Policy functions have been transferred to the Secretariat of Energy (SENER), regulatory functions will be performed by the Energy Regulatory Commission (CRE) and market control functions to the new National Centre for Energy Control (CENACE) (DOF 2014b). Furthermore, CFE has also been horizontally unbundled into six generating companies. The Energy Transition Law, approved in 2015, complements certain aspects of the Electricity Industry Law by inter alia establishing so-called 'clean energy' targets in terms of the share in total electricity generation in future years: 25% by 2018, 30% by 2021, and 35% by 2024 (DOF 2015a). Mexico's definition of 'clean energy' includes renewable energy sources (wind, solar, hydroelectric and geothermal) but also nuclear energy and cogeneration (DOF 2014b, Art. 3, section XXII).[17]

As outlined above, nuclear power currently has little relevance in Mexico with only one nuclear power plant. Mexico's National Electric System Development Plan, however, envisages the expansion of nuclear power capacity to up to 4 GW. Building new or expanding existing nuclear power plants to reach the planned capacity would, however, require several billion dollars of investment by the government (CAT 2017). Expansion of nuclear power is therefore not very likely to happen as planned.

6.1.3 Current Status of ETS Introduction and Other Relevant Developments

The Mexican ETS is still at planning stage, and main decisions on the design of the ETS building blocks have not yet been taken. In this section, the current status of ETS development is briefly summarized.

The legal basis for the development of the ETS is provided by the reformed General Law on Climate Change (LGCC), which has recently been adopted by the Mexican Congress (DOF 2018). Article 94 of the reformed law gives SEMARNAT the mandate to develop a mandatory ETS. In comparison to the previous version of the law, the reformed LGCC significantly strengthens the legal basis of the emissions trading system and its adoption can also serve as an indicator for the political support among parties to introduce an ETS (Interview 11 2017). Furthermore, a solid legal basis can be expected to facilitate the process of introducing the legislation establishing the ETS. As all other legal measures that create compliance costs, ministries must develop regulatory impact assessments which are reviewed by the Federal Commission for Regulatory Improvement (COFEMER) and they cannot issue any regulation until COFEMER has issued a final opinion (OECD 2017). The legal basis provided by the reformed LGCC can be expected to ease this process, limiting the risks of delays and a potential weakening of the ETS design, as was feared by one interviewee (Interview 6 2017).

Interestingly, linking to other carbon markets seems to be an explicit consideration in establishing the ETS in Mexico: Article 95 of the reformed LGCC makes a reference to linking by stating that the participants of the emissions trading system will be allowed to implement activities and transactions that allow a linkage with other national or international markets. The intention to promote an emissions trading system with future linking in mind is also included in the Special Programme on Climate Change (PECC) from 2014: Under strategy 5.3, the PECC includes the goal of developing projects, programmes and mechanisms to allow for the participation in trading of GHG emissions. Furthermore, "mechanisms should be promoted to link a voluntary Mexican emissions trading system with international markets as well as local markets, such as California's" (Government of Mexico 2014: 70, translation by the author).

In order to establish capacities in the private sector, SEMARNAT, the Mexican Stock Exchange and the Mexican Carbon Market Platform $MEXICO_2$ signed an agreement in August 2016 to launch a carbon market simulation. Currently, around 100 companies from the different sectors (transport, power and industry) participate in the simulation on a voluntary basis. The simulation uses EDF's CarbonSim tool allowing participants to gain experience in emissions trading scenarios, potentially developing important capacities in the private sector (Interview 11 2017). The exercise is divided into three phases, with each cycle allowing to introduce new rules, increasing the complexity of the simulation (MexiCO2 2016). At the time of announcing the start of the simulation in 2016, it was erroneously communicated as a "pilot", raising concerns from the private sector. Later on, the initiative was termed "carbon

[17] Cogeneration (or CHP) plants are likely to be fuelled by natural gas. According to calculations by the Climate Action Tracker, the share of cogeneration plants in the electricity mix could be as high as 6% by 2024 (compared to 0% in 2014). Such a development could reduce the share of renewables in the 2024 clean energy target of 35% to 29% (CAT 2017).

market exercise" in order to underscore its non-binding character. The ETS simulation does neither use the official company names nor real data from companies, basically resembling a "video game" (Interview 11 2017). The simulation started in October 2017 and was operational for the period of twelve month (Carbon Pulse 2018).

SEMARNAT is further cooperating with the private sector to build capacities and develop the ETS regulation. In January 2017, a Memorandum of Understanding (MoU) was signed with the Commission for Private Sector Studies on Sustainable Development *(CESPEDES)* - a member of the World Business Council for Sustainable Development - and the International Emissions Trading Association (IETA) to promote the Mexican carbon market. The signing of a MoU with CESPEDES for cooperating towards the development of the national ETS regulation was scheduled for April 2017. The MoU was to create a Public-Private Working Group to draft the ETS regulation until the second half of 2018 (Escalona / Pereyra 2017). However, proposals to modify the General Law on Climate Change in order to build a more solid basis for the establishment of the ETS as discussed above caused concern among the private sector, who first wanted to see what these potential changes would mean. This delayed the process and the MoU has not yet been signed. Despite the MoU not being signed, technical aspects have already been discussed and the exchange process has begun (Interview 11 2017).

6.2 Analysis of Relevant Climate Policy Instruments

In this section, two existing policy instruments will be analysed to assess how they can contribute to the establishment of an ETS in Mexico: The Mexican carbon tax (*impuesto a los combustibles fósiles*) and the clean energy certificates trading scheme (*certificados de energías limpias*).

6.2.1 Carbon Tax

6.2.1.1 Policy Instrument Introduction and State of Play

The Mexican carbon tax entered into force in January 2014 by way of an amendment to the Law on the Special Tax on Production and Services (LIEPS) (DOF 2013b). The tax was introduced as part of a larger fiscal reform initiated by President Peña Nieto. The basis for the introduction of the tax was established by the General Law on Climate Change which envisages the introduction of economic, financial and fiscal instruments to mitigate climate change. According to Peña Nieto's draft decree, presented to Congress in September 2013, the carbon tax has the dual objective to reduce GHG emissions and increase revenue generation. In addition, the tax is to provide co-benefits such as local environmental protection, health benefits and increase Mexico's competitiveness as a green and energy efficient economy. Furthermore, it is seen as a reaffirmation of Mexico's commitment to meet its emission reduction target for the year 2020 adopted with the LGCC (Presidencia de la Republica 2013).

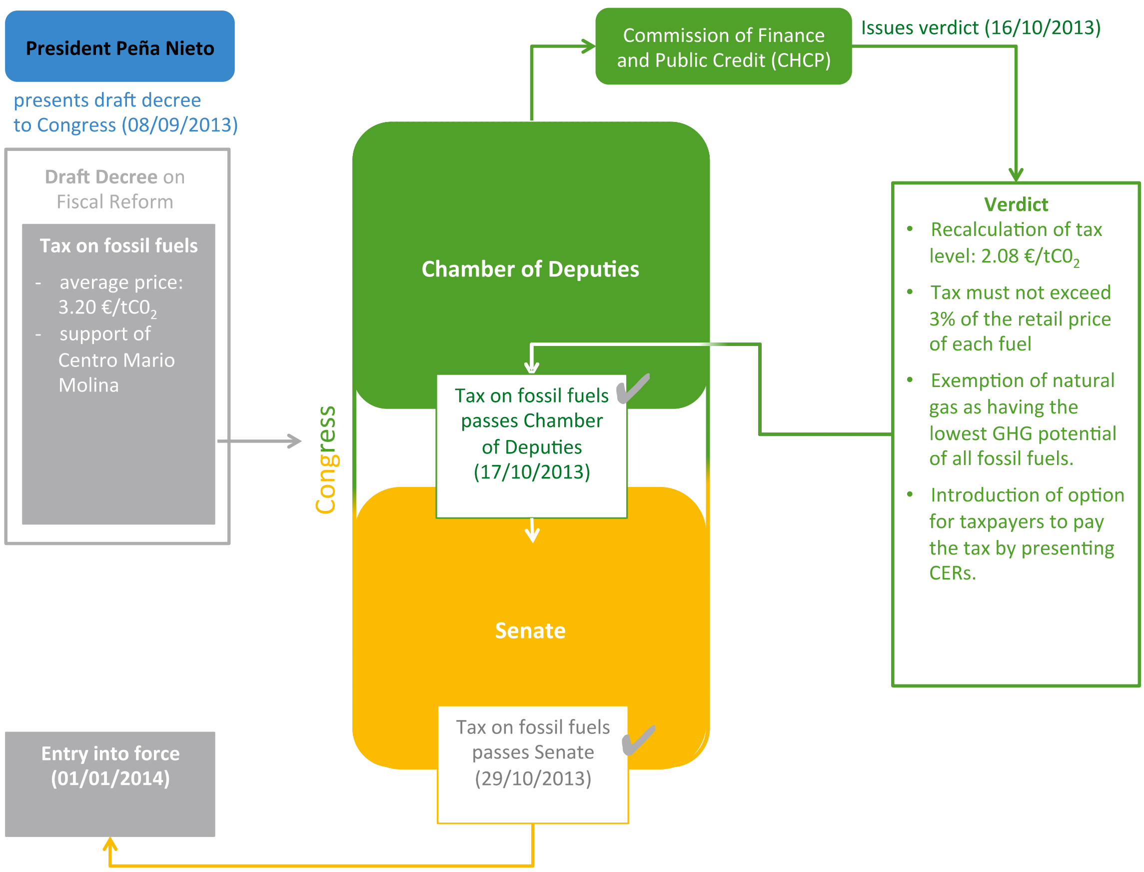
The political process of introducing the carbon tax was heavily influenced by the private sector. The original proposal for the carbon tax was developed with the support of the Centro Mario Molina, an environmental research institute and think tank. The draft contained a homogenous carbon tax of around 70.68 MXN (EUR 3.20)[18] per tCO_2, which was derived by taking into account carbon prices from carbon markets in Europe, New Zealand and California. In a next step, individual tax rates (so called "*cuotas*") for each type of fuel were calculated on the basis of emissions factors derived from the Intergovernmental Panel on Climate Change (IPCC) (Presidencia de la Republica 2013). When this proposal was forwarded to Congress, key elements were modified during the political process due to intensive lobbying from the fossil industry (Interview 2 2017).

In this process, natural gas was exempted from the tax as it is the fossil fuel with the least local air pollution impact and limited CO_2 emissions. For the other fossil fuels, the originally proposed average quota was adjusted downwards to an average level of 2.08 EUR per tCO_2 (Muñoz Piña n.d.). As a result of these changes, the implicit price per tonne of CO_2 varies across the fuels taxed and there is no

[18] Amounts in Euro are calculated on the basis of the exchange rate from 23 November 2017.

uniform price on carbon (Montez de Oca et al. 2014). In addition, an upper limit to the tax rates at 3% of the sales price of the fuel was established and the possibility for tax payers to use Certified Emission Reductions (CERs) from CDM projects based in Mexico was introduced (see below for the details of the offsetting option). With these modifications, which are contained in the verdict of the Commission of Finance and Public Credit (CHCP 2013), the tax passed the Congress (Chamber of Deputies and Senate) and entered into force in January 2014 (DOF 2013b). Tax rates are adjusted annually to the consumer price index. Price levels for the year 2018 were published in December 2017 and range between 6.93 MXN cents (EUR 0.31 cents) per litre of propane and 42.88 MXN (EUR 1.94) per ton of coal coke. For fossil fuels not listed the tax rate was set at 46.67 MXN (EUR 2.11) per tonne of carbon content (DOF 2017a). This rate is applied if covered entities do not transparently declare the type of fuel sold or imported. Figure 22 below describes the political process.

Figure 22: Political process of carbon tax introduction



Source: Own illustration based on Wang-Helmreich et al. (2016)

With the Mexican carbon tax, the regulated entity addressed by the policy is upstream. The tax is to be paid by the producers or importers of fossil fuel products at the moment of importing or selling one of the fossil fuels listed. As fossil fuels can be sold several times, the so-called "*acreditaciones*" can be used. This instrument allows companies to show that the tax for the respective product has already been paid at an earlier stage, allowing the reimbursement of the tax paid. This avoids that the tax is being paid several times. Another relevant aspect is that the carbon tax is only levied for the combustion of fossil fuels, not for their transformation. Entities therefore have the possibility to indicate if (a share of) the fuel is not used for combustion in order to be exempted from the payment of the tax. Steel companies, for instance, can indicate that part of the fossil fuel used is not combusted but included in the final steel product, claiming that carbon tax must not be paid (Interview 1 2017). Similarly, cement industry managed to be exempted from the carbon tax (Interview 4 2017). In order to avoid the abuse of this regulation and make its application more comprehensive, the Secretariat of Finance and Public Credit (SHCP) together with SEMARNAT is elaborating transparent and robust rules for the clear identification of fuels not used for combustion (Interview 1 2017).

The Monitoring and Reporting system established with the introduction of the carbon tax is characterized by its simplicity. Tax payers have to submit information four times a year (in April, July, October, January) to the Tax Administration Service (SAT) on the price, value and volume for each product sold in the trimester before (DOF 2013b Art. 19, XIII). In addition, they must provide information on their 50 main clients and suppliers (DOF 2013b, Art. 19, VIII). Taxpayers must further implement physical controls of fabricated or produced volumes and provide a trimestral report on the monthly reading of devices used for these physical controls (DOF 2013b, Art. 19 X). The carbon tax MRV system is not integrated into the mechanism for reporting on emissions (Interview 1 2017).

One peculiarity of the Mexican carbon (or rather: fuel) tax is the inclusion of the **offsetting option**, which allows tax payers to use CERs from Mexican CDM projects to pay a share of their carbon tax. Eligibility is limited to credits that were issued after 1 January 2014 and correspond to the second commitment period of the Kyoto Protocol. Notably, submitting CERs will not directly reduce the overall volume of taxed tCO_2. Instead, the market value of the CERs at the time the tax liability is paid is used as a proxy to reduce the overall carbon tax liability. The private sector had for a long time pushed for a rule that would allow using one CER to reduce the overall amount of tCO_2 taxed. This endeavour, however, wasn`t successful (Interview 5 2017).

The implementing rules for the offsetting option were published in December 2017, almost four years after the entry into force of the carbon tax. According to these new rules (DOF 2017b), the regulator will take into account the market price from the European Energy Exchange (EEX) in Leipzig to determine the 'market' value of the CERs. When paying the tax with CERs, tax payers are required to indicate the total amount of CERs they want to use for paying the tax as well as the closing price from the day before the payment.[19]

In order to avoid a situation in which the submission of CERs by tax payers reduces the revenues for SHCP, the ministry will resell these CERs on the global market. Notably, the credits cannot be sold at a price lower than the market price. Here again, the EEX closing price of the day previous to the transaction day will be used as a benchmark (DOF 2017b, rule 6). It should be noted that this procedure could cause problems in terms of **double counting** and it remains to be seen if this issue will be addressed by establishing respective accounting rules. The recently published document (DOF 2017b) does not contain any information on respective accounting rules. For the time being, it is still unclear how large this double counting risk will be as it still remains to be seen whether the carbon tax offsetting option will actually be used to an extent that could lead to a negative environmental integrity impact. The key issue is that there is no incentive for tax payers to sell their CERs to SHCP at market prices as they could also directly offer them at the global market. In addition, for the offsetting option's first year of application (2018) the share of the tax burden that can be paid using CERs is limited to a maximum of 20% (DOF 2017b).

In terms of performance of the carbon tax, the interviews revealed a large variety of views. Interviewees engaged in the development and operation of the tax maintain that the carbon tax is working, as it raises revenues and costs are being passed on, having an impact on consumption. They also emphasise that the tax does actually have a strong impact on the private sector, which is also seen as a reason for why they are actively pushing against higher tax rates (Interview 1 2017; Interview 2 2017). These observations are also supported by SEMARNAT, indicating that the carbon tax could have reduced approximately 1.8 million tCO_2 per year, compared to a counterfactual scenario with no carbon tax (SEMARNAT 2017a). Other interviewees, in particular from the civil society and research

[19] The closing price can be accessed using the following link: https://www.eex.com/en/market-data/environmental-markets/spot-market/green-certified-emission-reductions#!/2018/01/17.

organisations, in contrast, criticised the lack of ambition of the instrument, maintaining that it has only a very limited climate impact while its effect mostly consists of revenue raising (Interview 3 2017; Interview 4 2017).

The Mexican finance ministry SHCP has experienced some challenges in terms of MRV and enforcement of the carbon tax. One issue is related to the so-called "acreditaciones" (see above), the instrument which allows companies to show that the tax for the respective product has already been paid at an earlier stage. Due to an administrative error, statistics showed an extremely large number of companies making use of this instrument. However, this administrative challenge could be solved and numbers are now correct according to one interviewee. Experiences have also been made with cases of attempted tax evasion, with companies trying to re-label their fuels as non-combustion fuels in order to be exempt from the tax. This for instance relates to the use of fossil fuels for lubricants. To avoid abuse of such exemption, SHCP and SEMARNAT have intensively cooperated in the elaboration of robust rules (Interview 1 2017).

6.2.1.2 Potential Contribution to ETS Building Blocks and Preconditions

Cap

The carbon tax does not pose limits on the amount of GHG emissions that can be emitted by the target group. Rather, emissions result from each regulated entity's set of decisions on the extent to which they pay the tax or reduce their energy consumption. As such, the carbon tax cannot be used directly as the basis for setting a cap for the ETS.

The carbon tax rate included in the President's draft decree was not based on data on mitigation potentials and the potential effect of tax levels on the implementation of measures, but on a formula which took into account the carbon price levels in carbon trading schemes of other jurisdictions. Therefore, data on mitigation potential and costs have had little relevance in this process. Interviewees indicated that capacities for modelling economic impacts in SHCP are particularly strong and that they are being used to assess the impact of the tax. Using these capacities in the ETS context, however, would require additional expertise, as experience in processing emissions data and dealing with market mechanisms is lacking. In light of the fact that the ETS will be run by SEMARNAT, strong inter-ministerial cooperation would be required to make use of these modelling expertise in the ETS context (Interview 8 2017; Interview 9 2017; Interview 11 2017).

On the political track, the introduction of the carbon tax and the final decision on the tax level provided valuable, yet not necessarily positive, experiences. Once the President's draft decree went into Congress, the final price levels for the fossil fuels were determined in a political process. The final outcome of this process, however, was a low overall tax level which exempted natural gas. Hence, the government was not able to develop and implement successful strategies for balancing and prioritising policy goals.

This is in part due to the dual objective of the carbon tax, which includes (or rather: emphasizes) revenue raising. This makes it less useful as an indicator for a commitment to address climate change. In fact, the provision to allow the use of credits to cover tax liabilities outlined above is an explicit illustration where revenue raising replaced emission reductions as the objective of the tax.

In terms of stakeholder involvement, the introduction of the tax provides relevant insights, even if the process as such cannot be used as a positive example: While the involvement of the scientific community and non-governmental organisations at the moment of developing the tax rate provided a basis for discussion and advanced its general acceptance (Muñoz Piña n.d.), the strong influence of the fossil fuel industry on the political process at a later stage resulted in watering down the regulation. Against this background, the carbon tax can be considered to provide limited yet relevant contributions to the political process of setting the cap for an ETS.

In terms of institutional capacities for establishing the cap of the ETS, the introduction of the carbon tax provides limited contributions, as the tax level was determined through a political process and no federal agency or a similar entity was tasked with determining the tax level. These experiences indicate that the ETS cap must be based on sound, independent analysis and involving multiple ministries. The latter is not only required to ensure that the cap is in line with the policy instruments of other ministries but also to signal the private sector that all ministries support the introduction of the ETS (Interview 11 2017). As highlighted by several interviewees, the backing of the finance ministry SHCP as the ministry with the largest capacities and largest prestige will be crucial for the success of the scheme. As one interviewee put it: "The ETS must be absolutely bought by [SHCP]" (Interview 4 2017).[20]

In terms of the legal basis of establishing the tax, Article 91 of the LGCC provided a basis for developing economic instruments that contribute to the national climate goals. The final carbon tax was then integrated into the Law on the Special Tax on Production and Services LIEPS, which was already in place since 1980. The ETS cap, in contrast, would have to be established at a regulatory level and would therefore not benefit from these legal antecedents.

Offsetting

The Mexican carbon tax allows tax payers to reduce their tax liability by submitting CERs from Mexican CDM projects. However, one CER will not reduce the amount of emissions to be taxed but its (market) value will be used to reduce the tax bill. According to current provisions (December 2017), tax payers will have the possibility to pay up to 20% of their carbon tax liability with CERs. The value of one CER will be the market value at the European Energy Exchange (EEX) on the day prior to the transfer.

The implementing regulations for this offsetting option have been published at the time of writing this report. While this on the one hand does not allow to draw conclusions from its application, the fact that they have recently been developed could also be an asset, as current conditions in the offsetting sectors are taken into account that could be used under the ETS. The offsetting option could therefore provide a certain contribution to the question of whether to establish an offsetting scheme in the ETS context.

The existence of such an offsetting option may, however, not necessarily indicate that there are political considerations to expand the price signal beyond the scope of the policy instrument. As the introduction process of the carbon tax has shown, the offsetting option was introduced with the goal to provide entities targeted by the tax with additional possibilities to comply with their tax obligations.

In technical and institutional terms, the offsetting option of the carbon tax will presumably fully rely on the CDM architecture. Mexico is the second largest CDM participant in Latin America, hosting 20% of the region's projects, and has significant experience with development and MRV of CDM projects. A domestic offsetting option under the ETS could build on these technical and institutional capacities. It should be noted, however, that due to the ongoing lack of demand for CERs and the market crisis, only about 26% of the project activities seem to have been operating in a regular fashion in Mexico in 2014 (Warnecke et al. 2015).

Market

The existence of the carbon tax does indicate a political willingness to use carbon price incentives to reduce emissions. However, due to its fiscal nature, the carbon tax has no market element and trading

[20] "*El ETS tiene que estar absolutamente comprado por Hacienda.*" Hacienda is short for Secretaría de Hacienda y Crédicto Público - SHCP.

capabilities or institutional capacities to oversee market activities have not been established. By the same token, the carbon tax does not provide a legal basis for the treatment of non-tangible assets.

Scope/Point of Regulation

The Mexican carbon tax has a broad scope, covering around 40% of Mexico's total GHG emissions (Spears et al. 2014). In terms of the point of regulation, the carbon tax regulates emissions upstream and is imposed on the disposal and import of fossil fuels. Due to this structure, the number of entities directly paying the tax is very low, being limited to approximately 30 entities that are PEMEX, CFE and a very small (yet growing) number of fuel importers (SEMARNAT 2017a). However, the relevance of private companies in the oil, gas and power sector might increase in the future, as the energy reform kicked-off the opening of these sectors by phasing-out state-companies' monopolies.

Therefore, under the current circumstances, using exclusively the carbon taxes' scope and point of regulation for the ETS would be relevant in case an upstream ETS system is considered. For a more conventional mid-stream ('stack approach') ETS, the carbon tax is too limited in terms of scope. However, it could provide a basis to build on for the set of companies covered by the carbon tax as part of a future wider scope ETS.

MRV

Since the carbon tax is being applied to the import and sales of fossil fuels, the monitoring and reporting infrastructure is very simple. Tax payers regularly report the value, volume and price of the products sold, while parameters such as carbon content, energy content and quality are not reported. Reporting can be done electronically. Since the carbon tax is built into the fiscal system, auditing is made by the tax administration service SAT, similar to other taxes (Muñoz n.d.). The data reported is stored and processed by SHCP, who also produces regular reports on revenues generated by the tax. The reports are publicly available.

With this structure, the information on the use of fossil fuels and respective emissions provided by the tax is limited in scope. The carbon tax does not gather additional data. Therefore, other sources of information outside the fiscal system seem to provide a stronger basis for the ETS, in particular RENE.

In terms of establishing the legal basis for MRV obligations, the carbon tax can only provide limited contributions to a future ETS, as the monitoring and reporting requirements of the carbon tax are built into the federal fiscal system. Collection and auditing of the carbon tax is done by the revenue collection agency SAT. The MRV system of the ETS would have to be developed on a different, newly developed legal basis.

Registry IT / System

As the tax has no trading component, there is no registry with accounts for individual entities and contributions to establishing such for the ETS will be limited. However, the offsetting component of the tax could provide some contributions for establishing such a registry. As this component has only recently been made operational, its potential contributions for this building block are unclear.

The carbon tax is built into the fiscal system, which includes electronic reporting. For this purpose, tax payers can use a specific programme called MULTI-IEPS (SAT 2017). The data reported is then processed and evaluated by the SHCP, who regularly publishes reports on the revenues generated. This indicates that there is high proficiency in processing data, making data available while also taking into consideration issues of data confidentiality.

Allocation

Allocation of emission allowances under an ETS requires carefully balancing environmental goals against the costs for targeted entities while also taking into account revenue generation impacts. In terms of the data requirements for allocation, the carbon tax can only provide data on the amount of fossil fuel imported and sold. This could be useful for an upstream ETS, but is too limited in scope for a mid-stream system. Also, usually production data are better suited as a basis for allocation, as it eliminates the effects of stock changes between years. For a mid-stream (stack-based) ETS, data on production, historic emissions, and projections for the sectors within the system's scope are needed, which are not provided by the carbon tax.

In addition, the legal basis for requiring covered entities to provide these data, the legal and fiscal nature of the emission rights or allowances, and the technical and institutional capacities to assess and process these data into allocation methodologies and decisions are not established in the carbon tax.

Enforcement

With the carbon tax being integrated into the general fiscal system, enforcement rules have a solid legal basis. The enforcement system of the ETS will, however, require another legal basis, as the ETS will not be part of the fiscal system.

When implementing the rules of the carbon tax, the government has gained relevant experience with cases of attempted tax evasion, leading to adjustments and clarification of the rules in order to close existing loopholes (see above). In addition, in order to capture fossil fuels that were not declared transparently by the importer or seller, the generic tax rate introduced with the rates for individual fuels is being applied. This allows the finance ministry SHCP to deal with attempted tax evasion. Since this generic tax rate is considerably higher than the fuel-specific tax rates, companies are incentivised to transparently declare the correct type of fuel. These implementation experiences could inform the development process of ETS enforcement rules and their application.

Summary

The Mexican **carbon tax** is a technically well-functioning policy instrument whose mitigation impact is however limited by the low tax rates that are an outcome of Mexico's political economy. For the development of the ETS, the carbon tax can provide contributions in some areas.

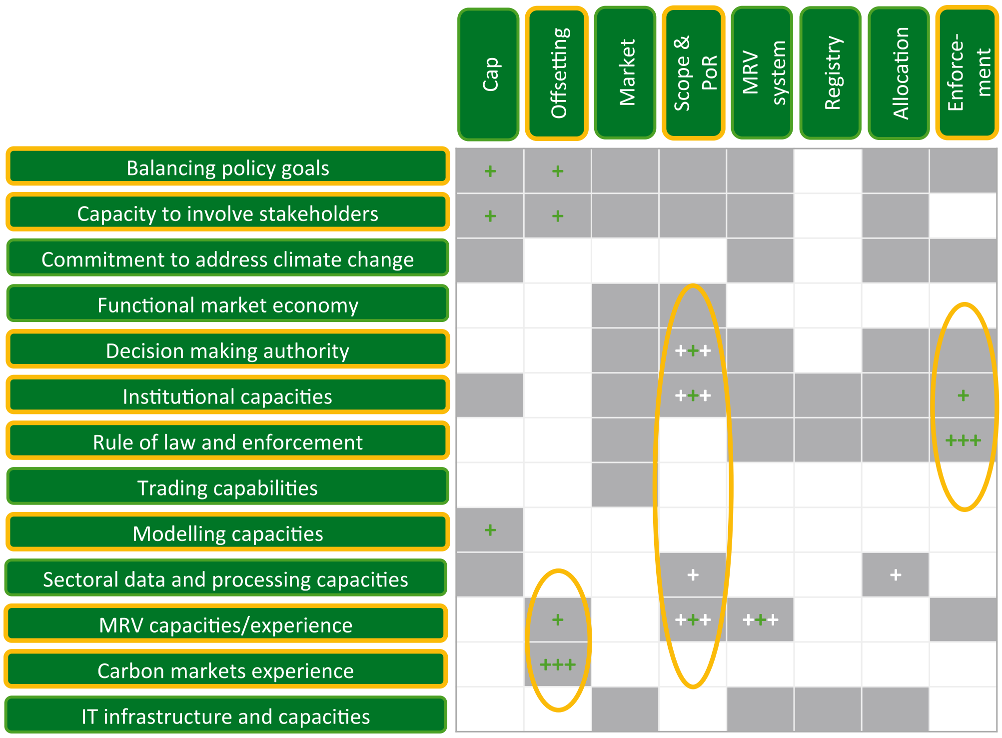
- The introduction of the carbon tax can provide valuable, yet not necessarily positive, experiences in terms of **stakeholder involvement** and **definition of the overall environmental goal** of an instrument. The experiences made with the carbon tax indicate that the ETS cap must be based on sound, independent analysis and including engagement with other line ministries.
- The carbon tax's offsetting component which allows tax payers to use CERs for reducing their tax liability could provide ideas for developing an **offsetting option** under the ETS. Given the fact that this offsetting component does not allow to actually offset emissions but only to reduce the tax burden according to the monetary value of the CERs submitted, its contribution to the design of an offsetting component under the ETS can be expected to be limited.
- The carbon tax's contributions to the building blocks **scope/point of regulation** and **MRV** depend on whether an upstream ETS is being considered. If this is the case, the data on fossil fuels sold and imported by covered entities could be used. For a mid-stream ETS, in contrast, the carbon tax is too limited in scope.
- Due to the fact that the carbon tax is integrated into Mexico's fiscal system, many of the elements on which it is built **cannot be used for establishing the institutional and legal structure of the ETS.** However, experiences could be used, for instance in terms of enforcement: Here, public

entities have gained important inter-ministerial experiences and established capacities to deal with attempts of tax evasion, which could be used when developing the enforcement system of the ETS.

- In terms of **modelling expertise**, which is relevant for defining the cap of the ETS, the carbon tax could in principle provide valuable contributions. However, additional capacity development measures are required to apply this expertise in the market context and process emissions data. Furthermore, inter-ministerial cooperation between SHCP and SEMARNAT would be required in order to make use of this knowledge in the environmental sector.

Figure 23 below illustrates the relationship between preconditions (left vertical column) and the different ETS building blocks (upper horizontal row) and shows in which areas the carbon tax may provide contributions to the ETS development process (yellow circles). Grey cells indicate the general relevance of the precondition for the respective building block. Areas where the carbon tax provides particularly strong contributions contain green plus signs. White plus signs denote the potential expansion of the contribution under certain circumstances. This is particularly relevant for the potential contributions to the building blocks scope/point of regulation and MRV, which will be largely depend on whether an upstream system is taken into consideration. As denoted by the white plus signs in the figure, the contribution of the carbon tax will be much higher if the ETS is designed as an upstream system.

Figure 23: Contribution of the carbon tax to ETS building blocks and preconditions



Source: Own illustration

6.2.2 Clean Energy Certificates (CELs)

6.2.2.1 Policy Instrument Introduction and State of Play

The Clean Energy Certificates (CELs) were introduced in 2014 with the Electric Industry Law, which requires covered entities (see below) to hold clean energy certificates according to a certain share of their energy consumption. 2018 is the first year of compliance.

The introduction of the CEL system must be seen in the broader context of the government's efforts to reform a state-run and oil-dominated energy system. The basis for the clean energy certificates was established with the national Energy Reform enacted in 2013 as discussed in section 6.1.2.2. Transitory Article 17 of the constitutional decree provides the legal basis for the CEL system by stating that "in terms of electric energy, clean energy and emission reduction, obligations will be established by law for participants of the electric industry" (DOF 2013a, Transitory Art. 17, translation by the author).

The CEL system as such was introduced in 2014 with the adoption of the Electric Industry Law, which provides SENER with the mandate for the establishment of the mechanisms necessary for the implementation of the policy and the development of the requirements for the acquisition of CELs (Art. 121, DOF 2014b). The Energy Regulatory Commission (CRE) is in charge of defining the regulation of the CEL system (DOF 2014b).

According to Art. 83 of the regulation, CEL's main goal is to contribute to the achievement of Mexico's clean energy targets at the lowest costs possible and through use of market-based mechanisms (DOF 2014d). Hence, the introduction of the CEL system must not only be seen in the context of the General Law on Climate Change from 2012, with its target to increase the share of clean energy to 35% by the year 2024. More broadly, CELs are to contribute to the Government's efforts to reform the electricity market. The latter has recently undergone some significant changes through the energy reform (see Box below).

Mexico's Electricity Sector

The energy reform is fundamentally changing Mexico's electricity sector, which was built on the monopoly of state-owned Federal Electricity Commission (CFE). With the energy reform, CFE was unbundled vertically and horizontally and the former state enterprise was split into separate companies for transmission, distribution and power generation.

With regards to **electricity generation**, CFE's portfolio of power plants was distributed among several companies. These generation companies are still subsidiaries of CFE but may, however, be turned into affiliates in the future in order to reduce CFE's ownership to up to 51%. Private generation is becoming ever more relevant. Private players can own and operate power plants but must sell all power produced to CFE under long-term power purchase agreements. Following previous reforms from the 1990s, there are already some private players involved in power generation. These will continue operating on the basis of the existing long-term purchase agreements.

Transmission and distribution networks have been legally unbundled from other CFE activities, they however remain subsidiaries of CFE. With the approval of SENER, private sector companies can finance, build and operate their own networks.

In terms of **supply and consumption of electricity**, Mexico's power sector comprises both regulated and unregulated supply as price regulation has only been partly abolished. Under regulated supply, basic service suppliers (currently only CFE) sell electricity to so-called basic service users - namely households and small industrial consumers - at regulated tariffs. Only qualified users - mainly large industrial consumers - are given the possibility to buy their electricity from the electricity market. Qualified users are users whose so-called "load centres" have a load of above 1 MW.[21] The term "load centre" refers to the overall set of installations and equipment that allows the final consumer to be supplied with electric energy.[22] Qualified users buy electricity either directly by engaging in the wholesale market or by signing a contract with a qualified supplier, who buys the electricity at the wholesale market on their behalf.

[21] The eligibility threshold could be lowered in the future, allowing users with less than 1 MW to participate in the wholesale market.

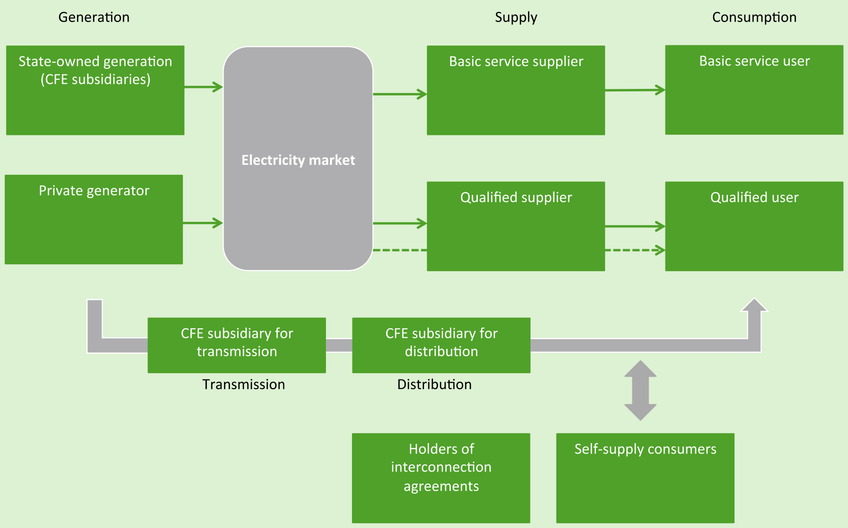
[22] This concept of demand based on "centros de carga" was required because the Electric Industry Law does not contain a definition of demand that allows for the identification of qualified consumer according to their consumption (Reportacero 2016).

Mexico's Electricity Sector

In addition, there are entities that are partially delinked from this electricity system: These are self-supply users who produce their own electricity as well as holders of interconnection contracts that have signed an interconnection contract before the laws of the energy reform entered into force. Figure 24 below illustrates the functioning of the Mexican power sector.

In this system, which combines regulated with unregulated elements, the Energy Regulatory Commission (CRE) plays a key role to ensure equal access to the grid for all market participants. The operation of the system and the market has been transferred to a new entity, the National Centre for Energy Control (CENACE).

Figure 24: Structure of the Mexican power sector



Source: Own illustration based on IEA (2016: 94)

Subsidized Tariffs

At the moment, residential electricity tariffs are heavily subsidised for all consumers, with the exception of the largest consumers. Phasing-out these fossil fuel subsidies is not an explicit part of the energy reform but would however be a requirement reflecting real generation cost and is also relevant in terms of achieving a functioning ETS. In addition, the subsidies are very costly: In 2014 costs for these subsidies amounted to over USD 6 billion. The International Energy Agency estimates that the costs for maintaining these tariffs would steadily rise towards USD 8 billion by the year 2040 (IEA 2016). A revision of the tariff system is envisaged for 2018, in order to produce a new tariff system based on consumption and the marginal production costs (Interview 7 2017).

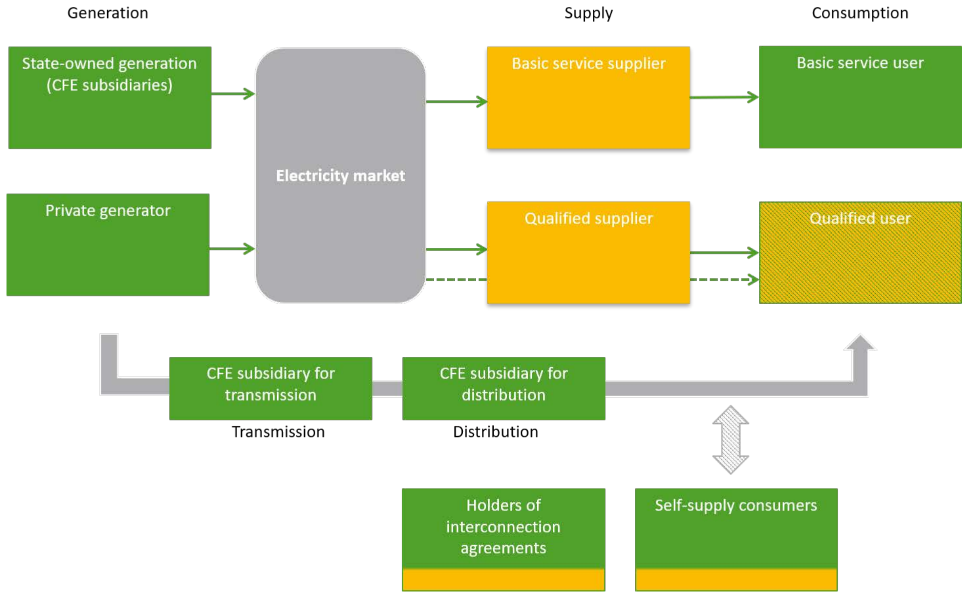
With the introduction of CELs, a new virtual asset was created, which certifies the production of one megawatt hour of 'clean' electric energy, in line with the definition of 'clean energy' that includes renewable energy sources (wind, solar, hydroelectric and geothermal) as well as nuclear energy and co-generation .

Demand for these CELs is created by the establishment of compliance obligations. Five different types of obligated entities can be distinguished (for an overview on the entities with compliance obligation see Figure 25 below) (DOF 2014b Art. 123):

- Basic service suppliers must comply with the CEL obligation for the amount of electricity they sell at regulated prices to the basic service users. Currently, CFE is the only basic service supplier.

- Qualified suppliers: When a qualified supplier buys electricity at the wholesale market and resells it he is obligated to comply with the CEL obligation.
- Qualified users: A qualified user will only be required to comply with a CEL obligation if he participates directly in the wholesale market. If, in contrast, he is represented by a qualified supplier he will not have to comply with a CEL obligation as 'his' supplier is already required to do so.
- Self-supply consumers: Self supply consumers will also be required to comply with the CEL obligation. However, only the share that is not clean will be taken as the basis for establishing the obligation to acquire CELs. For instance, a consumer with a wind turbine uses 80% to meet its electricity demand while meeting the additional 20% from the national grid. The CEL obligation will be calculated on the basis of the 20% from the grid (Interview 9 2017).
- Holders of interconnection contracts: Users having signed interconnection contracts before 2014 (prior to the energy reform) that continue in force and do not exclusively rely on clean energy are also affected by the CEL obligation. Here again, only the share of electricity that has not been generated from clean energy will be used as a basis to calculate the obligation. Consider for instance, a consumer has signed an interconnection contract with a company that provides him with electricity, allowing the consumer to meet 60% of his demand while the remaining 40% will be supplied from the national grid. Here, the CEL obligation will be calculated on the basis of the 40% of electricity supplied from the grid.

Figure 25: The Mexican power sector and entities with CEL compliance obligation



Source: Own illustration

Figure 25 indicates the entities that are required to comply with CEL obligations (in yellow). As qualified users will only have to comply if they engage directly on the market they are only partially denoted as obligated entities. Similarly, holders of interconnection agreements and self-supply consumers will only have to comply with a share of their consumption and are therefore not fully marked in yellow.

In addition, it is possible to buy CELs on a voluntary basis. For instance, large companies without CEL purchase obligation could buy CELs in order to "clean" their power use and use this for marketing reasons. Voluntary buyers must be registered as voluntary entities in the S-CEL registry, the System for the Management and Issuance of Clean Energy Certificates (DOF 2017c, Art. 14).

The obligation for obligated entities to hold CELs is derived from the electricity consumed at the load centres that correspond to the obligated entity. For instance, the obligation for a qualified supplier is derived from the amount of electricity consumed at the load centres of the final users to which he supplies electricity. The consumption is then used as a basis to calculate the obligation using the following formula:

Obligation = R * C

R is the uniform CEL requirement expressed as a percentage of the electricity consumed and C is the total electrical power consumed at the load centres that are associated to the obligated entity (DOF 2017c, Art. 48). The requirement R is determined by the ministry of energy SENER in the first trimester of each year for the three succeeding years. SENER has further the possibility to determine the requirement for future years. Once determined, the requirements cannot be reduced (DOF 2014b, Art. 124). For the first two compliance years 2018 and 2019, a clean energy quota was established at 5% and 5.8% respectively (DOF 2015b, 2016a).

When determining the requirements for the years 2020, 2021 and 2022, SENER took into account a series of parameters, inter alia (DOF 2017d):

- Existing power plants and plants currently under development, estimations about the additional potential of each technology at national level
- Expected lead time for the development of projects and technologies that provide additional potential
- Long-term estimates on fossil fuel prices
- Expected price developments as a result of technological advances
- Current and projected electricity demand

On the basis of these and other parameters, different scenarios have been developed using a time horizon of 15 years:

- A scenario with no increase of CEL obligations
- A scenario with different levels of obligations that allows to estimate the costs for the national electricity system
- A scenario that allows the achievement of the clean energy targets contained in the Energy Transition Law, with a linear projection of these targets.

On the basis of these parameters and scenarios the requirements for the acquisition of CELs have been derived (see Table 8):

Table 8: CEL requirements

Compliance period (1. Jan to 31 Dec)	Clean energy target (%)	CEL Requirement (%)
2018	25	5
2019	26.7	5.8
2020	28.3	7.4
2021	30	10.9
2022	31.7	13.9

Source: Own compilation based on DOF (215b, 2016a, 2017d)

On the supply side, eligibility of entities allowed to generate CELs depends on the installations and the energy these power plants are using. In terms of installations, all clean energy power plants that begin operations after August 11 2014, the date on which the secondary legislation of the constitutional reform was enacted by the President, are eligible. Clean energy power generation plants owned by CFE that began operations before this date are eligible if they have implemented an expansion project to increase production (DOF 2014c).[23] As outlined above, Mexico's definition of clean energies does not only include renewable energies but also nuclear and (usually gas-fired) high efficient cogeneration (DOF 2014b, Art. 3, section XXII). All these technologies are eligible and each megawatt hour of clean energy generated will receive one CEL, independent of the type of technology applied. However, if fossil fuels are applied in the generation of electricity, the generators will be allowed to receive one CEL for each MWh generated multiplied by the percentage of fossil fuel-free energy (DOF 2014c). For cogeneration plants that use fossil-fuels, a theoretical share of 'fossil-fuel energy' is calculated using a formula developed by CRE (DOF 2016b). This allows efficient cogeneration plants to generate CELs if certain conditions are met (for details see: Llamas / Probst 2018).

In order to obtain CELs, all clean energy generators must be included in a registry, the System for the Management and Issuance of Clean Energy Certificates *(S-CEL)* which is run by the CRE (see below). In addition, they must be certified by a CRE-accredited entity which certifies that the plant generates clean energy and pay the rights to be registered in the system (DOF 2017c, Art. 12).

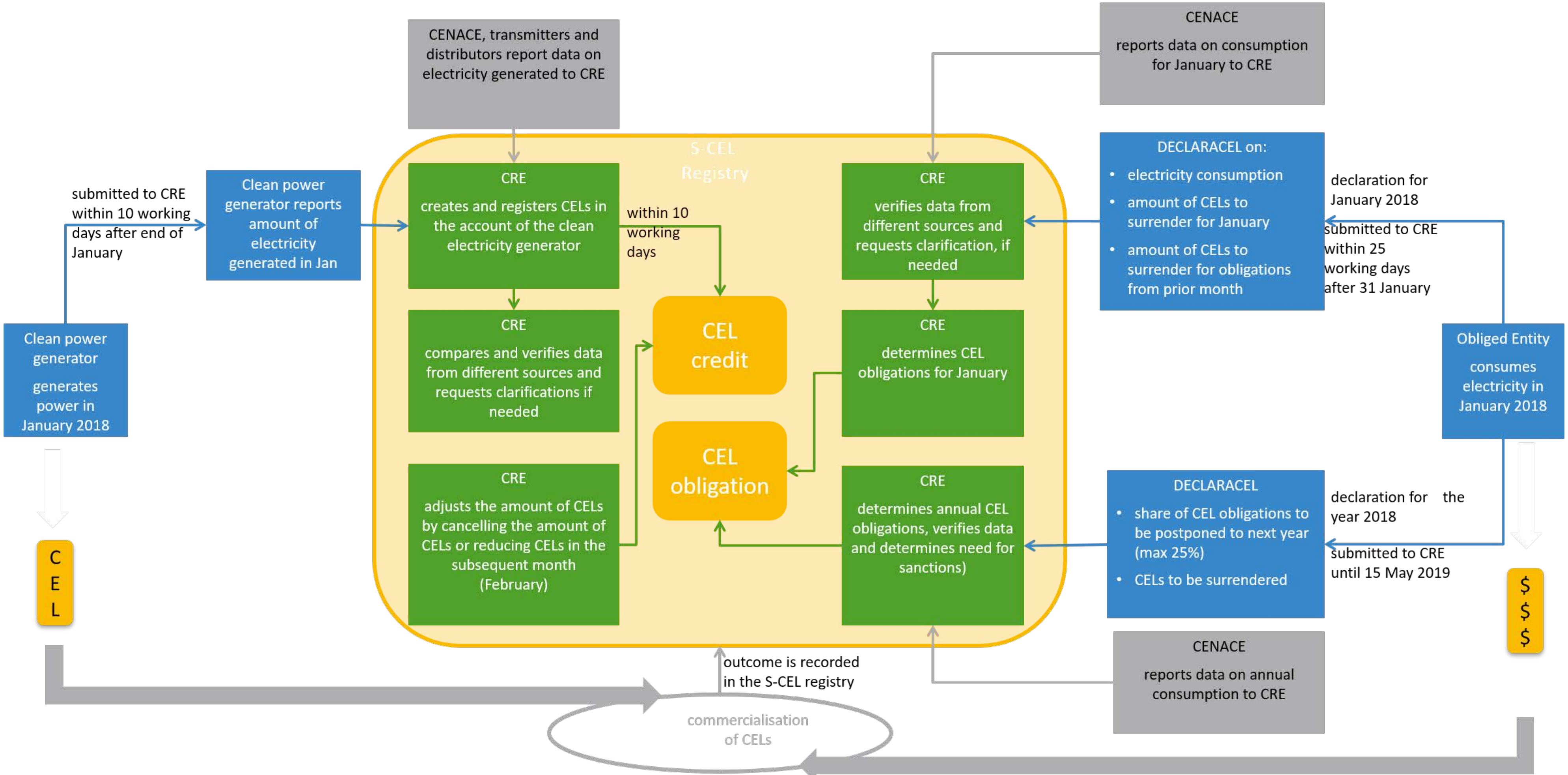
The value of CELs is not determined by the regulator, but defined through the demand-supply balance. CELs are a tradable commodity and their purchase is considered a commercial transaction which is why they will be subject to commercial law and principles, such as the commercial code, mercantile legislation and federal civil code (DOF 2014c, Art. 11). CELs are fully bankable and do not expire (IEA 2017b).

To ensure the integrity of CELs and the compliance with the CEL obligations, an MRV system was introduced which operates at two levels, the demand side and the supply side:

On the demand side, the system requires obligated entities to declare their CEL obligations to the CRE by providing data on their electricity consumption, on a monthly basis. At the same time, their counterpart (CENACE or a distributor) reports data on electricity consumption to the CRE. CRE then verifies the information obtained from the different sources and, if necessary, can request clarifications. On that basis, the CEL obligations for the respective month will be calculated. These obligations can either be fulfilled in that same month through provisional declarations that cancel the respective amount of CELs. Alternatively, cancellation of CELs will be made at the end of the year with a final annual declaration. Reporting and CEL cancellations are made using a tool called DECLARACEL that is part of the S-CEL registry (for the form see: CRE 2017a). The final annual declaration must be made by 15 May of the following year at the latest. This declaration will be used to determine whether the covered entity is compliant with its obligations and if penalties for non-compliance could apply. After acquired CELs have been used to fulfil the obligation, they will be immediately cancelled, nullifying the instruments' transferability (DOF 2017c, Art. 50-52). Figure 26 provides an overview on the MRV processes using the example of energy consumption by an obligated entity in the month of January. Verification takes place once the one year-long compliance period is concluded and is conducted by the CRE. In addition to using all information submitted to the CRE, the commission can conduct reviews and random visits to verify the compliance with clean energy obligations or the information that was submitted (DOF 2016c, Art. 57-58).

[23] In addition, plants whose capacities were not included in an interconnections agreement under the rules prior to the reform are also eligible.

Figure 26: MRV framework of the CEL system and role of S-CEL registry



Source: Own illustration based on CRE (n.d.)

On the supply side, the MRV system is used to oversee the generation of CELs (DOF 2017c, Art. 26-33). The process is structured along the following steps (see Figure 26):

- Power plant generates clean energy
- CENACE reports preliminary information about the energy generated to CRE
- CRE generates and registers the CELs in the accounts of the clean electricity generators
- CRE compares and verifies the information obtained from the obliged entities and CENACE, potentially adjusting the CELs of the generator.
- Clean energy generator receives CELs which can be commercialised on the market

Covered entities and clean energy operators have different possibilities to transfer CELs. These are laid down in the Bases de Mercado (DOF 2015c). One possibility is the spot market, which is operated by the National Centre for Energy Control (CENACE) at least once a year. Holders of CELs can offer to sell CELs at any price they consider convenient, including different prices for different packages of CELs. Similarly, acquiring market participants are free to offer to buy CELs at any prices, including different prices for sets of CELs. Once the bidding period is over, CENACE calculates the equilibrium price in a way that the total amount of offers to sell equal or below the equilibrium are matched to the total amount of offers to buy at a price equal or above the equilibrium price. Amounts of CELs will then be assigned to the different market participants at the equilibrium price. CENACE informs the CRE about the transfers to take place and CRE then transfers the CELs among the accounts of market participants (DOF 2015c, Art. 12.1.2).

Market participants in addition have the possibility to implement bilateral transactions. For such bilateral transactions to take place, market participants will have to enter into a contract (*contratos de cobertura eléctrica*) and the transactions must be registered in CRE's S-CEL registry. CRE will then transfer the CELs from the seller's to the buyer's registry account (DOF 2015c, Base 12, section 12.1.3).

In addition to these possibilities for short-term transfers of CELs, long-term auctions are being held. The aim of these long-term auctions is to assign contracts for the disposal and acquisition of CELs locking-in prices for a duration of 20 years (DOF 2015c, section 1.3.6). Hence, clean energy generators can sign contracts with buyers allowing them to sell CERs at fixed prices for a period of 20 years. Similarly, CEL buyers can make sure that they will be provided with a quantity of CELs for the price defined by the auction. These auctions are held in conjunction with auctions on energy and capacity and bidders are allowed to offer packages. Auctions are operated by CENACE who matches bids from sellers and buyers. After a first auction in 2015, the second auction carried out in 2016 saw the participation of around 60 selling companies offering their products to CFE, the only buyer allowed in the first two auctions. On average, in 2016 the price for one MWh of energy together with a CEL was at 33.47 USD. After having implemented these two auctions in 2015 and 2016, a third auction was carried out in November 2017 which was open to buyers other than CFE. It was also the first time that the new six subcompanies of CFE presented individual offers (CENACE 2016; SENER 2017). The price levels achieved for clean energy (energy + CEL) in this last auction was at 20.57 USD per MWh and CEL, a reduction of 38% compared to the previous auction (CENACE 2017).

The government further introduced strong penalties in case covered entities do not comply with the requirement to acquire CELs: For each MWh that is not covered by a CEL, a penalty of between 6 to 50 minimum daily wages will be applied. The final penalty depends on different factors, such as the percentage of non-compliance (the share of electricity that is not covered by CELs), whether it is the first time or recurrence and whether compliance was delayed further (DOF 2016c).[24]

[24] Estimates in the literature about this vary: According to a report by EY, this corresponds to around 560 and 2944 MXN (EY 2015) (around 25 to 130 EUR)[24], while the IEA estimates that penalties are between USD 30 and 250 per MWh (IEA 2017b). Del Razo (2016), in contrast, estimates that fines could be up to USD 740 per every CEL not submitted.

Table 9: Penalties for non compliance with CEL obligations (number of minimum daily wages per MWh)

	Compliance if obligations was not delayed further				Compliance if obligations was further delayed			
	>0% and 25%	> 25% and 50%	>50% and 75%	>75% and 100%	>0% and 25%	> 25% and 50%	>50% and 75%	>75% and 100%
First time	6	8	10	12	8	10	12	14
Recurrence	12	16	20	24	16	20	24	28
Third time or more	18	24	30	36	24	30	36	42

Source: DOF (2016c)

On the basis of the minimum wage for 2017 of 81 MXN per day, the maximum penalty is 4,050 MXN (EUR 184.46) while the minimum penalty is 486 MXN (EUR 22) per CEL. It must be noted that payment of the penalties will not exempt the participant from its obligation to acquire CELs, i.e. the system has a 'make-good provision'. The timeframe to buy CELs to make up the shortfall is equivalent to the timeframe for paying the penalty. Collection of penalties is done by the National Centre for the Control of Energy (CENACE) upon instructions by the CRE and using the billing and collection process applied by CENACE in the wholesale market. CENACE is then to inform the CRE of the payment of the fine, in order to record this in the S-CEL registry (DOF 2016c).

For the first four years of operation, a flexible mechanism was agreed. This mechanism allows covered entities to defer their obligation to acquire CELs by up to 50% for two years if there is scarcity of CELs in the market or if their price is above a threshold calculated by CRE. The conditions are as follows (DOF 2015a, Art transitorio 22):

- If during the first compliance year (which is 2018) the CRE determines that the total number of CELs registered is below 70% of the total obligation for each of the first two compliance years, or
- If the 'implicit price' of CELs, calculated by CRE using a specific methodology is above a certain price level. According to Ernst & Young, the price ceiling calculated on this basis is equivalent to MXN 322.75 (EUR 14,65) (EY 2015).

Interviewees indicated that scarcity of CELs could be a possible scenario, because of two reasons: One issue is the recent decline of precipitation that may challenge electricity production of hydroelectric plants in the future (Interview 7 2017). A second concern is that clean power producers must be included in the registry and meet the other participation requirements mentioned above. Hence, CEL generation could be less than what the share of clean energy may indicate if power generators do not engage in the market (Interview 9 2017).

6.2.2.2 Potential Contribution to ETS Building Blocks and Preconditions

Cap

The CEL system has established a clean energy obligation for specific entities, mainly electricity suppliers and large consumers, which is determined on a yearly basis three years prior to the respective compliance period. Once established, these obligations cannot be reduced (DOF 2014b Art. 124). The share of clean energy is derived from the clean energy target as included in the Energy Transition Law, which stipulates a gradual expansion of the share from 25% in 2018, 30% in 2021 and 35% in 2024. As outlined above, SENER has taken into account numerous parameters to deduct the CEL requirements that are to ensure these clean energy targets are met. Balancing environmental goals with economic and social considerations was presumably relevant when defining and weighing these parameters which led to these CEL requirements.

However, and despite the recent energy reform taking shape, the power sector in Mexico is still characterized by a vertical structure and only slowly opening to the private sector. This structure facilitated the involvement of stakeholders during the introduction of the CEL system and allowed SENER to establish a dialogue that was clearly led by the ministry. As indicated by one interviewee, the process could inform a similar process under an ETS as it shows that the affected industry can agree to a new instrument (Interview 3 2017). The dialogue was established ad hoc and no permanent forums were installed that could be used for the involvement of stakeholders when establishing the ETS. With regard to the commitment to address climate change, the introduction of the CEL system cannot be used as a strong indicator as it was primarily established to achieve the clean energy targets at the lowest possible costs.

An important area where the CEL system could contribute to cap-setting is using the clean energy targets to determine the level of the cap of the ETS – or, in case the ETS will have a bigger scope than the CEL system, the contribution of the CEL sectors to the overall cap. The analysis, modelling and impact assessments that have gone into setting the CEL requirements can provide a useful basis to build upon for the ETS cap-setting. Potentially, also the ambition level of the CEL can be translated to the cap (stringency of the target), at least for the sectors concerned. As highlighted by one interviewee, the process could inform cap setting under an ETS (Interview 11 2017).

Offsetting

The CEL system has no offsetting component and does therefore not provide contributions to the processes of establishing offsetting provisions under an ETS.

Market

Due to its market-based nature, the CEL system could provide strong contributions to several preconditions relevant for this building block.

One key precondition to a functioning ETS is the existence of a functioning market in the relevant sectors. In this regard, the Mexican power sector is characterized by some peculiarities as the process of market liberalization is ongoing and the sector continues being dominated by CFE, the state-owned company which was recently vertically and horizontally unbundled. In terms of power generation, CFE was split up into six individual sub-companies. Unbundling remains partial since it is carried out at the legal level, not affecting ownership. CFE power plants will be allocated to each generation company with a view to develop competitive conditions and limit market power issues (IEA 2017). It remains to be seen whether the restrictions imposed on CFE will be effective in allowing other companies to effectively compete with CFE and its affiliates. Depending on the sectoral scope of the ETS (i.e. total size), this could also lead to CFE being a dominant market power with strong influence on carbon market prices. As pointed out by one interviewee, a stronger and faster reduction of the existing privileges of CFE is required (Interview 7 2017). Closely related to this issue is the regulation of power tariffs, which are still heavily subsidized in particular for residential consumers in Mexico. Such a structure makes pass-through of price signals difficult (Interview 3 2017), leading to a less effective ETS in terms of reducing emissions.

With regards to legal preconditions, the introduction of the CEL system also provided a legal basis that could be used as a starting point for the ETS. CELs are commodities that can be freely traded, sold and owned and their transactions are subject to the existing principles of commercial law. These principles and how they have been incorporated into the legislation and put in practice for the CEL system could be used as a basis for the treatment of allowances under the future ETS. This potentially includes the definition of the virtual assets and how they are created and treated in e.g. accounting and taxation systems, the rules for market oversight, market access and ensuring market credibility. Potentially, also legislative texts and the processes and institutions to develop and implement them may be of use in the development of the legal basis of the ETS.

The market place established for CEL trading and the institutional capacities established for its operation could be used as model for developing similar structures for an ETS. Within the National Centre for Energy Control (CENACE), significant capacities were developed to operate the CEL market. However, several interviewees pointed out the main focus of this institution is on the power sector, focusing on ensuring energy security and low prices, while emissions are not within their mandate (Interview 3 2017; Interview 4 2017). However, there are strong similarities between the carbon market and the electricity market, as the latter strongly influences the former. With regards to the trading capacities in the private sector, interviewees indicated that the capacities established within CEL market participants are significant and that they will be relevant for trading of allowances under an ETS (Interview 3 2017). This is also seen in Europe, where energy companies use their experience as electricity trading to operate as traders, or operate exchanges, for third parties in the carbon market. Whether the traded asset is electricity, green/clean energy certificates or carbon allowances is of limited importance, especially as the supply and demand of the latter follows electricity supply and demand patterns quite closely. Often, also package deals are traded, including both electricity delivered and the carbon allowances to cover the associated emissions. Therefore, both the market platform and the experience gained with it in the context of the CEL can be a significant contribution to building the market component for the ETS. However, under current legislation, CENACE has no role under the ETS (Interview 11 2017). Therefore, learning from the experiences made and adapting the design of these institutions may be needed.

Since the ETS will presumably not only cover the power sector, regulation under the ETS would need to be organised differently from the role of CRE, the regulator of the CEL system. Here, a different entity, potentially a specific division within SEMARNAT, should be created to regulate the ETS (Interview 9 2017; Interview 7 2017).

The CEL provisions allow for the participation of non-compliant entities in these markets. Until now, however, a secondary market has not yet been established.

Scope/Point of Regulation

The scope of the CEL system is by definition narrower than the scope of an ETS (unless the ETS would focus only on the power sector). However, the power sector will be an important part of a wider ETS, given its size in emissions. While efforts for other sectors of the ETS would have to start from scratch, for the power sector, the efforts in terms of identifying participants, gathering data, establishing baselines, establishing institutional responsibilities will to a certain extent have been done for the CEL system.

As pointed out above, the Mexican power sector is still limited in terms of number of participants and CFE as the former single supplier continues dominating the sector. Interviewees underscored that this structure facilitated the introduction of the CEL system in a top-down manner. On the down side, though, it is problematic in terms of transparency, as for instance, CFE consisting of clean energy generators and fossil fuel electricity suppliers will be both seller and buyer of CELs (Interview 7 2017).

MRV

The CEL system established a well-defined MRV system with clear reporting requirements, timeframes, and verification measures, both for the clean power generators as well as for the covered entities. Once operational, the system as such will provide relevant insights and lessons learned regarding how to establish such a process in institutional terms.

In terms of institutional capacities, obligated entities have established systems and responsibilities for monitoring and reporting their electricity consumption. They are gaining relevant experiences in this area and are also establishing relevant baseline data. However, this does not include the monitoring of GHG emissions, either associated with the electricity consumption or other emission sources. In this respect, monitoring under the CEL system is much simpler than it would be under the ETS. In addition, the verification of power consumption and compliance with CEL obligations is done by CRE on the basis of the information obtained from CENACE and the regulated entities as well as through random visits. Hence, the CEL system does not introduce a structure of independent third-party verifiers with a respective accreditation body in place.

Registry / IT System

The registry *S-CEL (Sistema de Gestión y Retiro de Certificados de Energías Limpias),* which will be run by the CRE is a cornerstone of the CEL system. The registry is used to manage and track all information related to the consumption and generation of electricity, the issuance, transaction, liquidation and cancelation of CELs and the compliance with clean energy obligations. The S-CEL registry shares several characteristics with the registry needed under an ETS, which is why it could provide a valuable basis for establishing the registry under an ETS, potentially even being expanded into the ETS registry.

The administrative framework of the S-CEL registry is laid out in Resolución 174/2016 (DOF 2017c). According to this framework, the registry is to process all the information about CELs in terms of issuance, ownership, technology used and history of entitlement. Each CEL will be assigned a unique serial number. For each entity participating in the system, the CRE assigns an account. In this account, all CELs issued, acquired, sold, surrendered or voluntarily cancelled will be tracked. Participants will have electronic access to their accounts using a personalised password (DOF 2017c, Art. 18). Covered entities will have the possibility to undertake provisional surrendering of CELs once a month as well as final surrender once a year using DECLARACEL. DECLARACEL is an electronic tool linked to the registry that uses an advanced electronic signature (DOF 2017c, Art 22). The S-CEL registry will also generate reports once a month about the current status of the CEL market in which information will be used in an aggregated form. The administrative framework of the S-CEL also contains technical specificities, such as the requirement to use (real-time) backups for safeguarding the information contained in the registry. As can be seen, several functions of the S-CEL registry closely align with what is needed from an ETS registry. That the system registers a different unit (MWh instead of tCO_2e) is not relevant to its structure, the way it is legislated, constructed or operated, or the experience gained with it.

At the same time, Mexico is operating the national emissions data base RENE, covering GHG data, which was by many interviewees seen as a starting point of the ETS (inter alia: Interview 7 2017). In contrast to the S-CEL registry, however, RENE lacks several of the functions needed for an ETS registry as it was designed as emissions database. As highlighted by one interviewee, experiences from introducing and operating the S-CEL registry could be used for the ETS registry and elements of the S-CEL registry could be copied, potentially significantly reducing costs.

Integrating both registries, in contrast, was seen as a less promising option, potentially increasing the complexity of operations (Interview 4 2017). As highlighted by one interviewee, the idea to integrate the CEL registry into the RENE has already been raised before by SENER. However, the idea was not pursued further and the S-CEL registry was then developed independently from RENE (Interview 6 2017). This could be seen as an indication that the architects of the S-CEL registry realized that RENE does not deliver many of the elements needed for a registry.

Allocation

The obligations for covered entities to acquire or hold CELs are derived by multiplying the individual power consumption in their respective load centres with the generic CEL requirement (Obligation = R * C). This formula, together with the establishment of the level of the requirement, constitutes the mechanism to distribute the effort across individual entities, equivalent to the allocation in an ETS. Information gathered by the system is limited to the consumption of electricity, while data on production, emissions and performance (historic and projected) is not recorded. As there is only one uniform factor to determine the requirement, the CEL system does not provide any inputs for grandfathering or benchmark-based allocation approaches. However, no such information is needed in case auctioning is used to distribute allowances in an ETS.

The need for an in-depth analysis of the effective mitigation costs for different sectors and activities was also highlighted by one interviewee (Interview 8 2017). This is particularly relevant if free allocation will be used as method for distributing allowances under the new ETS.

Interviewees also emphasised the different perspective regarding CELs and allowances, which will potentially strongly impact the discussions about (free) allocation. According to one interviewee, allocation of allowances will be more difficult as the allocation process is typically used to take into account issues such as carbon leakage. This is different from the establishment of the CEL system where no specific carbon leakage provisions where made (Interview 4 2017). In part, carbon leakage is prevented by establishing CEL obligations for the supplier, meaning that imported electricity and domestically generated electricity are treated the same. There might however be an indirect carbon leakage effect on qualified users depending on the CEL price. Despite this, during the development of the system this did not play a major role in the discussions (Interview 4 2017). This must be seen in light of the overarching reform process taking place at the moment of introducing the CEL system. While it was clear that CFE as the largest supplier would be affected directly by the CEL obligation, the impact on users was presumably less clear: The CEL obligation was introduced with the option to participate in the wholesale market as a qualified user. So future qualified users might at that point not have been fully aware of the impact of the CEL obligation as they were not yet decoupled from CFE and would therefore only be affected indirectly through price increases.

The auctions for CELs, which have in the past been held together with auctions for capacity and energy, could possibly form a basis for auctioning under the ETS, if that allocation approach were to be chosen. This also applies to the auctioning system and the corresponding legislation (e.g. on market oversight and market access). The experiences gained by both public and private entities responsible in these activities could be of use when engaging in similar activities under the ETS.

Enforcement

The CEL system has established strong compliance provisions with heavy penalties in case of non-compliance. However, since 2018 will be the first year of compliance, there is no experience yet in its application. In addition, it should be kept in mind that the government's leverage in the power sector is very strong: sanctions for non-compliance with the provisions of the regulator will be enforced by CENACE, the operator of the wholesale market, using the billing and collection process applied in this market. As highlighted by interviewees, this is very different from the environmental sector where a similar structure is currently lacking. SEMARNAT does at the moment not have the means to enforce compliance and impose similar sanctions in case of non-compliance. As a result, it is expected that substantial effort would be required to establish these capacities to develop a well-functioning enforcement system for the ETS.

In addition, the legal basis for the establishment of sanctions in the environmental sector is very different from the energy sector. As the CRE controls the entire power chain, a regulatory framework has been established which allows the CRE to issue resolutions. In the environmental area, in contrast, such a regulatory framework is missing. Therefore, SEMARNAT must use "*reglamentos*" to manage the ETS, which have to pass Congress. This can be much more challenging in political terms (Interview 9 2017).

Summary

To what extent can the CEL system contribute to the process of establishing an effective ETS in Mexico? The **CEL system** is the new kid in town, with 2018 being the instrument's first year of compliance. While at this stage it is not yet possible to draw conclusions about its operation, interviewees have shown a generally positive stance regarding its design and the way it has been introduced. The system can be expected to provide significant contributions:

- The introduction of the CEL system is characterised by a **successful involvement of stakeholders** and a dialogue that was clearly led by the ministry. While the introduction of the CEL system and the adoption of the overall CEL requirement were facilitated by the vertical structure of the electricity sector, other factors seem to have played a significant role as well.
- In particular the process of developing the overall CEL requirement on a scientific basis by taking into account numerous parameters and scenarios could inform the process of establishing a cap under an ETS, as it might facilitate the acceptance of the affected entities to introduce a robust instrument.
- Due to its market nature, the CEL system can provide particularly **strong contributions to the market components of an ETS:** Institutional capacities of market regulators, operators as well as participants will presumably provide a solid basis for the establishment of allowance trading, while the legal definition of CELs and the treatment of market transactions could be used as a blueprint for defining these aspects under an ETS.
- Similarly, the **S-CEL registry** covers several functions needed under an ETS, making it a promising starting point for the development of a registry under the ETS.

As can be seen from the quantity of red plus signs in Figure 27 below, the CEL system has the potential to contribute to several ETS building blocks and preconditions making it a strong asset for the ETS development process.

Figure 27: Contribution of the CEL system to ETS building blocks and preconditions

	Cap	Offsetting	Market	Scope & PoR	MRV system	Registry	Allocation	Enforce-ment
Balancing policy goals	+		+				+	
Capacity to involve stakeholders	++		++				+	
Commitment to address climate change								
Functional market economy			+	+				
Decision making authority			+++	+				
Institutional capacities	++		+++	+	++	++		+
Rule of law and enforcement								
Trading capabilities			+					
Modelling capacities	+++							
Sectoral data and processing capacities	++							
MRV capacities/experience				+	+			
Carbon markets experience								
IT infrastructure and capacities			+++			+++		

Source: Own illustration

6.3 Reflections on Selected Aspects of ETS Development in Mexico

The process of establishing an ETS in Mexico is significantly advanced and, as outlined above, existing policy instruments - the carbon tax and the clean energy certificates (CEL) trading scheme - could provide substantial support to this process. The Mexican government's political willingness to introduce an ETS is high. The recent adoption of the reformed General Law on Climate Change (LGCC) which has established a solid legal basis for a mandatory ETS in Mexico indicates that there is also significant political support from the legislative branch. Support from the private sector, civil society organisations and research institutions, in contrast, is less clear. While the private sector raises concerns about increased costs and potential double burden, civil society and research institutions welcome the introduction of a robust ETS in principle. The latter two also point at the challenges associated to the introduction and management of the system and highlight the need to enhance the ambition level of the carbon tax and to gain further experience with the implementation of the CEL system.

Against this backdrop, this section provides some insights into the Mexican ETS development process. In a second step, the Mexican climate policy landscape is analysed in order to inform ways to achieve an effective carbon pricing mix for Mexico.

The analysis of Mexico's ETS development process highlighted numerous areas where the country is significantly advanced. At the same time, however, we identified areas where additional progress is needed in order to establish an effective emissions trading system. The following section will provide some general reflections that relate to political, institutional and technical aspects relevant for introducing and operating an ETS in Mexico.

6.3.1 Political Track: Inter-Ministerial Cooperation and Dealing with Stakeholder Interests

The Secretariat of Environment and Natural Resources (SEMARNAT) is the ministry in charge of introducing the ETS. SEMARNAT has considerably advanced the political process and there seems to be broad political support within the executive branch for the development of an ETS. In order to arrive at a successful ETS development process, backing from other ministries and inter-ministerial cooperation could be further strengthened. One potential key procedural measure to strengthen inter-ministerial cooperation and backing of the ETS is the installation of an inter-ministerial emissions trading group, comprising representatives from different ministries.

Inter-ministerial cooperation will also be crucial to facilitate the coexistence of instruments, as highlighted by interviewees: A strong exchange between SEMARNAT and other line ministries - in particular the Secretariat of Energy (SENER) and the Secretariat of Finance and Public Credit (SHCP) - is required to ensure that all three policy instruments are consistent and synergistic in terms of design and that implementation follows a commonly agreed timeline (Interview 4 2017; Interview 5 2017). Such stronger cooperation could also allow for information on regulated entities to be shared across ministries.

In terms of substance, the work of the inter-ministerial group could be guided by a mandate based on common principles and overarching goals, agreed upon up-front. One basic principle relates to the impact of the ETS vis-à-vis other policies: The inter-ministerial group could agree on the common objective that the ETS should not be designed in a way that undermines other policy goals but that instead synergies should be strived for. In cases where adverse impacts cannot be avoided by design, remedies to reduce and ultimately offset these impacts could be strived for, in order to align the structure of the ETS with the structure of other ministries` policy instruments and their respective objectives. In addition, the ETS could be designed to ensure that the costs and benefits of the ETS are distributed in a way that allows other ministries to back the new policy instrument. If, for instance, allowances are allocated through auctioning the revenues could relieve pressure on public budgets.

Another important task for the Mexican government is dealing with stakeholder interests. The exchange process with the private sector, which has already started, could draw from the experiences made during the introduction of the CEL system and the carbon tax: The introduction of the tax showed how the political influence from the fossil fuel industry can significantly reduce the reach and impact of a policy instrument. Hence, a strong engagement process with industry that is characterized by strong governmental leadership and dedication can be considered paramount in dealing with the opposition against establishing a robust ETS. Here, decision makers may be able to build on the experiences made from the introduction of the CEL system, a process clearly led by the ministry. While private sector representatives were allowed to express their views on individual design elements, the overarching goal of introducing the instrument was not put into question.

The introduction of the ETS in Mexico takes place under specific political circumstances: On 1 July 2018, Mexico elected a new president, Andrés Manuel Lopez Obrador, who will take office on 1 December. With the launch of the 36-month pilot phase of the ETS now being scheduled for early 2019 (Carbon Pulse 2018), the preliminary market rules are hence to be elaborated by the incumbent government while it remains to be seen how the new government will position itself in these ongoing processes.

In the past, the Mexican government had already agreed with industry representatives to establish a dialogue forum on technical issues of the ETS design. However, when the governmental plans to reform the General Law on Climate Change and to establish a robust legal mandate for a mandatory ETS became public, the private sector was hesitant to enter into an official dialogue with the government before knowing the details of these reform plans. With the adoption of the reformed General Law on Climate Change (DOF 2018), these plans have now become reality and industry could be more willing to enter into "working mode" and discuss design options with the government. In order to mobilise broad support of the ETS, the dialogue forum could also allow for the participation of civil society organisations and other non-business organisations. In addition, this can be expected to lead to more transparency, with less room for undue political influence from industry.

Clearly communicating the benefits for the different stakeholders could help to gain support for the ETS: An ETS is – according to economic theory - the most cost-efficient and flexible option to reach a predefined climate change mitigation target. For the entities that will presumably be ETS participants, the reformed law already contains a section that ensures that the competitiveness of the sectors participating in the system will not be adversely affected. In addition, positive experience with the ETS market simulation, concluded by mid of 2018, could be used to communicate the benefits of the process. When dealing with the interests of civil society, the potential to raise revenues that could be used for achieving a socially just transition to low-carbon development could be of utmost importance and might dilute some of the concerns regarding an additional burden for final consumers.

6.3.2 Legal / Institutional Track: Taking into Account the Ongoing Energy Reform Process and Building on Institutional Capacities

Mexico is in the midst of a fundamental transformation of its energy (electricity, oil and gas) sector and the Mexican energy reform is still unfolding. The power sector is gradually being opened up to the private sector and the monopolies for CFE and PEMEX are being discontinued only stepwise. The challenge for the existing policy instruments is that they are to contribute to this transformation while their performance is at the same time contingent on the broader progress of these transformation efforts. The success of these ongoing reform processes will also be relevant for the future ETS, which requires a functioning market economy to work effectively.

When defining the scope of the ETS and its point of regulation, the ongoing process to reform the energy sector is an important aspect to consider. An ETS exclusively focusing on the power sector with electricity generators being defined as the point of regulation could result in a de-facto market dominance of CFE, the state-owned electricity utility that is still dominating the sector. As the result of the most recent auctions shows, this situation is already changing, as a growing number of private energy producers is entering the sector. Hence, the sector is still in the midst of a dynamic transformation. While at the moment an ETS focusing exclusively on the electricity sector does not seem to be a viable option, the number of participants from this sector will presumably grow in the future.

Another important factor to take into consideration is the role of electricity subsidies and regulation of tariffs for consumers. While these regulated tariffs currently still prevent the price signal from being passed on, the threshold for consumers that can buy electricity at unregulated tariffs will potentially be reduced in the future, presumably allowing the price signal to be passed on to a much broader extent. Aligning the design of the ETS with these future policy decisions could be supported by an exchange between the ministry of energy SENER and SEMARNAT. Consider, for instance, the ministry of energy decides to further reduce the threshold for consumers that can buy electricity at unregulated prices. This decision would have an impact on electricity suppliers that are regulated under an ETS. A higher share of unregulated electricity tariffs increases the suppliers' possibilities to pass-on the price signal to the consumers, resulting in reduced compliance costs. These cost reductions for suppliers could be used to increase the ambition level of the ETS, by increasing the stringency of the cap. If, in contrast, the decision by the ministry to increase the share of deregulated prices is not taken into consideration by the ETS regulators, the opportunity to increase the ambition level of the ETS would be foregone. In order to maximize the ambition level of the ETS, the cap could be readjusted, taking account these policy decisions.

Another question is the extent to which the institutional capacities established by the CEL system and the carbon tax could be integrated when developing the future ETS. Both instruments have established strong separate institutional capacities in terms of system operation and regulation and, in the case of the CEL system, also trading. One challenge for transferring these to the ETS development process, however, is the fact that capacities are established in institutions which are not linked to SEMARNAT. Also, institutions responsible for the CEL system focus on electricity use rather than GHG emissions.

While using existing institutions for performing key administrative and regulatory tasks of the ETS does not seem a viable option, a regular exchange process between SEMARNAT and key institutions from the carbon tax and the CEL systems would help transferring experiences and capacities in order to further improve the ETS development process.

6.3.3 Technical Track: Combining Elements from the S-CEL Registry and RENE to Establish a Robust ETS Registry

A robust registry is a cornerstone of a well-functioning ETS. While RENE was in the beginning considered as a possible starting point for developing an ETS registry, it is an emissions database and therefore lacks several of the functionalities needed for an ETS registry. The S-CEL registry, in contrast, offers several of the functionalities needed: It assigns individual accounts for participating entities and processes all information about CELs in terms of issuance, ownership, transfers, and cancellation.

We consider that the S-CEL registry is the more promising starting point for an ETS registry, as several of its functionalities align with what is needed from an ETS registry. The fact that the S-CEL registry does not process data based on emissions and that it is limited to the power sector is of only limited relevance for the individual functions of the registry. There are, however, still different options for how to use the S-CEL registry in the ETS context. One possibility would be to integrate the existing S-CEL registry into the ETS, resulting in one uniform registry being used for the ETS and the CEL system. This would be particularly appealing for entities with compliance obligations under both systems. Integrating both registries could, however, increase the complexity of operations, as highlighted by one interviewee (Interview 4 2017).

In fact, using one registry for two policy instruments could make things more complex if the coverage and the point of regulation of these systems is not the same. Using the structure of the S-CEL registry as a blueprint for developing an ETS registry could therefore be the more promising option. Experiences from introducing and operating the S-CEL registry could be used for the ETS registry and the architecture and key elements of the S-CEL registry could be copied, potentially significantly reducing costs in comparison to designing the ETS registry from scratch. In order to arrive at a well-functioning ETS registry, the information currently recorded by RENE could then go into this new registry, while RENE should be maintained as an emissions database.

6.4 Achieving an Effective Policy Mix in Mexico

For a long time, the debate about national climate policy design was dominated by the mainstream economists' view of carbon pricing being a silver bullet to effectively combat climate change: The carbon price established by an emissions trading system or a carbon tax would ensure that emission reductions are achieved at the lowest possible costs and the price signal would be passed on across the value chain. In recent years, however, there is growing recognition that a price on carbon will not be sufficient to address all market failures hindering a sufficient uptake of mitigation options and that additional policy instruments are required to effectively transition towards a low carbon economy (High-Level Commission on Carbon Prices 2017). This is also a recognition of the fact that only some implementation barriers might be addressed by means of a price signal, while other policies are needed to address other barriers and achieve additional impacts, such as research and development to bring forward and deploy new technologies (Hood 2011). The recognition of the fact that a single policy instrument will not be sufficient to address the multiple policy objectives raises the question of how to best combine the different policy instruments and how to take into account the specific national circumstances during their design and operation.

In Mexico, transitioning existing policy instruments into an ETS is not being considered a viable option by most interviewees. There is, however, significant awareness about the challenges associated to the coexistence of instruments and, in particular, concerns about multiple burden have been raised. Against this backdrop, the following section will first map the Mexican policy landscape in order to show how the existing policies impact key sectors in Mexico. On that basis, we discuss options of how an ETS could be integrated into the Mexican policy landscape. Finally, options in dealing with key issues of policy overlap will be presented.

6.4.1 Mapping the Mexican Climate Policy Landscape

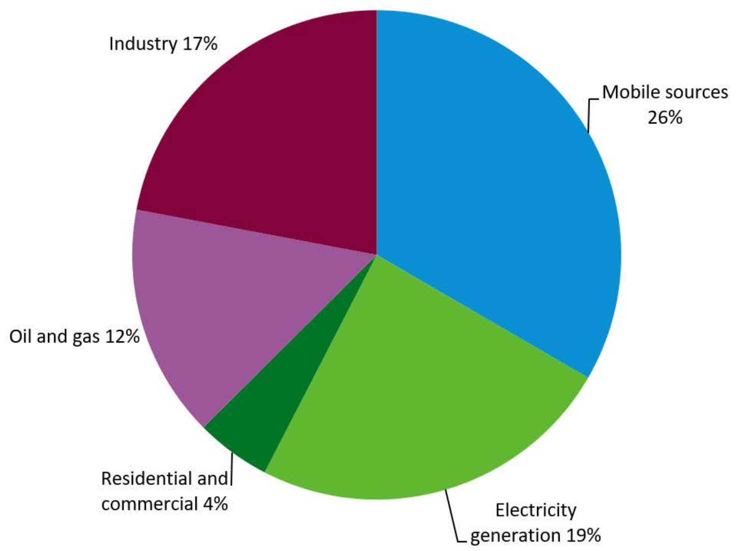
This section maps the Mexican climate policy landscape in order to assess which entities are directly or indirectly affected by the policy instruments. This will allow the identification of potential cases of multiple burden but also show where there is double provision of rewards. In doing so, the price regulation in the sectors affected is taken into account, in particular fuel subsidies and regulated electricity tariffs.

As outlined above, Mexico has only recently introduced two key policy instruments, the carbon tax and the CEL system. Both instruments are still at an early stage of development: The carbon tax entered into force in 2014 while compliance with CEL obligations will only be required from 2018 onwards. The regulatory framework for the CEL market has just been finalised and some provisions for the carbon tax are still being fine-tuned. These instruments could be further improved and adjusted for an effective coexistence with the emissions trading system.

In addition, the existing instruments are expected to provide important benefits, which would be at stake with them being replaced by an ETS. For the ministry of finance SHCP, for instance, the revenues generated by the carbon tax are of utmost importance. Therefore, SHCP favours a combination of both instruments where the carbon tax can be used as a price floor while it would continue to receive revenues from auctioning.

For the mapping exercise, individual sectors have been analysed regarding the role of existing policy instruments therein. It should be noted, though, that this mapping does not provide a basis for identifying individual companies that might be affected by multiple instruments.[25] Figure 28 below indicates the relevance of the individual sectors in terms of their contribution to national GHG emissions. Transport (26%), electricity generation (19%) and industry (17%) are the sectors with the largest share of GHG emissions in Mexico. At the same time, there is significant experience in dealing with emissions from these sectors under an ETS, which are included in many of the existing emissions trading systems: electricity generation and industry are covered by 18 out of 21 systems while emissions from transport are targeted by seven ETS (ICAP 2018a). The following analysis will therefore focus on these three sectors.

Figure 28: Distribution of Mexico's GHG emissions by sector in 2013



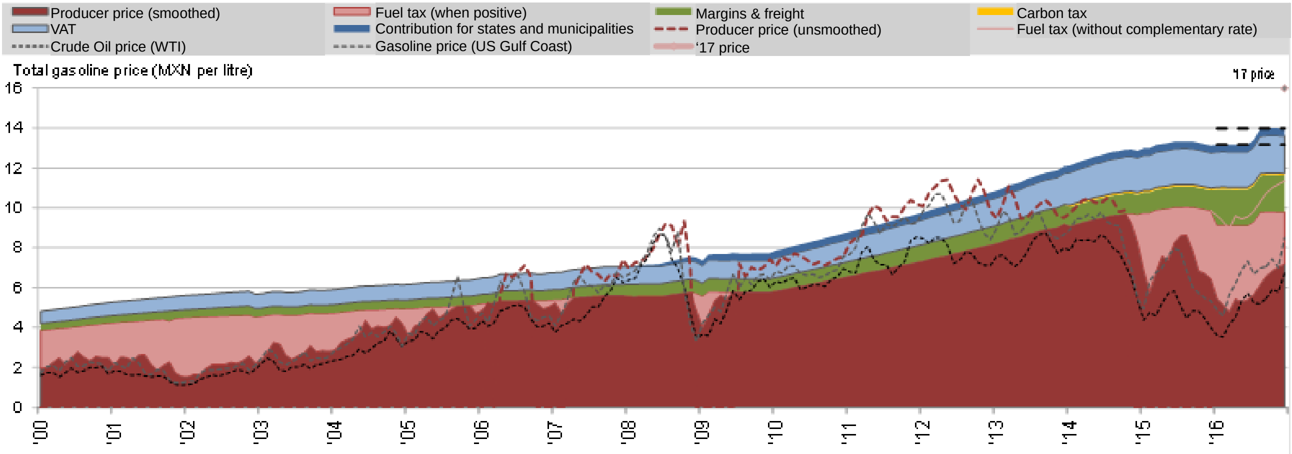
Source: Government of Mexico (2015b: 11)

Transport

With more than 170 Mt/CO_2e in 2013, the transport sector is the largest source of emissions in Mexico (Government of Mexico 2015b). Most motor vehicles are fossil-fuel driven and covered by the carbon tax which was introduced in 2014. The Mexican carbon tax is to be paid by importers and sellers of fossil fuels and the price signal is passed on to fuel users. As the example of gasoline price in Figure 29 below shows, the carbon tax does impact the final gasoline price. Due to the current low tax rates, however, this impact of the carbon tax (yellow line) on the total price for fossil fuels is at the moment minimal.

[25] The objective of identifying the impact on individual companies could be supported by an exchange process between the three line ministries SEMARNAT, SENER and SHCP and the private sector. The working group established by SEMARNAT together with the private sector could explore this issue. The results could potentially inform the definition of the scope of the ETS and how to allocate allowances (Interview 11 2017). Interviewees underscored that it will be key to involve all three ministries in this process and that the process should be centrally managed, possibly by SHCP who enjoys highest authority and has strong institutional capacities (Interview 4 2017).

Figure 29: Price composition of gasoline in Mexico



Source: Ahrlinghaus / van Dender (2017)

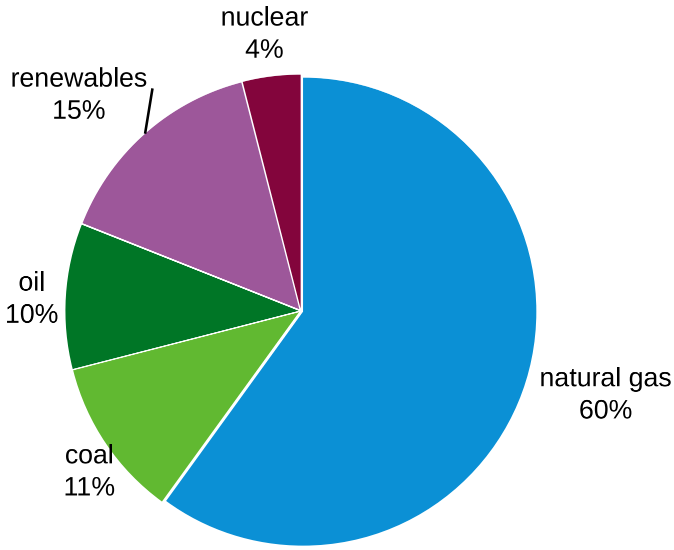
However, another tax in this sector has become more relevant over the past years. The excise tax on transport fuels applies to regular gasoline, premium gasoline and diesel for transport use. This tax was reformed in 2016. Prior to this reform, the tax was used to dampen domestic price fluctuations of gasoline and diesel in Mexico, with negative rates leading to large fossil fuel subsidies. This was a result of the interplay between the level of the domestically regulated retail price and production costs. With the modification of the tax in 2016 and the gradual deregulation of fuel prices, however, positive fuel tax rates have been achieved. With this change, the transport fuel tax has had a significant impact on the composition of transport fuel prices in Mexico, as the light red segments of the figure above show.

With regards to aviation, kerosene was exempted from the tax. This step was justified by the need to comply with international law, as ICAO requires countries not to tax fuel used in international flights. While this does not prevent the taxation of domestic flights, a taxation of domestic flights could raise legal issues, as Mexican law does not allow discrimination in the application of excise taxes to the same economic activity (G20 2017). In light of these uncertainties, taxation of aviation was disregarded.

Electricity sector

Power generation is only Mexico's second largest source of emissions (127 Mt CO_2e/yr), due to a relatively low carbon intensity. While 80% of electricity generation is based on the combustion of fossil fuels, this is predominantly natural gas, as Figure 30 below indicates.

Figure 30: Electricity generation mix



Source: Own illustration based on IEA (2017a: 131)

The Mexican carbon tax is imposed on the import and sale of fossil fuels used for combustion and could therefore potentially be highly relevant for the sector. However, around 60% of the electricity in Mexico is generated from natural gas, which is exempted from the tax. Furthermore, the carbon tax does not apply a uniform rate per tonne of CO_2 across all fossil fuels taxed. Coal is the fuel with the second largest relevance for power generation, with a share of 11%. While coal is covered by the carbon tax, its taxation per tonne of CO_2 is particularly low, lying well even below the rates per tonne of CO_2 of other fossil fuels. The rate for mineral coal is 0.72 EUR per tCO_2, while for diesel the rate is 2.30 EUR/tCO_2 (Arlinghaus / van Dender 2017). This clearly minimizes the impact of the carbon tax. Oil, the third fossil fuel used for electricity generation has a share of 10.2%. Here, the price lies at 2.22 EUR per tCO_2 (Arlinghaus / van Dender 2017). According to Arlinghaus and van Dender (2017), the effective tax rate on emissions in the electricity sector amounts to 0.75 EUR per tCO_2.

The CEL system is a policy instrument directly aimed at reducing the emissions from power generation by supporting the generation of electricity from clean energy sources. The obligation to buy CELs is mainly put on electricity suppliers and large consumers.

One key question is whether the price signal can be passed on to the final consumers or whether this is prevented by regulated consumer prices. In Mexico, electricity prices have been subject to regulation for a long time, with subsidies playing a pivotal role, in particular for residential and agricultural users. Subsidies are highly regressive, most supporting relatively rich households and farmers (G20 2017). According to an IEA study citing numbers from the state-owned electricity utility CFE, net subsidies to end users amounted to USD 37.6 billion during the time period from 2010 to 2015. In 2015, subsidies to residential and agricultural consumers amounted to USD 3.8 billion, representing around 17% of the cost (IEA 2017a). The costs of power generation decreased significantly in 2014 and 2015, reducing the cost of supply by almost 20% since 2013. However, these savings have not reduced the subsidy bill, as the savings were passed on to final consumers, reducing their tariff (IEA 2017a).

Final consumer tariffs are determined by different factors, such as the voltage of the connection, the type of usage and the region in which the user is based. Residential consumers usually pay a national tariff that is subsidized. However, households in regions with a warmer climate receive additional subsidies. Users with a particularly high consumption level are required to pay a higher tariff. The tariffs for commercial and industrial consumers were not subsidized in 2015 (IEA 2017a).

With the Electric Industry Law, the price setting process is gradually modified, allowing prices to increasingly reflect the actual costs. One first step in this direction was the application of a methodology approved by the CRE in November 2017, which was developed together with SHCP, SENER and CFE, the latter currently being the only basic service supplier. The new methodology has been applied since December 2017. The tariffs calculated by the new methodology take into account diverse factors, including the costs for transmission and distribution, the costs for the energy, capacity and also CELs (CRE 2017b). Hence, the costs for CELs are gradually being passed on to the user. At the moment, however, the application of the new methodology only impacts consumers from industry, services and commerce, representing 10% of the users receiving electricity on the basis of regulated tariffs. The remaining 90% of the users, the domestic and agricultural consumers, will not be affected by the new methodology, as their tariffs remain fully regulated (Milenio 2018). Hence, these consumers will not be impacted by the price signals of the CEL system and the carbon tax.

Electricity consumption in 2014 amounted to 257 TWh, with the largest share being consumed by industry (55.4%). Large consumers can register as qualified users, which allows them to buy electricity at non-regulated tariffs and participate in the wholesale market, either directly or through a qualified supplier. The threshold for qualified consumers was lowered in 2016 from 2 MW to 1 MW, and could be further reduced in the future. Qualified consumers receive the price signal of both the carbon tax and the CEL system, as the carbon tax impacts the costs of electricity generation in the power sector and may therefore indirectly impact the prices of the auction for electricity contracts (Martin et al. 2015).

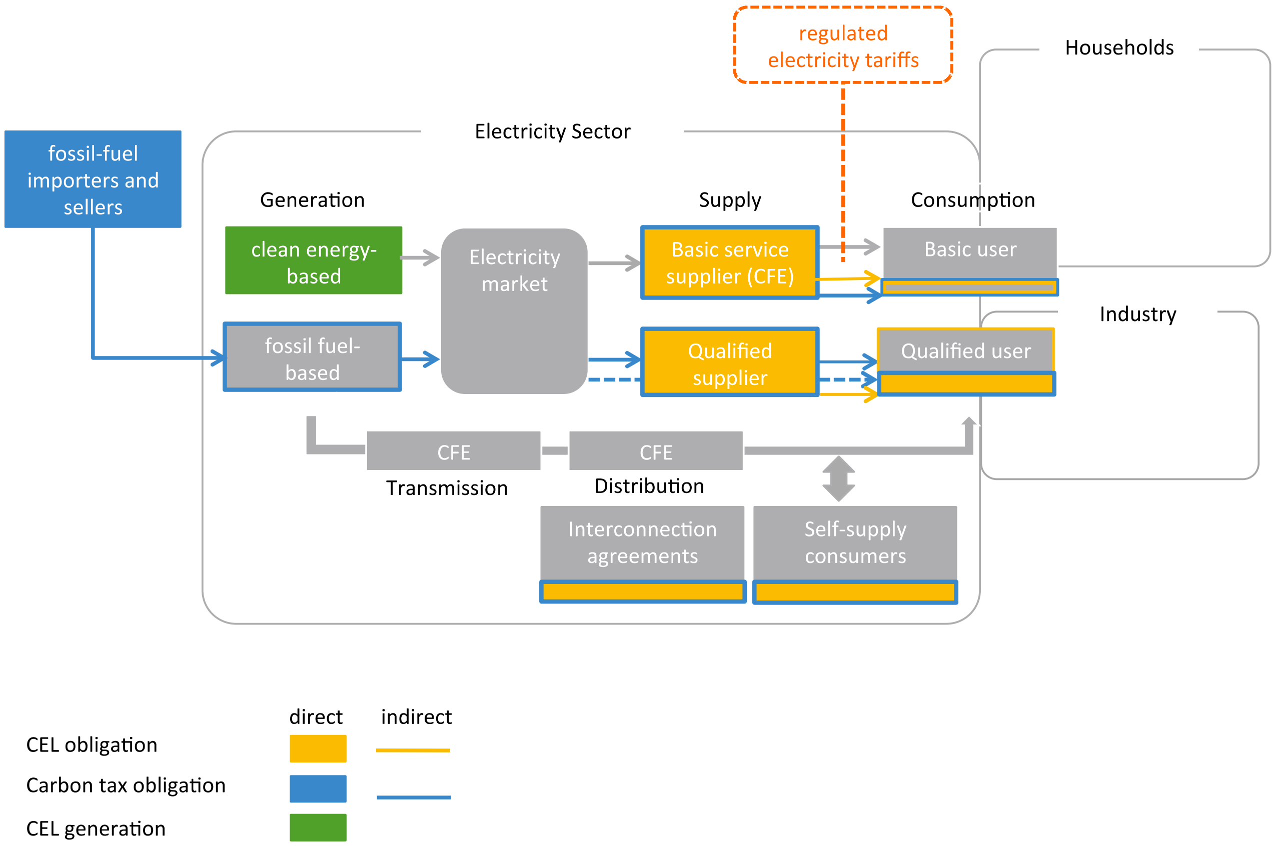
Figure 31 below illustrates how the carbon tax and the CEL system impact the electricity sector. The impacts are further summarized in Table 10.

Table 10: Impact of instruments on different entities in the electricity sector

Type of entity	Impact of carbon tax	Impact of CEL System
Fossil fuel importers and sellers	Direct/negative: has to pay carbon tax on fossil fuels imported and sold	Not affected
Power generator using fossil fuels other than natural gas	Indirect/negative: has to buy fossil fuels at a higher price	Not affected
Power generator using natural gas	Indirect/positive: benefits from natural gas exemption, has competitive advantage compared to generators using other fossil fuels	Not affected
Power generator using clean energy sources	Indirect/positive: has competitive advantage vis-à-vis generators using fossil fuel sources	Direct/ positive: has the possibility to generate CELs
Basic service supplier	Indirect/negative: has to buy electricity at a higher price due to carbon tax price signal pass-on	Direct/negative: has to buy CELs

Type of entity	Impact of carbon tax	Impact of CEL System
Qualified supplier	Indirect/negative: has to buy electricity at a higher price due to carbon tax	Direct/negative: has to buy CELs
Basic service user (industry, service and commerce)	Indirect/negative: has to buy electricity at higher price due to carbon tax	Indirect/negative: has to buy electricity at higher price due to CELs
Basic service user (house-holds, etc.)	Not affected as costs can-not be passed through	Not affected as costs cannot be passed through
Qualified user	Indirect/negative: has to buy electricity at higher price due to carbon tax	Direct/negative: has to buy CELs if directly pur-chasing electricity on the wholesale market Or Indirect/negative: has to buy electricity at higher price due to CELs

Figure 31: Impact of CEL system and the carbon tax on the electricity sector



Source: Own compilation. Note: Entities that are directly affected are marked in blue (carbon tax), yellow (CEL buyers) and green (CEL generators). The coloured lines indicate if an entity is indirectly affected by the policy instruments. The orange box indicates a barrier to the pass-on of the price signal.

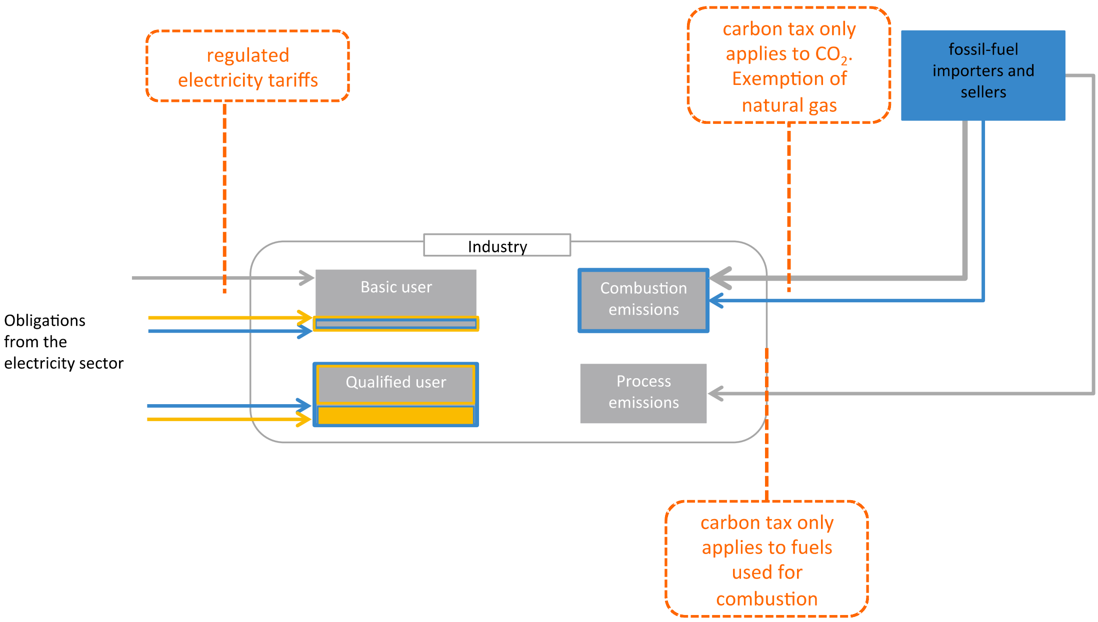
Industry

In the industry sector, large consumers of electricity are affected by both the CEL system and the carbon tax. If they are registered as qualified users and participate in the wholesale market, they have a direct obligation to buy CELs. If they participate in the market via a qualified supplier, the CEL obligation is with this supplier, who forwards the costs to the qualified consumer. Industrial consumers may also purchase their electricity on the basis of regulated tariffs. In this case, a specific price formula is applied which also takes into account the costs of purchasing CELs.

In addition to being a major consumer of electricity, industry is also a direct source of (non-electricity related) emissions. The Mexican industry is the third-largest source of GHG emissions in the country, with emissions amounting to more than 115 $MtCO_2e$ in 2013, corresponding to 17.3% of the national emissions. The larger share (9.6%) of these emissions stems from combustion processes, while 7.7% are industry process emissions (Government of Mexico 2015b).

These emissions are only partially covered by carbon pricing. First, the carbon tax only applies to CO_2, while other greenhouse gases are not taken into account. Second, natural gas is exempt from the tax. A third factor which is particularly relevant is that the carbon tax is only applied to combustion activities, while processes where fossil fuels are used but not combusted are exempt from the tax. Figure 32 illustrates how the carbon tax and the CEL system impact the Mexican industry.

Figure 32: Impact of the carbon tax and the CEL system on industry



Source: Own compilation. Note: Entities that are directly affected are marked in blue (carbon tax) and yellow (CEL buyers). The coloured lines indicate if an entity is indirectly affected by the policy instruments. The orange boxes indicate barriers to the pass-on of the price signal.

6.4.2 How to Effectively Integrate the ETS into the Mexican Climate Policy Landscape?

In the following, we will discuss how an ETS could be integrated into the Mexican policy landscape. In principle, there are three different approaches. First, Mexico could implement the ETS only in those sectors that are not directly targeted by the carbon tax and the CEL system (1), resulting in the systems not being directly connected. Second, the sectoral scope of the ETS could partially overlap with the coverage of the carbon tax and the CEL system. For this second approach, there are two different options: Coordinated coexistence and coexistence without coordination. Coordinated coexistence (2) means that the impacts of other policy instruments are taken into account during the design and operation of the instruments. Uncoordinated coexistence (3) means that such a process for adapting the policy instruments is not applied.

At the moment, the scope of the ETS has not yet been defined. However, SEMARNAT has indicated that the ETS could be focused on the energy and industrial sectors, while emissions from other sectors such as transport, waste or agriculture will presumably be reduced through different measures (ICAP 2018b). Such coverage is in line with most of the emissions trading systems established in other regions: Electricity generation is traditionally one of the key sectors of an ETS and is being covered by the majority of the systems. By the same token, industry emissions are tackled by almost all of the systems in place.[26] Therefore, a situation in which there is no overlap with the existing policy instruments seems highly unlikely. We therefore focus in the following on an ETS system covering the emissions of the electricity sector and industry, i,e, overlapping with the existing policy instruments.

6.4.2.1 Introducing an ETS in Mexico's Electricity Sector

An emissions trading system can regulate emissions in the electricity sector at different points. One possibility is to regulate emissions at the point of fuel production, import or distribution, i.e. an upstream system. Another possibility would be use the power generators as the point of regulation, i.e. a mid-stream system often referred to as the 'stack approach' (where emissions occur). A third option is to regulate electricity consumers, i.e. a downstream system.

Upstream regulation would be consistent with Mexico's carbon tax, which is imposed on the sale and import of fossil fuels. This would facilitate the process of identifying the obligated entities and facilitate monitoring. However, this would mean a double burden for importers and sellers of fossil fuels, with the exemption of gas suppliers, who are not affected by the carbon tax. It should be noted, though, that these fossil fuel importers and sellers might be able to pass on the costs. However, the number of fossil fuel importers and sellers is very limited in Mexico, and still dominated by the previously state-owned PEMEX. This could be a barrier in terms of market liquidity and transparency.

Defining electricity generators as the point of regulation could be an alternative. At the moment, fossil-fuel power generators are not directly targeted by one of the other policy instruments. However, the electricity company CFE has only recently been divided into six sub-companies. Therefore, there is a risk of market dominance that could present a barrier in terms of market transparency. Looking at the individual generators shows that an ETS that places the obligation on generators could result in a multiple reward for power generators that generate electricity from clean energy sources. Clean electricity generators are already in a competitive advantage with fossil fuel-based power generators due to the fact that they do not have to pay the carbon tax but can instead generate CELs. Introducing an ETS that targets fossil-fuel power generators would result in a third comparative advantage. This multiple reward is the result of the three policy instruments synergistically reinforcing the politically desired incentive.

Another possibility would be to focus on electricity users. Large electricity users registered as qualified consumers participating directly in the wholesale market are already required to buy CELs. In addition, they are indirectly affected by the carbon tax and must pay (slightly) higher costs for electricity. With the introduction of the ETS, these entities would be confronted with an additional (third) burden. Small electricity consumers, in contrast, purchase electricity at regulated tariffs and are therefore not affected by the price signal of the CEL system and the carbon tax. However, monitoring costs could be prohibitively high if these entities were to be defined as point of regulation.

[26] Exemptions are the Regional Greenhouse Gas Initiative (RGGI) as well as the systems in Massachusetts and China.

Hence, in light of these considerations, a mid-stream system seems to be best compatible with the design of Mexico's existing policy instrument's and the tariff structure of the power sector, which is still under partial regulation.

6.4.2.2 Introducing an ETS in Mexico's Industry

In the industrial sector, fuel combustion and industrial chemical conversion processes are key emissions sources.

Emissions from fuel combustion can be covered up- or downstream. An upstream system could build on the structure of the current carbon tax, which is imposed on the import and sale of fossil fuels. This design choice would result in a double burden for importers and sellers of fossil fuels. However, importers and sellers could pass-on the costs to actual emitters.

If a downstream approach is chosen, the system could build on RENE, the national emissions registry which requires all emitters above 25.000 tCO_2e to report their amount of GHGs emitted. RENE could assist with the identification of emitters and provide a basis in terms of monitoring, reporting and verification (MRV). A downstream approach would also be particularly well suited to cover industrial process emissions, which can only be monitored at the point of emission. Emissions from industrial processes are currently not targeted by the carbon tax, which only covers carbon emissions resulting from combustion. There would therefore be no double burden if these emissions are targeted by the ETS.

Introducing an ETS that is applied to the different types of emissions in industry could be a possibility to mitigate the design flaws of the carbon tax, namely its non-uniform tax rate, the fact that natural gas is effectively exempt from the tax as well as the exclusion of process emissions (non-energy use of fuels). This was also highlighted by an interviewee (Interview 1 2017).

6.4.3 What are the Challenges and Pitfalls of Integrating an ETS into the Mexican Policy Landscape?

6.4.3.1 Dealing with Double Burden

As outlined above, with the introduction of an ETS that has a sectoral overlap with other instruments, some companies or installations might be affected by more than one instrument, leading to a multiple burden. The prospects of being affected by a multiple burden can lead to resistance against governmental plans to introduce an ETS, as it may have distributional impacts and could become an issue of fairness and may impact competitiveness among entities covered. In Mexico, it is in particular the industrial sector that is worried about the impact of the ETS if it coexists with the carbon tax and the new CEL system. As outlined above, several entities in the Mexican electricity sector are already impacted by the CEL system and the carbon tax. It must be noted, though, that the actual impact of a double burden will depend on the entities' possibilities to pass-on costs. For instance, qualified suppliers that deliver electricity to the large users will have the possibility to pass-on costs, while those supplying households and other smaller consumers will not be able to do so, due to the regulation of tariffs (for details see Table 10 above). Policymakers should take this into consideration when dealing with private industry raising arguments of double burden. It should be noted, though, that a double or multiple burden might in some cases be required: In cases where one policy instrument is not sufficient to incentivise the desired behaviour, imposing an additional incentive (additional burden) might be needed.

The actual impact of a double burden resulting from the introduction of the ETS can be mitigated by taking into consideration the economic impacts of those other policies when designing the ETS allocation approach. The allocation process could be designed in a way that allows companies to show how their economic activities will be affected by the policy instruments in place. The process should not only take into account whether entities can pass on the price signal but also consider their exposure to international competition. Taking these issues into account is also in line with Article 94 of the reformed General Law on Climate Change, which states that the ETS will not adversely impact the competitiveness of the sectors against international markets (Cámara de Diputados 2017).

6.4.3.2 Dealing with the Waterbed Effect

Another aspect to be considered is a possible waterbed effect. The term "waterbed effect" describes a situation in which an ETS is complemented by additional instruments with emission reduction effect. Since the overall emissions level is determined by the cap of the ETS, the emission reductions achieved by the complementary instruments may only lead to a displacement of allowances to other sectors within the ETS, effectively only shifting the location and timing of emissions under the determined cap.

In Mexico, a waterbed effect could occur if there is an overlap between the future emissions trading system and the existing instruments, the CEL system and the carbon tax. Even if the emission reduction effect of the existing climate and energy policy instruments may not be significant, the impacts of possible overlaps should be taken into account during the introduction and the operation of the policy instruments.

The most promising approach in dealing with the waterbed effect is to take the interactions between policy instruments into account during the process of determining the cap. This approach would allow taking the aggregate effect of non-ETS policy instruments into account. The cap should be set at a level that ensures that a certain degree of scarcity on the market is maintained with the emission reduction of the supplementary policies. When deciding on the final cap, different cap settings should be tested taking into account a range of varying circumstances (Hood 2011).

During the operation of the ETS, the process should allow for readjusting the cap downwards to reflect emission reductions induced by the interaction of policy instruments. This would also allow policymakers to increase the ambition level of non-ETS policy instruments without having to fear that these adversely impact the price level by freeing-up allowances. The Mexican carbon tax, for instance, could in the future be strengthened by increasing the tax rates for fossil fuels, a step that was not possible during the current term of office. In order to avoid a rise of emissions from activities not affected by this policy decision, the government could voluntarily cancel or set-aside a share of the allowances, effectively avoiding the waterbed effect by lowering the cap. As this may reduce planning security of market participants, a transparent process that takes into account different future scenarios could be developed and made publicly available. Furthermore, specific moments in time for readjusting the cap could be defined.

6.4.3.3 Linking Markets and Allowing Fungibility of Units

In a scenario where different market-based instruments coexist, policymakers could decide to link the different markets, allowing a unit from one market to be used for meeting the obligations in a second one. Hence, in the Mexican case, this could mean that CELs could be used to show compliance under the ETS or that allowances could be used to comply with the CEL obligations. The picture provided by interviewees about linking is mixed. While some interviewees are sceptical about linking the two markets (Interview 5 2017; Interview 6 2017), others are in favour, for instance maintaining that allowing CELs to substitute ETS allowances (one-way linking) could be a viable option (Interview 7 2017).

In Mexico, the idea to use a unit from one instrument for compliance with another instrument has already become reality as carbon tax payers can use CDM certificates for compliance with the carbon tax. It must be noted, however, that these units are based on the same metric. In addition, the CERs will only reduce the tax payer's bill according to their current market value and they will not reduce the amount of emissions covered by the tax.

Similarly, offsetting through the use of CERs is also being discussed with regards to the obligations under the CEL system and the future ETS. In light of the large surpluses of CERs held by the private sector of presumably 1.5 million CERs per year (Interview 5 2017), there is a general hope among CER holders that they will be allowed to use their certificates in the emerging markets to offset obligations. According to one interviewee, these hopes are also fostered by government representatives, who have publicly indicated that obliged Parties will be allowed to submit CERs in order to comply with their CEL obligations (Interview 5 2017). While the current regulation does not allow the use of CERs in the CEL system and prospects are limited that such a possibility will be introduced, the private sector has also been pushing for the use of CERs in the future ETS and a proposal to establish an exchange mechanism between the CDM and the ETS was submitted to SEMARNAT (Interview 5 2017). Apparently, the endeavour was successful, as the reformed Climate Change Law states that the ETS will have to recognize mitigation activities implemented in the context of the Kyoto Protocol (DOF 2018, Transitorio Segundo).

By the same token, the reformed General Law on Climate Change states that "the future ETS must recognize emission reductions achieved through the use of clean energy certificates" (DOF 2018, Transitorio Segundo, translation by the author). The power sector strongly advocated in favour of linking these two markets and is exploring technical issues of linking the CEL system with the future ETS. Linking both instruments and allowing the use of units from one instrument to demonstrate compliance with a second one is however associated with significant risks, as will be shown in the following.

One key concern is the risk of undermining the integrity of the instruments involved: If the unit from one scheme is used to show compliance with the obligations under a second one, the credibility and effectiveness of the latter could be reduced. In the case of Mexico, this risk is particularly evident if ETS permits would be used for the achievement of CEL obligations: As ETS permits are not associated with the generation of clean energy, the incentive of the CEL system will be reduced and its overall objective might not be achieved. Likewise, the integrity of the ETS could be undermined if CELs are used for compliance under the ETS as the climate change mitigation contribution of individual CELs may vary, depending on the technology used for their generation and depending on the emission intensity of the (fossil fuel) electricity replaced by clean energy (see also: Martin 2018).

Another argument against allowing CELs to be used for compliance under the ETS is limited compatibility of the future Mexican ETS: Since emissions trading systems to which the Mexican ETS could be linked in the future do not allow energy certificates to be used for compliance, this could be barrier to ETS linking. This is also recognised by some of the proponents of linking the ETS with the CEL system (Interview 5 2017).

6.5 Key findings on Mexico

Contribution of Existing Policy Instruments to ETS Development

The case study's findings indicate that existing policy instruments - the carbon tax and the clean energy certificates (CEL) trading scheme - could provide significant support to the ETS development process in Mexico. With its trading component, the CEL system can deliver a particularly strong contribution providing critical political experience and institutional knowledge relevant for establishing some of the ETS building blocks, notably cap setting and market. In terms of technical preconditions for the ETS development the CEL system can deliver relevant sectoral data and provide a registry which aligns with several of the functions needed under an ETS. With 2018 being the first compliance year, however, no assessment of the implementation of the CEL system can yet be made. The carbon tax, in contrast, is already in place since 2014: Its contributions to the ETS development process, however, are much more limited and are further dependent on whether an upstream ETS is being considered. If an upstream ETS was put in place, the carbon tax could inform the scope of the ETS and its monitoring, reporting and verification (MRV) system, since the point of regulation would coincide. One peculiarity of the tax is its offsetting component which could inform the development of an ETS offsetting component once more experience with this element has been made. The rules for implementing this offsetting option have just been published in December 2017 and it remains to be seen how they will be applied.

The Political Process of ETS Introduction in Mexico

In political terms, the process of establishing an ETS is significantly advanced: Interviewees generally concurred in that it is not about whether Mexico will have an ETS or not, but that it is rather a question of when. This latter question was addressed with the recent reform of the General Law on Climate Change, which envisages the mandatory ETS to be preceded by a pilot ETS with no economic impact on its participants that will run for 36 month. The preliminary rules for the pilot ETS must be published by May 2019 the latest (DOF 2018, Transitorio segundo). Hence, the mandatory ETS will enter into force in May 2022 the latest. SEMARNAT had originally intended to start the pilot ETS in the third quarter of 2018 (SEMARNAT 2018), allowing the mandatory phase to begin in 2021 in line with the entry into operation of the Paris Agreement (SEMARNAT 2017b). According to recent reports, however, the development of the ETS has slowed, with the launch of the pilot system now being expected for early 2019 (Carbon Pulse 2018).

In general, there seems to be considerable political support for establishing an ETS within the executive branch: Neither SHCP nor SENER are opposing the introduction of the ETS and former president Peña Nieto participated in the Carbon Pricing Leadership Coalition expressing his support (Interview 11 2017). On the occasion of the One Planet Summit held in Paris in December 2017, Enrique Peña Nieto together with the government leaders from Canada, Chile, Colombia and Costa Rica and subnational governments in the US and Canada launched the Carbon Pricing in the Americas cooperative framework. In their joint declaration, these governments commit to implement carbon pricing as a central policy for ambitious climate change action and strengthen international and regional cooperation in the field (Carbon Pricing in the Americas 2017).

For a long time, support within the legislative branch, in contrast, was less clear. The recent adoption of the reform to the General Climate Change Law (LGCC) by the Mexican Congress, however, can be considered a clear indicator of the strong support from the legislative branch and across political parties: The reformed LGCC provides SEMARNAT with a mandate to establish a mandatory ETS and to introduce a pilot system which will run for three years.

Advancing Mexico's ETS Development Process

In the process of developing the ETS, SEMARNAT is engaging with the private sector and has established a working group to discuss design issues of the ETS. In general, the position among the private sector is somewhat diverse: While there is some strong opposition from a part of the private sector, others clearly support the process. The majority seems to have adopted a wait and see approach: While they are at the moment not actively opposing, they are potentially playing for time. In this regard, one interviewee cited a Mexican mariachi song which says: "Say yes to all of them but don't tell them when".[27] From the experiences made with the carbon tax, this situation could entail the risk of the instrument as such being introduced but becoming a toothless tiger. This calls for design processes that are built on robust research and involves all political branches concerned.

In order to deal with the opposition from the private sector, strong inter-ministerial cooperation and an intense stakeholder engagement process with non-governmental stakeholders will be key. These

[27] Translation by the author. The original text is: "A todos diles que sí pero no le digas cuando". Source: La Hija del Mariachi: Negrita de mis Pesares. Available online at: https://www.youtube.com/watch?v=ypAt3Wdj9k4

processes should be institutionalised building on existing structures by establishing an inter-ministerial emissions trading group.

During the design and operation of the ETS, the ongoing energy reform process must be taken into account as not only the current structure of the energy sector but also future reform decisions therein could significantly impact the functioning of the ETS. Here again, a strong cooperation between line ministries will be crucial to align the reform process with the introduction and operation of the ETS. An intense communication process involving also staff on the working level would help to make the best use of the institutional capacities established with the carbon tax and the CEL system.

When developing the ETS registry, elements of the existing structures should be smartly combined. While the S-CEL registry could provide the structure for performing key registry functions, RENE could deliver the emissions data.

Achieving an Effective Policy Mix in Mexico

The introduction of the ETS should not be used as an argument for the discontinuation of existing policy instruments. Instead, existing (and future) instruments can be smartly combined to address the different market failures preventing the transition towards a low carbon economy. Analysis of existing policy instruments' impact on key sectors shows that that there are cases of entities being affected by multiple instruments (multiple burden) while certain activities are not covered by carbon pricing yet (i.e. carbon pricing gaps for natural gas and process emissions).

Operating an ETS alongside other policy instruments may increase the cases of multiple burden and double rewarding. While these effects must be taken into consideration during the design and operation of the instruments it should be noted that being impacted by more than one instrument is not problematic per se but that it may be necessary in cases where one (low) incentive of one instrument turns out to be insufficient to trigger the desired behaviour. In addition, the introduction of an ETS could assist in bridging some of the current carbon pricing gaps in Mexico.

7 Case Study India

The structure of the case study on India is similar to the Mexico one: we first summarise the general climate policy framework in India under consideration of the general political and economic context (section 7.1), then analyse in section 7.2 the relevant climate policy instruments in India, and afterwards contemplate on key issues of the Indian ETS development process (section 7.3). Section 7.4 then looks at challenges and pitfalls of integrating an ETS into the Indian climate policy landscape, and section 7.5 summarises the key findings.

7.1 Climate Policy Framework in India

India has been an increasingly influential actor in the international negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) over the recent years due to becoming one of the fastest growing economies worldwide, and playing a leadership role in the G77 and the BASIC group[28] especially since 2009. As the world's most populous country, India is in a paradoxical situation: while in absolute terms it is the largest emitter of greenhouse gases after China and the US[29], on a per capita basis it ranks among the lowest emitters world-wide. Current per capita GHG emissions are ten times lower than those of the U.S. (Panagariya 2016), and so is the per capita GDP. This is why India frequently refers to the principle of common but differentiated responsibilities (CBDR).

Being one of the most vulnerable nations to the impacts of climate change, India has a significant stake in a successful outcome of international mitigation policy. Given India's development needs, the government has always made it clear that climate action is subordinate to social and economic development, including poverty reduction. The country houses 24% of the global population without access to electricity (over 300 million people), approximately 30% of the global population relying on solid biomass for cooking and 90 million people that lack access to clean water (Government of India 2015). However, the willingness of the Indian government to implement measures that promote meaningful outcomes and its awareness for India's own role in successful mitigation action has increased in recent years. This has been facilitated by the rapid cost reductions in renewable energy technologies, which have made it possible to better align development aspirations and climate actions.

In line with a policy driven by local priorities rather than international climate diplomacy, India has deliberately developed policy instruments that do not address GHG emissions directly. In the last five years, innovative white and green certificate trading schemes and a coal tax have been introduced (see detailed descriptions in section 2 below), but none of them refers to GHG emissions. Also the country's Nationally Determined Contribution (NDC) under the Paris Agreement does not specify an absolute GHG emissions target but only an intensity target.

Until today, discussions on implementing a domestic Emissions Trading System (ETS) for India have not fallen on fertile grounds. A recent announcement from the Ministry for Environment, Forest and Climate Change (MoEFCC), however, may indicate an increasing political willingness to promote a domestic ETS (CarbonPulse 2017). Environment Minister Dr. Harsh Vardhan stated that India is planning a voluntary carbon market with assistance from the World Bank that focuses on sectors not yet covered by existing policy instruments. Under the World Bank's Partnership for Market Readiness (PMR), India has published a Market Readiness Proposal (MRP) in February 2017. The PMR lays out the required preparatory policy work needed to implement market based mechanisms, as well as required background work such as the development of a meta-registry. It also explores the potential for linking of existing and new market mechanisms. Procurement notices from the World Bank to start this work have been released in September 2017 and the proposal evaluation phase has started (WB 2017b).

[28] Brazil, South Africa, India and China

[29] Projections suggest that India will contribute 6% of global emissions by 2020 (Elzen et al. 2012).

The World Bank is eager to finalize the PMR project before the end of 2020, but the upcoming national election in 2019 makes it unlikely that relevant decisions regarding new policy instruments will be taken during that period.

7.1.1 NDC Overview

India ratified the Paris Agreement one year after submission of its (I)NDC in October 2015. Three of the eight goals of India's NDC (Government of India 2015) are quantified, while five are of a qualitative nature. The key goal of the country's NDC is to reduce emission intensity per unit of GDP by 33-35% below 2005 levels by 2030. In contrast to absolute GHG emission targets, the intensity target specifies GHG emission reductions relative to India's economic output. An absolute emission target can be approximately derived from the intensity target, assuming a 7.2% annual GDP growth rate (Climate Action Tracker 2017). India's emissions would then reach around 6 GtCO2e by 2030 excluding LULUCF[30], which is an increase from 1990 levels by approximately 6 times. Moreover, the NDC sets out to increase the share of "non-fossil fuel based" energy to 40% of installed electric power capacity and to create an additional carbon sink of 2.5–3 GtCO2e through afforestation by 2030 (Government of India 2015).

According to observer assessments, India's ambition as laid out in its NDC is moderate. Considering that India's emission intensity already declined by 18% between 1990 and 2005, and that existing commitments aim to reduce it by another 20-25% from 2005 levels by 2020, the new NDC emission intensity target of 33-35% by 2030 does not appear overly ambitious. Unlike China, the country has not yet specified a peaking year for its GHG emissions. Nevertheless, the Climate Action Tracker regards India´s target as compatible with the 2°C goal, which is partly based on the fact that the non-fossil energy target implies more mitigation than the emission intensity target (Climate Action Tracker 2017).

For meeting the targets specified in its NDC, India expects massive external financial support. A first cost estimate for the conditional elements of the NDC ranges around USD 2.5 trillion in total until 2030. At COP 21 and on several other occasions, Prime Minister Modi has clearly stated that India will not be able to achieve its NDC without significant financial support. India has always expected those countries that caused climate change to take major responsibility (Eibinger 2016).

7.1.2 Overview of Relevant Climate Policy Instruments

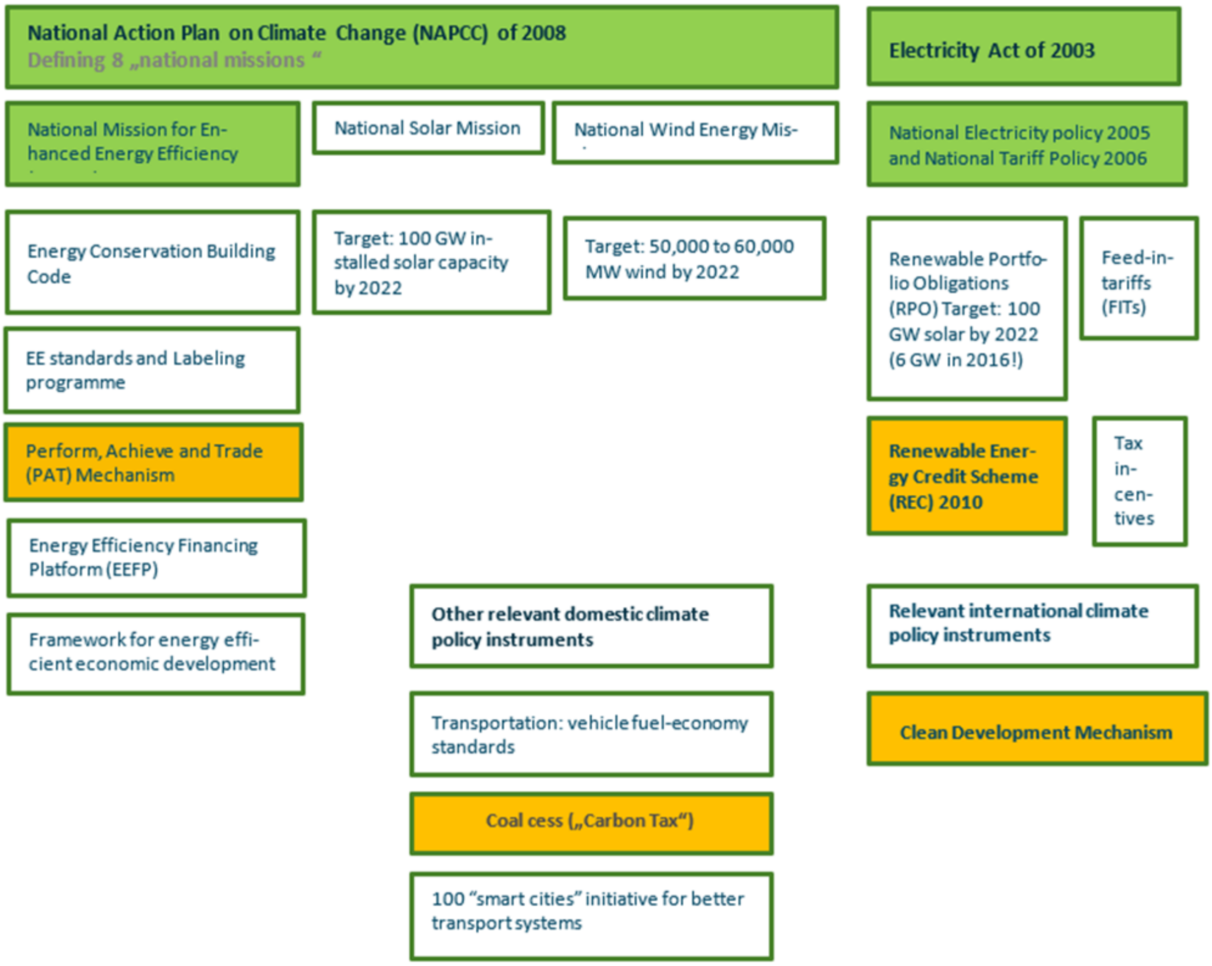
India has established a number of energy and climate policies. This case study only looks at those that are considered most relevant in the context of ETS implementation. Figure 33 displays the most relevant policy acts and strategies as well as their instruments (instruments that are selected in this case study are marked in red).

The National Plan on Climate Change (NAPCC) was adopted in 2008 and covers "eight national missions". Examples of relevant missions are the National Solar Mission, the National Mission for Enhanced Energy Efficiency (NMEEE), and the National Mission for a Green India. Launched in 2010, the NMEEE aims to achieve electricity and fuel savings. Certain NMEEE programmes have been hugely successful such as Ujala, a programme that provided 150 million lightbulb-replacing LEDs to households within less than three years, while others have been a failure (Ebinger 2016). Other policy examples are the Energy Conservation Building Code that stipulates building requirements at the central government level, as well as the Perform, Achieve and Trade (PAT) Mechanism, a market-based energy

[30] Land Use, Land Use Change and Forestry

efficiency (white) certificate mechanism that covers large fossil fuel consuming companies from energy intensive sectors.

Figure 33: Landscape of relevant policy instruments in India



Source: Own illustration

The Electricity Act of 2003 provides the basis for several renewable energy policy instruments. The act was complemented by the National Electricity Policy in 2005 and the National Tariff Policy in 2006. The National Tariff Policy set out Renewable Purchase Obligation (RPO) targets of 0.25% and 3% by 2013 and 2022, respectively. These RPOs require obligated entities, mostly distribution companies, to source a certain share of their total distributed power from renewable energy. The 2022 target of the National Solar Mission entails an installed solar capacity of 100 GW by 2022, which is a fairly ambitious undertaking given an installed solar capacity of 5.8 GW in India for 2016 (WRI 2017), and a total global installed capacity of 227 GW in 2016 (World Energy Council 2017; LSE 2017). In 2010, the central government launched a trading system for Renewable Energy Certificates (RECs). This allows companies to fulfil their RPO by buying RECs or to generate additional revenues in case of a REC surplus.

In the same year, India also introduced a tax on domestically produced and imported coal (formally called "Clean Environment Cess", informally "coal cess [31]"). Initially, the revenues from this tax were earmarked for the National Clean Energy Fund (NCEF) in order to promote clean energy initiatives and research, but since 2016 the proceeds go to the general budget. This tax has been raised from an initial level of INR 50 (USD 0.75) to INR 200 (USD 3) per t in 2015 and to INR 400 (USD 6) per t in 2016 (LSE 2017; Chaturvedi 2016).

In the context of participation in the international market for GHG emissions credits, India had a remarkable success in tapping resources from the Clean Development Mechanism (CDM). With 1991 out of a total of 8439 individual CDM projects, almost one quarter of the entire CDM portfolio is located in India. The country ranks second with regard to programmatic activities, since 37 Programmes of Activity (PoAs) with 176 Component Project Activities (CPA) have been registered in India (UNEP DTU 2017a; UNEP DTU 2017b).

Finally, it should be mentioned that India undertook initial steps to pilot an emission trading scheme, albeit only for SO2 and NOx and not for GHGs. The State Pollution Control Boards (SPCB) of Gujarat, Tamil Nadu and Maharashtra formally launched it in early 2011 in cooperation with the Ministry of Environment, Forest and Climate Change (MOEFCC) and the Central Pollution Control Board (CPCB). SPCBs were to determine which pollutants will need to be regulated for industrial facilities based on the overall pollutant concentration, and to distribute emission permits to covered facilities. However, as the World Bank (2017) reports, this did not happen until now. Whether the schemes ever materialize remains to be seen.

7.2 Analysis of Relevant Climate Policy Instruments

This section analyses PAT, REC, the coal cess and the CDM with regard to their contributions to ETS implementation, gaps and barriers for the transition to an ETS, as well as the potential for co-existence.

7.2.1 Perform, Achieve & Trade Scheme (PAT)

The PAT is a market-based mechanism with the aim to reduce the Specific Energy Consumption (SEC) of energy intensive industries. The SEC target is defined for each company on the basis of its past energy consumption. If the company exceeds its target (i.e. over-performs), it receives Energy Saving Certificates (ESCerts) for the excess savings achieved, which can be sold on the market. If it fails to meet its target, it needs to buy ESCerts from the market. Over-achievers and under-achievers can trade through specific energy exchanges in order to comply with the scheme. Non-compliance (after trading) initiates a penalty process. Although white certificate schemes had already been tested in Italy (see chapter 8.2.3), France and the UK, the PAT scheme was the first one that focusses on a broad range of industrial sectors instead of electricity and gas suppliers as regulated entities (Bhandari et al. 2017).

7.2.1.1 Policy Instrument Introduction and State of Play

PAT has its roots in the Energy Conservation Act of 2001, which stipulates energy efficiency measures in 15 energy intensive sectors. Of these 15 sectors, the following eight are covered by PAT: thermal power, iron and steel, cement, fertilizers, textiles, aluminium, pulp and paper and chlor-alkali. Established under the Energy Conservation Act, the Bureau of Energy Efficiency (BEE) is the administrative

[31] Emanating from the colonial times the term "cess" is common in India and refers to a tax. Usually it is used with a qualifying prefix (education cess, irrigation cess, etc.)

entity responsible for PAT and energy efficiency improvements in general. Other stakeholders and their roles are shown in Table 11.

Table 11: Stakeholders under the PAT scheme

Stakeholder	Role
Ministry of power	Oversee electricity production and act as inter-mediary between the Central Government and State Electricity Boards
Bureau of energy efficiency	Regulate the PAT scheme
Energy efficiency services Ltd (state owned company)	Approve Auditors and Set DC Targets
Designated consumers	Obliged Entities required to achieve PAT targets
Accredited designated independ-ent energy auditors	Monitor the PAT scheme; verify ESCerts
IEX & PXIE	Establish and operate the Trading Platform for ESCerts

Source: IEX (2017a)

Following the process described below, energy efficiency baselines and targets have been assigned to a total of 478 companies in the first cycle (2012 – 2015), which cover 36% of India's total energy consumption (2009-10 levels; BEE 2017). A company is only required to participate in PAT if it exceeds the sector-specific minimum annual energy threshold shown in Table 12.

Table 12: Designated consumers (DC) of each sector in cycle 1 (2012-2015)

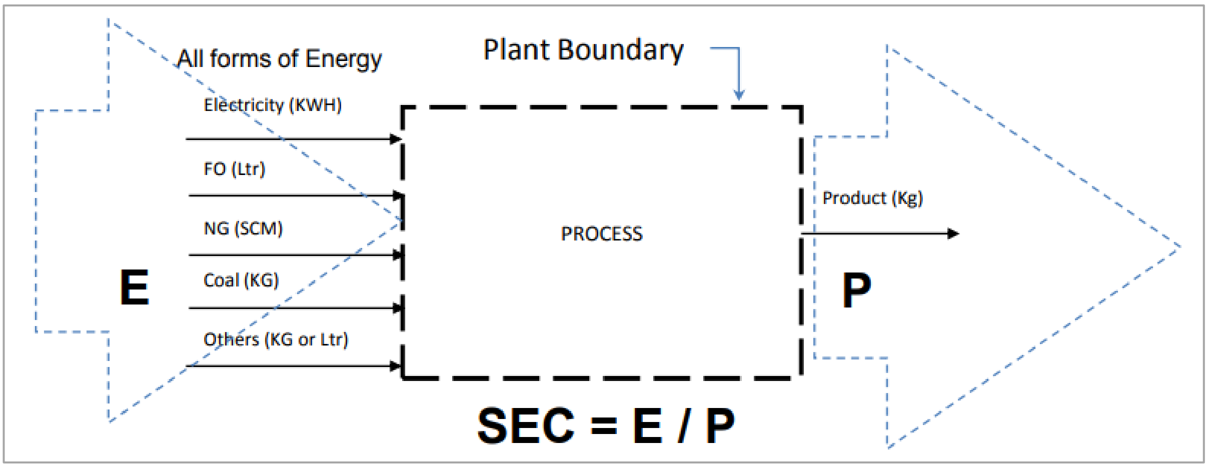
Sector	Minimum annual energy threshold [toe]	No. of DCs within sector	Total energy savings [million toe]
Aluminum	7,500	10	0.456
Cement	30,000	85	0.816
Chlor alkali	12,000	22	0.054
Fertilizer	30,000	29	0.478
Iron and steel	30,000	67	1.486
Pulp and paper	30,000	31	0.119
Textile	3,000	90	0.066
Thermal power plant	30,000	144	3.211
Total		**478**	**6.686**

Source: Adapted from Bhandari and Shrimali (2017)

A company covered by PAT is termed "Designated Consumer" (DC) and publicly declared as such by the BEE every year. Every DC has its own energy saving target. As shown in Table 12, the expected total saving of the scheme over the course of the first cycle (2012 – 2015) is 6.686 Mtoe.

Energy efficiency targets for entities are calculated on the basis of the so-called gate-to-gate Specific Energy Consumption (SEC). The gate-to-gate SEC is defined as net energy use within the plant boundary (energy going into the plant) divided by the total quantity of output exported from the plant boundary (see Figure 34). Energy that is going into the plant boundary includes gaseous, liquid and solid fuels as well as electricity. All energy inputs are converted into tons of oil equivalent (toe) to standardize the metric for energy efficiency calculations. Residential energy consumption, mining operations, transportation and construction are not considered in the calculation of the SEC.

Figure 34: Schematic explanation of Specific Energy Consumption (SEC)



Source: BEE (2017)

Targets under the PAT scheme are assigned top-down, based on different factors. In a first step, the total energy saving target of PAT is allocated to each sector proportionally to its energy consumption. If a sector for instance consumed 10% of the total energy of the eight sectors covered under PAT cycle-I, a proportional reduction target of 0.668 Mtoe would be assigned to that sector (10% of 6,686 Mtoe). In a next step, these sectoral targets are again broken down to sub-sectoral targets in a proportional manner, based on the industrial processes applied. The aluminium sector for instance divides into the smelter and refinery sub sectors, while the textile sector would be broken down into processing/spinning/composite or fisec (Bhandari and Shrimali, 2017). Annex B contains a list of these subsectors.

Finally, targets are calculated based on plant-level SEC baselines. Each DC is a specific facility (plant)[32] with its own assigned target, which is defined as a percentage reduction from its corresponding baseline. The SEC of the period April 2007 to March 2010 has been used to calculate DC-specific baselines.[33] However, every DC is benchmarked against the best performing DC in order to avoid penalizing already strong performance. The formula below quantifies the individual DC target, where X% represents the targeted SEC reduction of the best performing DC within the sub sector (Bhandari and Shrimali, 2017):

$$(1)\ Plant\ target\ (\%) = \frac{Plant\ SEC}{Best\ SEC} * X\%$$

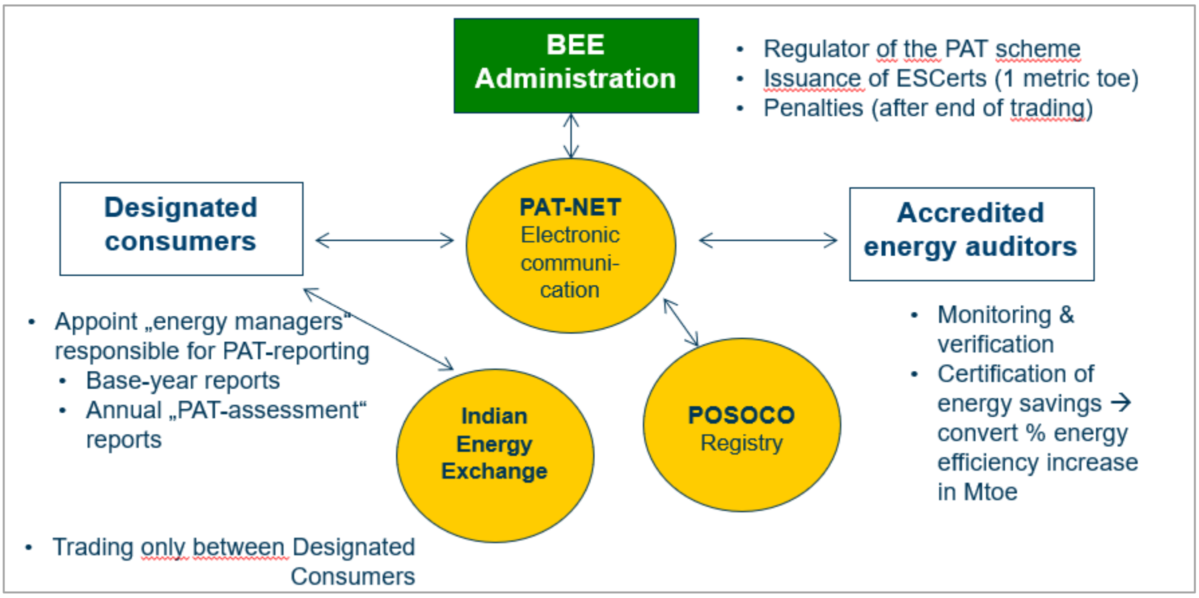
The lower the performance of a DC compared to the best performing DC, the stricter its target will be. Targets are expected to become more stringent in the subsequent cycles of the scheme. However, given the limited publicly available information, this process is not transparent at the moment.

DCs must submit annual "PAT assessment documents" during the compliance period that contain information on the DCs energy consumption. Each DC needs to appoint an energy manager who submits PAT assessment documents. Accredited designated independent energy auditors are monitoring and verifying a DC's potential energy savings. The verification is done at the end of a compliance period. After positive recommendation from the designated energy auditors, certification of energy savings is completed after the end of the first cycle period. This is necessary for the issuance of tradable ESCerts.

[32] No information was available regarding the rules for several plants that are operated at the same site, or a plant that consists of several sub-plants.
[33] The DC is the obligated reporting entity (company) but it can have various plants.

Figure 35 illustrates the interactions between involved PAT stakeholders and provides an overview over their main responsibilities.

Figure 35: Interaction of different stakeholders and their responsibilities



Source: Author's illustration

Every cycle of PAT has a duration of three years. If an entity over-performs on the SEC target over the course of the three year compliance period, it is allowed to sell the surplus to another entity who failed to meet its target. For example, if a company achieves a 4% SEC reduction against the target of 3%, it will be awarded ESCerts (in toe) for the additional 1% achievement. One ESCert corresponds to 1 metric toe. Selling and buying is enabled by the regulated Indian Energy Exchange (IEX) and Power Exchange India (PXIL). A publicly available electronic database of tradable permits is maintained. Communication between all relevant actors (DCs, BEE and designated auditors) is taking place on an electronic platform called PAT-NET. As market regulator and administrator, BEE is responsible for issuance of certificates depending on the level of achievement of a DC's target. ESCert trading is taking place between DCs to whom ESCerts have been issued (sellers) and DCs who have been entitled/obliged to purchase ESCerts (buyers). Trading can only take place through the energy exchanges and not over-the-counter (OTC) or directly between two DCs. Only covered DCs are eligible for trading. The price determination in this process takes place through double-sided closed auctions and is calculated by exchanges[34]. Since every ESCert has a lifetime of two PAT cycles, banking of certificates is possible to a limited extent: ESCerts generated in PAT-cycle 1 can be used until the end of PAT-cycle 2 (IEX 2017b).

In March 2015, the first cycle of PAT has been completed. In total, energy savings of 8.67 Mtoe have been observed after cycle 1 which is 30% above the target of 6.686 Mtoe. According to the BEE, this first phase resulted in emission reductions of 31 million t CO2eq and savings of INR 9500 crores[35]

[34] In a double sided closed auction seller and buyer DCs place sealed bids and the exchange determines the market clearing price. Afterwards, the financial settlement takes place through the exchange and the ESCerts are transferred online. In this context the auctioning process is part of the trading and does not precede it. After ESCert purchase no resale is possible, which is why "auctioning" has a slightly different meaning than in the context of the EU ETS.

[35] 1 crore = 10 million

(approximately USD 1.4 billion) (BEE 2017). However, it must be noted that this is a reduction against a baseline that allows for production increase.

Trading commenced for the first time on 26 September 2017. Subsequent trading sessions had been envisaged to take place every Tuesday until 31 December 2017. However, the compliance deadline was extended to 19 January 2018 (BEE 2018). DCs that are unable to meet their target are subject to financial penalties. In the near future, the BEE will check the accounts of entities and assess the achievements after trading in order to initiate the penalty process where necessary.

According to the IEX, 1,298,904 ESCerts have been traded until the end of the first trading cycle, i.e. until January 2018 (see Table 13). While the price started at INR 1200 per ESCert (approximately 18 USD), it dropped by 80% to INR 200 per ESCert over the course of the subsequent eight trading days. Lately, prices gradually increased to up to INR 1000 again. Also, the number of participants who engaged in trading has continuously risen over the last trading days, indicating that an increasing number of entities intends purchasing certificates before the compliance deadline of 31 December 2017 (IEX 2018).

Table 13: Trading results PAT cycle 1 as of January 2018

Day	Sell Bid	Purchase Bid	Trade Volume	Price Discovered	No. of
	(ESCerts)	(ESCerts)	(ESCerts)	(Rs/ESCert)	Participants
26.09.2017	239,644	50,904	10,904	1200	39
03.10.2017	236,031	51,925	23,295	1200	40
10.10.2017	348,587	64,459	43,078	1000	52
17.10.2017	381,443	40,538	40,148	800	45
24.10.2017	349,806	42,271	41,455	600	52
31.10.2017	383,379	21,037	19,359	500	51
07.11.2017	436,394	11,521	10,351	350	61
14.11.2017	319,810	12,241	12,125	200	45
21.11.2017	336,121	10,963	7,513	200	53
28.11.2017	368,361	117,514	36,580	250	64
05.12.2017	355,226	262,331	46,928	350	73
12.12.2017	433,769	495,553	123,520	525	85
19.12.2017	831,224	730,885	449,818	1000	112
26.12.2017	1094,568	365,980	220,791	899	126
02.01.2018	777,567	145,150	28,983	500	78
09.01.2018	824,707	152,195	74,895	501	79
16.01.2018	894,445	110,511	109,161	450	81
Total			**1,298,904**		

Source: IEX (2018)

In total, ca. 3.85 million ESCerts have been issued to 306 entities that achieved their targets compared to 1.45 million ESCerts that need to be bought by 110 entities to meet their shortfall. With the current volume of 1,298,904ESCerts as of July 2018 about 90% of the required ESCerts have been bought by

DCs that missed their targets. This indicates that penalties will need to be assigned and enforced if the final trading days do not show significant further trading by DCs.

Under PAT, energy saving targets are assigned to DCs for a three year cycle. The first cycle – for which we showed the first trading results in Table 12 - was running from 2012 – 2015. PAT cycle II has started in 2016 and will last until 2019. Cycle II is expanded to cover 143 additional entities in the existing sectors and in three additional sectors (refinery, distribution companies and railway). In the future, PAT will be implemented on a "rolling basis", meaning that new DCs can be included every year. Therefore, PAT cycle III will run from 2017 to 2020, covering 116 additional entities. PAT cycle IV will run from 2018 – 2021 etc. ESCerts issued in one cycle remain valid until the compliance period of the next cycle. The demand/supply-ratio of ESCerts is expected to increase to 1 in the future because of more stringent targets in the coming PAT cycles. The yearly increase of ambition level is around 2-3% (Interview 12).

In theory, non-compliance with PAT requirements would lead to penalties as set out by the Energy Conservation Act (Government of India 2001). The act specifies that a penalty should not exceed INR 1 million (~USD 15,400)[36] plus an additional charge of the market price of every toe of energy that a DC would have been obliged to purchase in form of ESCerts (BEE 2016a). The BEE estimates the price of a toe at USD 200 and has the right to recalculate and determine the financial value of one toe.[37] Thus, the current penalty is ~USD 15,400 plus USD 200 per toe (Bhandari and Shrimali, 2017). However, interviewees highlighted that the PAT mechanism is not expected to show significant non-compliance due to three reasons: 1) Moderate stringency of cycle-I targets, 2) awareness for the importance of energy efficiency in the Indian power context, and 3) strong stakeholder engagement and information dissemination. According to different interviewees, the cycle-I targets are easy to achieve by harvesting the 'low hanging fruits' of EE improvement. Having moderate targets in the beginning of a new mechanism is sensible when participation and awareness among participants is the key goal. Increased stringency in subsequent PAT cycles will put the spotlight on the enforcement mechanism. Finally, the PAT mechanism has been developed for over 7 years in total. Throughout the entire development process there have been numerous stakeholder consultations and workshops with entities from public and private sectors. This strong emphasis on engaging the involved entities on design issues of the mechanism is expected to ensure high compliance rates (Interview 7 and 12).

7.2.1.2 Potential Contributions to ETS Building Blocks

The PAT mechanism is perceived as a successful mechanism by the interviewees, because participation of the covered industries was very high and a significant number of entities have met their target. Although several stakeholders expressed their concerns that the targets of PAT cycle-I were too low, many interviewees dismissed that overly ambitious efficiency gains were the primary goal of the PAT in its first phase. The goal was rather to test whether the underlying processes result in a functioning mechanism. "The critical aspect of every Indian policy instrument is always to make the stakeholders aware about it in a first phase and make them participate" (Interview 5). Given the successful first trades between September 2017 and January 2018, the mechanism's underlying infrastructure has proven to work. This could not be taken for granted since there is no precedence of a white certificate trading mechanism with comparable coverage anywhere else in the world. The experience gained with setting up this mechanism could be valuable for any future market-based instrument.

Considering the preconditions defined in the methodological discussion in work package 1, white certificate schemes were rated as 2nd out of 7 regarding the preconditions for establishing emissions trading in a country. The PAT scheme is well advanced in terms of the policy, legal/institutional and technical dimension: Benchmark methodologies were developed and the required data were collected

[36] INR/USD exchange rates as of 12 December 2017
[37] Currently the BEE has been calculating the price of 200 USD/ toe on the basis of the average cost of energy across all DCs (Bhandari and Shrimali, 2017)

and used in target-setting, multiple stakeholder consultations were held and IT-infrastructure, registries and trading markets were set up. All this could directly inform the process of setting up an ETS (Interview 2 & 9). In the following, the PAT mechanism's contributions to the individual core building blocks of an ETS are summarized.

Table 14: PAT contribution to core building blocks

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
Cap	+	► Based on the data reported by covered entities between 2005 and 2009, sector wide SEC baselines and targets have been calculated (**technical track**). PAT spent significant effort to develop baselines and targets for entities of different sectors and the experience with that process could be useful to determine the ETS cap. This can be valuable especially because there has not been a study yet that assesses what the sectoral targets could be; at the moment there is only the broad NDC target (**political and technical tracks**). The same calculations that generated different sectoral targets can contribute to calculating sectoral caps (Interview 11). ► Some interviewees expressed the opinion that PAT set targets in its first phase that have not been sufficiently ambitious and that a potential ETS needs to have a more stringent cap in order to facilitate trading (Interview 11) (**political track**). Hence, the processes for establishing a cap are basically there, it is rather a question of defining targets in a way that there is a sufficient number of sellers and buyers. For converting the PAT-caps into ETS-like absolute targets, one would need to take an extra step of converting fuel used into CO_2-emissions, which can be done with standard emission factors (**technical track**).
Offsetting	n.a.	► PAT has no offsetting component
Market	++	► Due to its trading component PAT has created a functioning market of ESCerts, with registries, online platforms and exchanges that are trading environmental commodities (**institutional/legislative track**). PAT contributes to understanding the market actors and requires infrastructure for trading of certificates (Interview 11) (**technical track**).
Scope / Point of regulation	+	► PAT cycle-I targets 8 different sectors (thermal power, iron and steel, cement, fertilizers, textiles, aluminium, pulp and paper and chlor-alkali). Further sectors will be included in the future phases. These focus sectors are those with the highest emissions and could therefore form the scope of the ETS. Hence, a broad share of the sectors that would fall under an ETS has already gained experience with a market-based instrument and has established associated roles and responsibilities within the organization, a data base on historical energy, production and performance data, as well as an internal MRV system for those data (**technical track**).

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
		► The PAT scheme has created a solid level of **institutional/legislative track** through the assignment of administrative roles to BEE and the introduction of the concept of energy auditors as third parties in a MRV scheme. These institutions could take similar roles in the context of an ETS. However, it remains unclear how India would distribute responsibilities on the state/national level: a clearly political question.
MRV	++	► PAT has established a legal and institutional framework as well as the technical rules (MRV rules, procedures and capacity) for energy use MRV, along with experience in regulating agencies and private enterprises (**institutional/legislative track and technical track**). DCs submit performance assessment documents to the State Designated Agency and designated energy auditors on the PAT registry. BEE receives a copy for issuance of energy savings certificates. The reports on specific energy consumption submitted by each DC are verified by accredited designated independent energy auditors through a Certificate of Verification submitted through the registry. Some of this framework and expertise can be built on in the establishment of an ETS (Interview 11) (**institutional/legislative track and technical track**). However, the monitoring of an ETS would need to be different from the one used currently in PAT, i.e. transfer fuel consumption to emissions (which can easily be achieved with emission factors as in the EU ETS[38]).
Registry/ IT system	++	► Registry and computer-based trading platforms have been established that can, potentially in an adjusted manner, also be used in an ETS-setting[39] (**institutional/legislative track and technical track**)
Allocation	+	► The energy intensity reduction target of each covered entity is calculated based on the level of its current efficiency compared to the best performing plant. The more efficient an entity already is, the lower its target compared to inefficient entities. The process of establishing baselines based on past performance as done under PAT is comparable to grandfathering combined with benchmarking in a cap-and-trade scheme (Interview 7) (**technical track**).
Enforcement	+	► Compliance is anticipated to be high due to the strong engagement of covered entities and the fact that the industry seems to be in favour of the mechanism as it is perceived as a way to save money through efficiency gains (Interview 1).

38 With a possible extension to cover non-energy-related GHG emissions.

39 Registry for ESCerts accessible under https://beenet.gov.in/UI_Forms/Registry/Default.aspx

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
		► The Energy Conservation Act represents the legal basis for imposing penalties. The latter consist of a fixed penalty of approximately USD 15,000 plus a variable amount of USD 200 per toe. Since enforcement procedures will be initiated for the first time after the PAT-I trading cycle closes in December 2017, it is too early to make any conclusions on enforcement efficacy (**policy track and institutional/legislative track**). Nevertheless, lessons will be generated that can be useful for an ETS. ► BEE will be responsible for calculating penalties. How this will be enforced in practice still needs to be seen. A strict enforcement will be key to the success of the scheme, but in the context of other policy instruments (see discussion below) it is not clear what enforcement level can be reached (**political and institutional/legislative tracks**).

7.2.2 Renewable Energy Credit Trading Scheme (REC)

REC is India's green certificate trading scheme, allowing its participants to trade the environmental value of renewable energy generation without having to physically transfer the associated amount of electricity. Demand for such certificates needs to be generated through governmental regulation that requires energy generation installations, energy suppliers and/or large energy consumers to meet a certain quota of the energy with renewable energies.

7.2.2.1 Policy Instrument Introduction and State of Play

The Government of India has undertaken both supply and demand side measures to cater to the country's fundamental goal of energy access. India is implementing an extensive RE capacity expansion programme. The share of RE grid capacity has been increased by a factor of six from 3.9 GW (2%) in 2002 to 36 GW (13%) in 2015. The government set out the target to achieve 175 GW of RE capacity by 2022. This ambitious target would lead to a share of renewable generation capacity of 40%, meaning that India would meet its NDC target of 40% non-fossil generation capacity already 8 years before 2030 (Climate Action Tracker 2017). The predominant share of current RE power installed comes from wind energy, which accounts for 23.76 GW or 65% of current capacity. The goal for wind energy capacity is to achieve 60 GW by 2022. Solar capacity is envisioned to grow substantially. Although by 2015 only 4.06 GW had been installed, India with its ambitious Solar Mission aims at 100 GW by 2022. Other sources of RE include biomass, which is planned to be expanded from the current capacity of 4.4 GW to 10 GW by 2022, and hydropower, which currently contributes with 46.1 GW to installed capacity (Government of India 2015).

The Energy Act of 2003 sets out a more modest renewable energy target of 15% of total electricity supply coming from renewable sources by 2020, starting with 5% in 2010 with a 1% increase per year (Government of India 2008). India is on track to reach this target, given that RE capacity already reached 13% in 2015. A number of incentives have been introduced that promote the RE capacity expansion, such as feed-in-tariffs (FIT) and tax benefits such as early depreciation. Moreover, the Energy Act 2003 specifies that renewable portfolio obligations (RPOs) need to be established for every state. A RPO obliges the regulated entity to source a certain share of energy production, supply or consumption from renewables.

India's federal structure leaves jurisdictional authority over topics like electricity to the state governments. Thus, the specific RPO level for each state is determined by the State Electricity Regulatory

Commissions (SERCs). The Central Electricity Regulatory Commission (CERC) sets a minimum RPO requirement and leaves room for individual adjustments to SERCs (see Table 15 for an overview of different RPO targets in India). Thereby the RPOs can be tailored to the availability of renewable resources in the different states. While wind energy is abundant in the southwest of India, highest solar potentials can be found in the northwest.

On 18th November, 2010 the REC mechanism was introduced with the goal to enhance the share of renewable energy, with the following sub-objectives (WB 2017a):

- Effective implementation of RPO in all Indian states;
- Increased flexibility to achieve RPO targets because participants can decide whether to invest in RE or buy certificates;
- Overcoming geographical constraints to harnessing available RE source;
- Reduction in transaction costs for RE based power; and
- Creation of competition amongst different RE technologies.

Table 15: RPO targets of different states

State	Year of first regulation	Pre-REC target			Post-REC Targets					
		2007-2008 (%)	2008-2009 (%)	2009-2010 (%)	2010-2011 (%)	2011-2012 (%)	2012-2013 (%)	2013-2014 (%)	2014-2015 (%)	2015-2016 (%)
Anndhra Pradesh (Draft)	2005	5.0	5.0	5.0					5.0	5.0
Assam	2010				1.4	2.8	4.2	5.6	7.0	
Bihar				4.0	1.5	2.5	4.0	4.5	5.0	
Chhattis-garh	2008	10.0	10.0	10.0	5.0	5.25	5.75			
Delhi (Draft)		1.0	1.0		2.0	3.4	4.8	6.2	7.6	9.0
Gujarat	2005	1.0	2.0		5.0	6.0	7.0			
Haryana	2007	2.0	5.0	10.0	1.5	2.0	3.0			
Himavhal Pradesh		20.0	20.0	20.0	10.01	10.01	10.25	10.25	10.25	
Jammu and Kashmir					1.0	3.0	5.0			
Goa and UT					1.0	2.0	3.0			
Jharkhand					2.0	2.5	3.1			
Karnataka	2008	1.0	1.0	1.0	0.25	0.25	7.25	7.25	7.25	7.25
Kerela	2006	5.0	5.0	5.0	5.25	5.25	5.25	5.25	5.25	5.25
Madhya Pradesh	2008		10.0	11.0	0.8	2.5	4.0	5.5	7.0	
Maharash-tra	2006	4.0	5.0	6.0	6.0	7.0	8.0	9.0	9.0	9.0
Manipur	2010				2.0	3.0	5.0			
Mizoram	2010				5.0	6.0	7.0			
Meghalaya	2010				0.5	0.75	1.0			
Nagaland					6.0	7.0	8.0			
Orissa		3.0	3.0	4.0	5.0	5.0	5.5	6.0	6.5	7.0

Punjab	2007	1.0	1.0	2.0	2.4	2.86	3.4	3.94	4.0	
Rajasthan	2006	4.28	6.25	7.5	8.5	9.5				
Tamil Nadu	2006	10.0	10.0	13.0	10.15	9.05				
Tripura	2010				1.0	1.0	2.0			
Uttarak-hand		5.0	5.0	8.0	10.0	11.0				
Uttar Pra-desh		7.5	7.5	7.5	4.0	5.0	6.0			
West Ben-gal	2005				2.0	3.0	4.0			

Source: Shrimali and Tirumalachetty (2013)

Obligated entities are all DISCOMS (electricity distribution companies), captive consumers[40] and open access users[41]. These categories show that the scheme obligates large entities (if an entity operates an own power plant or is an open access user it is unlikely to be a small company). Under the REC mechanism, they can buy Renewable Energy Certificates (RECs) on power exchanges or directly purchase renewable energy from generators to fulfil the RPO applicable to their state[42]. If an obligated entity does not reach the amount of renewable energy specified in the RPO, it needs to buy RECs on the market. The various central and state level agencies involved in REC are shown in Table 15 (Shrimali and Tirumalachetty 2013).

Renewable energy generators in India can choose whether to make use of existing Feed-In-Tariffs (FIT) or to take part in the REC market. If they opt for REC, they feed their electricity into the grid and register at the National Load Dispatch Center (NLDC) in order to receive RECs. The NLDC is responsible for registration, issuance, redemption, and settlement of RECs. NLDC will issue RECs to RE generators, which will be recorded through a public registry called REC Registry.

Table 16: Central and state level agencies involved in REC

Agency	Central/State level	Role
Central Electricity Regulatory Commission (CERC)	central	Central regulatory authority, establishment of rules, appointment of compliance auditors
National load dispatch centre (NLDC)	central	Responsible for registration, issuance, redemption, and settlement of REC certificates
Power exchanges PXIL and IEX	central	Trading of RECs
Forum of regulators	central	Harmonization, coordination and ensuring uniformity of approach among different SERCs
State Electricity Regulatory Commissions (SERCs)	state	Establish policies and rules for REC in their respective states
Accreditation agencies	state	Scrutinizing and verifying of applications from RE generation companies
State Load Dispatch Center	state	Monitoring RE entering the grid

[40] Captive consumers are companies that operate a power plant on their production site in order to generate electricity for their own consumption. This is not unusual in the Indian context where captive power constituted approximately 15% of installed capacity in 2008 (Hansen 2008).

[41] Open access users purchase electricity directly from power exchanges.

[42] Which is then broken down to RPO level.

Source: IEX (2017a)

One REC certificate represents the generation of one MWh renewable power. Every certificate is earmarked with its specific source of generation, location, and generation year. Although different technologies are eligible for producing RECs such as wind, solar PV, solar, biomass and smaller hydro, two different forms of RECs exist: Non-solar RECs and solar RECs. The latter have been introduced with a separate obligation, in order to incentivize investments in solar power, while standard RECs cover other forms of renewable energy. While the RPO targets of states are ranging between 2% and 10% of total capacity depending on the state, it was decided that 0.25% needs to be delivered by solar RECs. As for market based mechanisms in general, the advantage of the REC scheme is cost effectiveness: obligated entities are free to choose whether to invest in renewable energy generation or buy RECs to fulfil the RPO requirements.

Similarly to ESCerts of the PAT, RECs are traded at the IEX and PXIL following specific requirements and procedures for application of participants and trading. They are traded with a floor price and a ceiling price that can be adjusted by CERC occasionally (see Figure 36). While REC prices have ranged between INR 1500 (~USD 22) and 3300 (~USD 50) at the beginning of the scheme, RECs are now trading at between INR 1000 (~USD 15) and INR 1500 (~USD 22) (IEX 2016, 2018).

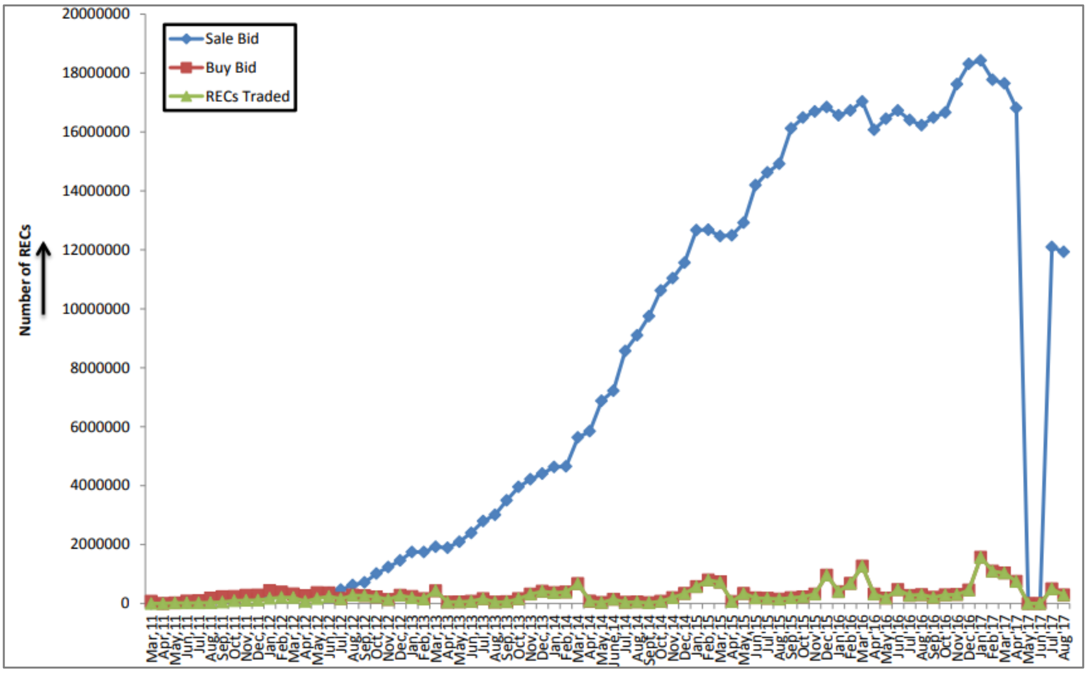
Table 17: Floor and ceiling price of RECs in INR/MWh

	Prices before 30 March 2017		Prices after 30 March 2017	
	Non – solar REC	Solar REC	Non-Solar REC	Solar REC
Ceiling price	INR 3300 (USD 50.3)	INR 5800 (USD 88.4)	INR 3000 (USD 45.7)	INR 2400 (USD 36.6)
Floor price	INR 1500 (USD 22.9)	INR 3500 (USD 53.4)	INR 1000 (USD 15.2)	INR 1000 (USD 15.2)

Source: Soonee et al (2017)

Trading takes place on the last Wednesday every month. Until 31 August 2017, ca. 22.3 million RECs worth USD 603 million have been traded in 76 trading sessions. As Figure 36 shows, the REC market has a strong surplus of sellers. There is usually a supply/demand-ratio of 10:1 (Interview 3). The CERC has continuously reduced the floor and ceiling price of RECs with the hope to promote trading. According to Soonee et al. (2017) a total capacity of 4,480 GW has been registered under the REC mechanism as of 30 July 2017, which represents just a fraction of the national 2022 target of 175 GW.

Figure 36: RECs traded until August 2017



Source: Soonee et al. (2017)

At the moment, the REC mechanism is confronted with several challenges that limit the mechanism's effectiveness. According to Indian stakeholders the most important barrier to a functioning REC market is **the lack of compliance** of obligated entities. The targets de-facto are voluntary since there are **no penalties** for non-compliance, contributing to the lack of REC buyers in the market.

This obviously reduces confidence of investors in incentives to build/operate renewable energy sites. Key to creating this trust would be the enforcement of the RPO targets by imposing penalties on obligated entities in case of non-compliance (Interview 1, 2, 5). As the SERCs have no inherent interest in achieving their RPO, it would be necessary for central authorities to hold state governments more strictly accountable for their RPO goal and demand them to impose penalties. However, several stakeholders stressed that strict enforcement is not advisable because penalties would need to be paid by state DISCOMS/utilities that are already under financial pressure. Assuming a strong enforcement of the targets would undermine the financially pressured companies' ability to provide electricity, a strong backlash from civil society would be expected (Interview 4, 5).

Other challenges facing the RECs scheme include:

- High volatility creates uncertainty among market participants. Because floor and ceiling prices are fixed trading volumes become volatile[43].
- The fact that DISCOMS are not able to meet the entire power demand within their state discourages them from entering the REC market. Stable energy access is of higher priority to them than complying with renewable energy targets (WB 2017).
- Information on obligated entities other than state DISCOMS is limited. At the moment the MRV and registry systems do not cover all obligated entities (WB 2017).

[43] There are various hypotheses for the phenomenon of increased volatility due to the introduction of price bands (floor and ceiling). One of them is called the 'magnet effect', which suggests that price changes accelerate when the price approaches one of the limits. On the one hand it is assumed that traders fear illiquidity once the ceiling price is reached and therefore buy faster. At the same time, behavioural factors, such as the anticipation of investors that the price will at some point reach one of the price bands, could be driving factors (for further analysis see Cho et al. 2002).

Several interviewees see the REC mechanism as a failure **because trading is so limited**. Some highlighted that the REC market did not have the potential to become a major driver of renewable energy in the first place; they observed that, so far, the decrease of PV prices and not the REC mechanism was the real driver of renewable energy investments and will remain so in the future. The REC mechanism only makes sense if coal power is cheaper than renewable energy. If the prices of solar drop even further over the next years an incentive through the REC mechanism would not be necessary anymore because renewable energy would already be more attractive than coal. It is therefore likely that not only the lack of enforcement but also the price development of renewables played a role for the limited trading activity. If in the future, when prices of renewable energy reach even lower levels, DISCOMS and other obligated entities will find it more attractive to invest in renewable energy directly rather than buying certificates (Interview 1, 4, 5, 7).

It is not clear to what extent RPOs have driven renewable energy deployment in India because compliance with RPOs is difficult to determine. Specific penalties for defaulters are not yet in place and a potential loophole for obligated entities exists: If an entity reports difficulties with achieving the targets, SERCs are allowed to delay the compliance deadline by a year or reduce the target (Shrimali and Tirumalachetty 2013). Under such conditions, trust of the private sector in the scheme and efficient participation appears to be unlikely. Only if capital providers view REC as a potential source of stable income would it be possible for REC to drive investment.

7.2.2.2 Potential Contributions to ETS Building Blocks

Considering the preconditions defined in the methodological discussion in section 2, green certificate trading schemes were rated as 1st out of 7 regarding the preconditions for establishing emissions trading in a country. The REC mechanism scheme matches with some building blocks of the policy, legal/institutional and technical dimension. However, some interviewees perceive it as less successful compared to PAT because of the limited compliance, enforcement and trading activity.

Several lessons can be learnt from the REC mechanism that could contribute to ETS building blocks. The major lessons from REC concern the importance to set the incentives right for the institutions involved **in setting/enforcing targets**. To achieve this goal, the national body that would implement the ETS would need to work closely with state level agencies responsible for enforcement, if enforcement responsibility is set to be placed on the regional level. Other contributions to ETS building blocks include the established institutional, technical and legal processes for trading and MRV. Renewable energy generators can apply for issuance of REC on a web-based IT platform that is connected to a registry where the amount of electricity supplied to the grid is specified.

Table 18: REC contribution to core building blocks

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
Cap	n.a.	► The lessons learnt from defining the RE target can be taken into consideration when setting an ETS-cap. This includes the entire process of RE target setting – with regards to involvement of institutions, collection and usage of data, and a quantitative understanding of sector specifics. ► The lessons learned from difficulties in setting the right target (RPO, cap) to yield buyers and sellers, the need to avoid escape holes are relevant for ETS.
Offsetting	n.a.	► Not Applicable

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
Market	+	► The REC mechanism established institutional processes for trading, which provide a basis for discussion of similar structures for a country-wide ETS (Interview 3) (**institutional/legislative track**). The same applies to experience with lack of buyers, lack of liquidity, price volatility , price floors/ceilings, lack of market confidence , risk of double-dipping, etc.
Scope / Point of regulation	n.a	► Conflicting interests between Federal and State governments to enforce compliance with penalties for obligated entities (DISCOMS, captive consumers and open access users) (**institutional/legislative track**).
MRV	+	► Renewable energy generators can apply for issuance of RECs on a web-based platform connected to a registry, where they state the amount of electricity supplied to the grid (**technical track**). After submission, the report is verified by the responsible State Load Dispatch Center (SLDC). Established institutional processes to conduct MRV provide a basis for discussion of similar structures for a country-wide ETS (Interview 3) (**institutional/legislative track**).
Registry / IT system	+	► A registry system is in place. While it does not cover emission reductions, but renewable energy generation (Interview 3) (**technical track**), the experience with setting up and operating a registry can be a helpful starting point for an ETS registry.
Allocation	n.a.	► Not fully applicable, although the allocation of purchase obligations can be seen as some form of target allocation.
Enforcement	+	► The major problem of REC is that until today no enforcement took place. Thus, experience gained will help identify which pitfalls of the REC could also become challenges for or even barriers to an ETS (Interview 5) (**political and institutional/legislative tracks**). ► Experience with REC has shown the importance of setting incentives for the institutions involved in setting and enforcing targets (**political track**). To achieve the right incentives, the national body implementing the ETS would need to work closely with state level agencies responsible for enforcement (Interview 7), if enforcement of an ETS was in the responsibility of the regional level (**institutional/legislative track**). ► Stakeholder involvement in the overall set up process of the enforcement mechanism would be important (**institutional/legislative track**).

Source: Authors

7.2.3 Coal Tax ("Coal Cess")

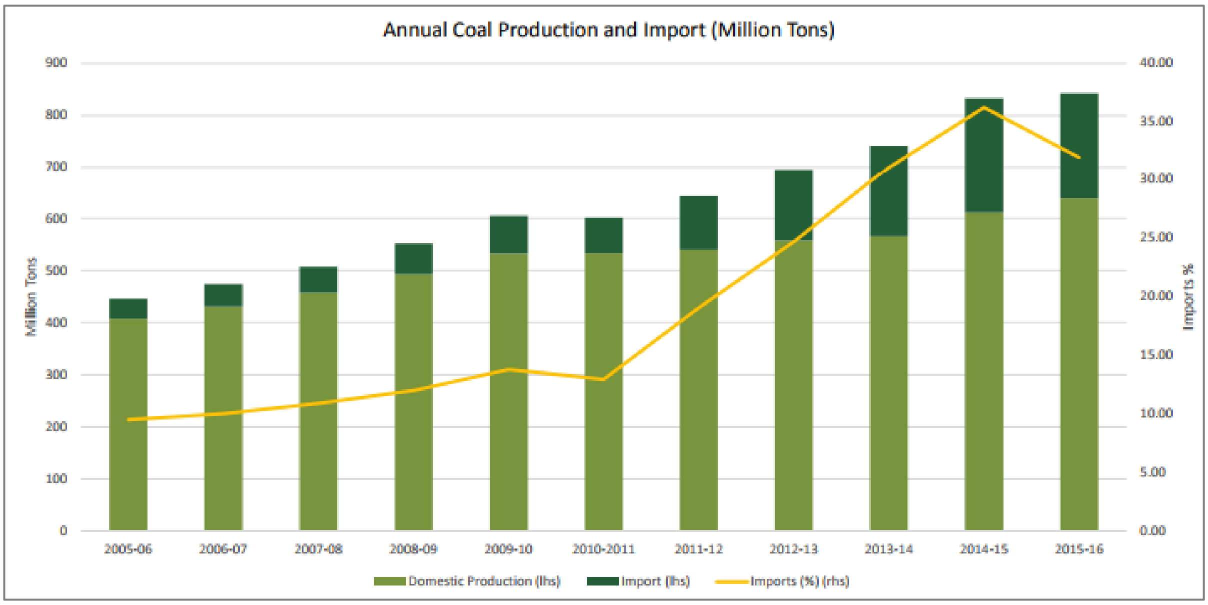
In 2010, the Government of India introduced a tax on domestically produced and imported coal , formally called "Clean Energy Cess", recently renamed as "Clean Environment Cess", while informally the term "coal cess" prevails.[44] Besides coal itself, the tax also covers coal derivatives such as lignite and peat. In the following, we use the term "coal cess".

7.2.3.1 Policy Instrument Introduction and State of Play

The coal cess is anchored in the Finance Acts of 2010 and 2016. These specify its application to domestically produced and imported coal, including briquettes, ovoids and similar solid fuels manufactured from coal, and coal derivatives such as lignite and peat. In some minor instances of coal mining under traditional and customary rights of local tribes, for example in the State of Meghalaya, exemption from the coal cess regulation has been granted.

Initially, the coal cess was set at INR 50 (USD 0.75) per t coal, but it has been steadily increased over the years and reached INR 400 (USD 6) per t in 2016 (LSE 2017; Indian Economic Service 2016; Chaturvedi 2016; Central Board of Excises and Customs 2016). Although India is the fifth-largest producer of coal in terms of energy (in terms of volume the third-largest), the group of producers affected by the coal cess is quite small. The Indian coal sector is dominated by the state-owned company Coal India Limited (CIL), which operates via eight subsidiaries and accounts for around 80% of the national output. The second largest producer is the state-owned Singareni Collieries Company Limited, contributing less than 10% to India's coal output. In addition, there are some private firms which are allowed to mine coal for their own use. This puts the coal-mining sector in India largely under state control, affecting 90% of production. In the beginning of 2017, India opened its coal-mining market for non-state companies under strict conditions, planning to auction a total of 23 mines to both state-run and private companies during this year (IEA 2014; Bloomberg 2017).

Figure 37: Indian domestic coal production and import over the last decade



Source: KAPSARC (2016)

The coal cess is also due on imported coal. As Figure 37 shows, coal demand has increasingly been met by imports over the course of the last years.[45]

[44] Emanating from the colonial times the term "cess" is common in India and refers to a tax. Usually it is used with a qualifying prefix (education cess, irrigation cess, etc.)

[45] India is a large coal importer due to the increasing demand in power generation and industry. Indonesia is the main exporter to India, currently accounting for around 60% of imported coal. Further important actors in coal import to India are South Africa, Australia, Canada and the United States. To reduce its dependency on imported coal, the Indian government currently undertakes plans to increase domestic production (1.5 billion tons by 2020, starting with a status quo of 603

The collection of the tax is undertaken by the Central Board of Excises and Customs, which is part of the Department of Revenue under the Ministry of Finance. The collection system foresees registration of every producer/importer covered by the scheme with the jurisdictional Central Excise Officer. The cess applies to the gross quantity of raw coal, lignite or peat raised and dispatched from a coalmine, and no deduction from this quantity for loss is allowed. Losses could occur, for example, on account of washing the coal or its conversion into any other product or form prior to its dispatch from the mine. The payment of the tax should take place monthly and on self-assessment basis (payment of cess is due the month after the tax-relevant activities took place). Furthermore, a centralized registration of an office for accounting or billing can be established by the mining companies, in order to ease this compliance burden for producers owning several mines as is the case for the dominant market player CIL.[46] In order to ensure compliance with these rules, a government official is granted access to any mine or premises of registered producers to carry out scrutiny, verification and checks as considered necessary. The officer shall have access to records of transactions with regard to production, storage and removal of coal products (National Academy of Customs, Indirect Tax and Narcotics, 2016). Any non-compliance to this regulation will be sanctioned by a general penalty of INR 10,000 (USD 150) and confiscation of the goods in question.

Apart from its implications on domestic coal production, the cess, being levied as a duty of excise, also applies to imported coal, including washed coal (compare Figure 37).[47] This means that in contrast to the application of the cess in the domestic context, where it is levied at the raw stage of goods, it is levied on all forms of imported coal. The collection takes place in form of an additional duty of customs (Chaturvedi 2016; Central Board of Excises and Customs 2016; National Academy of Customs, Indirect Tax and Narcotics, 2016).

Although the coal cess comes with tax reliefs in other matters, it was initially not meant to generate generic government revenue, but to ensure capitalization of the National Clean Energy Fund (NCEF). Established in 2010-2011, the NCEF provides financial support to public and private sector entities seeking to invest in research and innovative projects in clean energy technologies. The NCEF Secretariat is located within the Indian Ministry of Finance and decision-making on project proposals lies within the responsibility of an Inter-Ministerial Group (IMG) chaired by the Finance Secretary. Eligible projects include, for example, a Green Energy Corridor for boosting the transmission sector, the Jawaharlal Nehru National Solar Mission's installation of solar photovoltaic (SPV) lights and small capacity lights or a pilot project to assess wind power potential.

Until 2017, 55 projects have been recommended with a total investment value of INR 34,811 crore[48] (~5.4 billion USD)[49] (Department of Energy, 2017; Indian Economic Service, 2016). However, almost 50% of the total revenue of INR 54,336 crore (~8.5 billion USD) collected by the coal cess since its launch in 2010 has not yet been transferred to the Fund, while only 16% has gone towards financing of projects (see Table 19). After the Ministry of Finance faced criticism on this matter by the media and interest groups such as the Clean Energy Access Network (CLEAN), it has become evident in August 2017 that the unutilized funding has been diverted to state budgets that faced a loss in revenue as a consequence of a reform of India's goods and services tax (GST). This can be partially explained by the massively increased revenues from the coal cess.

million tons (Mt) in 2013) and state-owned power plants announced to stop importing coal from 2018 on (IEA 2014; Economic Times 2017).

[46] Reporting duties remain with the producer who is commissioned to maintain accounts showing the quantity of specified goods actually removed during a month, actors to whom these were removed, the amount of Cess payable during a month and the total amount of Cess paid.

[47] Washed coal refers to coal that has been purified and contains significantly reduced amounts of ash, soil and solid minerals. Imported coal is usually washed coal because it is more expensive due to its higher energy content.

[48] Lakh and crore are Indian metrics that refer to 100,000 and 10 million, respectively.

[49] Exchange rate: 0,0156 INR/USD (15 December 2017)

Table 19: Allocation of revenue generated from coal cess to NCEF (amounts in INR Crore)

Year	Coal Cess Collected	Amount transferred to NCEF	Amounts financed from NCEF for projects
2010-2011	1,066.46	0.00	0.00
2011-2012	2,579.55	1,066.46	220.75
2012-2013	3,053.19	1,500.00	246.43
2013-2014	3,471.98	1,650.00	1,218.78
2014-2015	5,393.46	4,700.00	2,087.99
2015-2016	12,675.60	5,123.09	5,234.80
2016-2017 (RE)	28,500.00	6,902.74	6,902.74
2017-2018 (BE)	29,700.00	8,703.00	-

Source: Department of Energy (2017)

While the coal cess faces significant barriers in delivering on its original purpose, it has contributed to the sudden loss of attractiveness of coal power plants compared to renewable energy, with coal plants running at unprecedented low load factors, and many new coal power plant projects being shelved. Whether this is just a temporary phenomenon or a long-term transformation remains to be seen. If general electricity access is achieved as planned, and urbanization continues, India's power system needs to almost quadruple in size by 2040 (IEA 2014). Although the government aspires to source 50% of this additional demand from renewables and nuclear power, it also supports the further expansion of coal mining and will continue to be dependent on large imports, as coal-fired plants in India are expected to still play a major role in India's energy mix (IEA 2014).

The interviews held in India revealed that the government's reasoning to divert the coal cess revenues away from its original purpose is rooted in the significant drop of prices for solar power with the effect that solar targets would be reached without public support through the NCEF (Interview 2). Other stakeholders, however, viewed the attainability of India's solar targets less optimistically. Moreover, several interviewees pointed out that the coal cess in its current form is not reducing any GHG emissions because the whole economy is heavily dependent on coal ("If you wanted to reduce emissions you would need to raise the cess so high that economic activity began to slow down", Interview X). Unlike a carbon tax that is applied to carbon emissions, the cess is applied at the point of raw material. If companies wanted to reduce the financial burden of the cess they would need to reduce their output due to their strong dependency. Targeted coal companies could not reduce the financial burden through more efficient technology because coal is the raw material for all of their products (Interview 5). Still, the reasoning with regard to the whole economy appears only to hold true if there were no alternatives to coal power. Higher coal prices will make coal power more expensive and subsequently alternatives power generation more competitive, as already becomes visible.

7.2.3.2 Potential Contributions to ETS Building Blocks

Considering the preconditions defined in the methodological discussion in section 2, carbon taxation was rated 4th out of 7 regarding the preconditions for establishing emissions trading in a country. The coal cess is subsequently assessed regarding its potential contribution to ETS building blocks.

Table 20: Coal cess contribution to core building blocks

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
Cap	0	► The coal cess does not impose limits on activities, energy use or emissions, and cannot be translated into a cap for an ETS. The data on coal production and import could be of use in cap-setting, though it would need to be complemented with coal export data, as well as data on the consumption of other fuels.
Offsetting	0	► The coal cess does not have any offsetting component, so no useful elements or no applicable lessons to be learned for the ETS.
Market	0	► The coal cess obligation cannot be traded, so no market elements exist and no lessons can be learnt for an ETS.
Scope / Point of regulation	+	► The cess is centrally administered by the government (**institutional/legislative track**). ► Companies that produce coal domestically and/or import coal (products) which are usually not covered in an ETS, as most ETS systems are mid-stream, i.e. the regulated entities are the one where emissions occur (stack approach). For an upstream ETS, the regulated entities could be similar as for the coal suppliers. This would have to be complemented with the suppliers of other fuels for a broader upstream ETS. ► The coal cess applies to individual mines, but allows for joint registration at the company level in case of multiple mines (in particular with the two larger state mining companies). This would be parallel to the option of pooling compliance obligations in an ETS. ► The number of entities covered by the coal cess is very limited, and they are usually large companies. Therefore, the lessons in terms of institutional capacity at the entities, verifiers or the government relevant for a broader ETS are limited.
MRV	+	► The system of collection involves company reporting and verification checks by empowered officers, which creates capacity at coal companies. So far this has been unproblematic (**technical and institutional/legislative tracks**).
Registry/ IT system		► A reporting system exists, but there is no publically available data regarding its design/features.
Allocation	0	► The differentiation of the level of a carbon tax across different fuels could be the equivalent of distributing the burden over participants, i.e. the role that allocation plays in an ETS. However, as the cess only applies to coal, no further interference can be drawn from the policy for the ETS.
Enforcement		► The cess enforcement is supported through random sample check of compliance; incompliance results in negligible sanctions (**political and institutional/legislative tracks**;

Source: Authors

7.2.4 Clean Development Mechanism

India has more than a decade of experience with GHG crediting mechanisms, most prominently under the UNFCCC's Clean Development Mechanism (CDM), but also through voluntary offsetting standards such as the Verified Carbon Standard or the Gold Standard, as well as first experiences with REDD+[50]. As the CDM is considered the dominant form of carbon market activity in India (IETA 2015), we will focus on the CDM.

7.2.4.1 Policy Instrument Introduction and State of Play

The CDM is one of the flexible mechanisms established by the UNFCCC under the Kyoto Protocol; it serves to generate GHG emission reductions in developing countries and make them available for compliance with the targets of developed countries under the Kyoto Protocol. Historically, the CDM is the world's most relevant instrument for GHG crediting, in terms of number of projects, credit volumes traded, lifetime of the instrument, geographical distribution and finance levied.

Out of a total of 8439 individual CDM projects almost one quarter (1991) is located in India. The country also ranks second with regard to programmatic activities, since 37 Programmes of Activity (PoAs) with 176 Component Project Activities (CPAs) have been registered (UNEP DTU 2017a; UNEP DTU 2017b). The majority of CDM activities focuses on wind, biomass, hydropower as well as energy efficiency (UNEP DTU 2017a; UNEP DTU 2017b; Upadhyaya 2010).

Through more than a decade of efforts by technical cooperation actors, such as GIZ, in providing technical capacity fostering the CDM and through entrepreneurship, India has built up good carbon market expertise. A considerable number of consulting companies specializing in CDM project development evolved. Hence, across various sectors, technologies and industries the Indian workforce has been exposed to carbon market approaches, a fact that may serve as a good foundation for future market-based instruments. However, the formerly strong Indian carbon market industry has suffered from the carbon market downturn after the years 2012/2013.

The Indian Designated National Authority (DNA), the National CDM Authority under the Ministry of the Environment was established in 2003 (NCDMA 2017). However, under the CDM, the role of a DNA is limited to approving the compliance of a specific CDM activity with its contribution to sustainable development. This process was often criticized as "rubberstamping" of projects, also in India. Over time, the UNFCCC, policy makers of buying countries[51] and buyers imposed stricter CDM standards. Hence, the quality of the CDM activities has increased over time, a process that has also affected the Indian CDM sphere. One aspect in this regard was criticism of the instrument by several environmental NGOs that claimed the mechanism had led in various cases to negative impacts on sustainable development, common land use and marginalized groups rights in India (for instance Carbon Market Watch, 2013).

7.2.4.2 Potential Contributions to ETS Building Blocks

Considering the preconditions defined in the methodological discussion in section 2, GHG crediting schemes were rated as 6th out of 7 regarding the preconditions for establishing emissions trading in a country. The CDM in India offers useful lessons that could contribute to the building blocks of an ETS. Not only has the CDM raised awareness for climate related markets that can leverage private capital in the private sector, but also has it established strong capacities in the area of MRV of climate action. Although this capacity has predominantly been created among private sector environmental consultancies and not throughout the entire private sector, it still is within the country and could benefit an ETS

[50] Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.

[51] E.g. the EU in requiring compliance with World Commission on Dams standards for large scale hydro, HFC project ban, or limitation to LDC projects.

that would require expertise with GHG emission reduction methodologies. Overall, the CDM could be contributing to the following building blocks:

Table 21: CDM contribution to core building blocks

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
Cap	0	► The CDM is a baseline-and-credit, or offset, approach, i.e. by definition very different from a cap-and-trade approach. In some case, sectoral baselines and projections developed for CDM projects or PoAs could provide useful input for setting a cap for an ETS.
Offsetting	++	► Sourcing, development, sales and trading of GHG credits have been practiced on a professional level in India; ► Creation of credits from various sectors has been executed; ► There is a pipeline of existing CDM projects which are eligible to earn Certified Emission Reductions (CER) but are unable to find suitable buyers, others still have existing Emission Reduction Purchase Agreements (ERPAs); ► The Indian CDM offers a pipeline of carbon offsets ready for any future scheme, be it a national ETS or any other market based mechanism; here, the issue of additionality would need to be addressed by the ETS regulation; ► CDM offsets have already been allowed in other ETS. In case the government decides to implement an ETS, CDM experiences can be used for the establishment of an offsetting component, such as the Chinese CDM case (**political and technical tracks**). ► The CDM in India was regulated by the UNFCCC rulebook, but domestically overseen by the national DNA, hence domestic policymakers understand how to administer an offsetting scheme (**institutional/legislative track).**
Market	+	► The CDM has provided stakeholders with experience of trading environmental commodities on a liquid market and how carbon trading works (Interview 5). Although much of the trading activity was not done by the CER earning companies but by consultants/project developers and NGOs, much of this expertise is still within the country and could be used to develop capacity with ETS participants (**technical track**).
Scope / Point of regulation	0/+	► The CDM is a voluntary mechanism (i.e. participation is voluntary), so there are no regulated entities. ► Various sectors and geographical regions have been covered by the CDM, however with a focus on RE and EE, and only with a limited number of participants in a sector. As a consequence, data availability and capacity development are fragmented, not covering the entire sector, nor all sectors, covered by an ETS (**technical track**); ► The CDM in India was regulated by the UNFCCC rulebook, but domestically overseen by the national DNA, hence domestic policymakers understand how to administer an offsetting scheme (**institutional/legislative track**).

Building block	Contribution (0 = none; + = moderate; ++ = strong)	Comment (reference to ETS tracks from section 2 in brackets)
MRV	0/+	► As the CDM rules are established by the UNFCCC, limited institutional capacity will have been developed with the Indian administration for developing MRV systems and methodologies. ► Many firms outsourced a lot of the CDM know-how to external consultancies, so limited capacity will have been developed in the credit generators. However, this MRV knowledge is still in the country and could be used in developing capacity with ETS participants and administrators. It surely could be reactivated relatively quickly in case demand for CERs would start to increase (**technical track**). ► In case of ETS implementation, the government will be interested in setting up a robust MRV system at sectoral and project level. India's exposure to the CDM and its GHG emission reduction methodologies is valuable (Interview 3) (**technical track**).
Registry/ IT system	0	► The CDM registry is operated by the UNFCCC, and Indian stakeholders will have had little exposure to it. Therefore, it will have limited value added for an ETS in India (**technical track**).
Allocation	n.a.	► Not applicable
Enforcement	0	► The CDM is a voluntary participation mechanism so no enforcement is required or implemented. Oversight occurs by the UNFCCC (and accredited verifiers), but not following the rules has consequences for the participants only in terms of non-approved projects or non-issued credits (i.e. revenue loss), no penalties or other sanctions were applied. In addition, the Indian government was not involved in this oversight regime. So other than the role of Indian verifiers, the CDM does not have a relevant contribution for ETS enforcement (**technical track**)

Source: Authors

7.3 Reflections on Selected Aspects of ETS Development in India

The previous analysis showed that the existing policy instruments in India – in particular the Perform, Achieve, Trade-Scheme, but also elements of the Renewable Energy Crediting-Scheme, the Coal Cess and the Clean Development Mechanism – have created a high amount of valuable information, procedures, and institutional infrastructure that could be used for and be built upon when implementing an ETS in India.

However, looking at the overall situation in India, it becomes clear that the introduction of an ETS is currently not on the political agenda: A large share of people lives in extreme poverty, energy supply is challenging and there is a strong drive for economic growth to improve the living and social conditions for its large and growing population. This impression was confirmed by the interviews conducted during the field mission in September 2017. In this chapter, we look whether, and if so what, ETS options could be adequate in the Indian climate policy context in the long term.

7.3.1 Political Track

The analysis showed that while India has started to develop experience with market-based instruments for energy efficiency and renewable energy, the key issue with regard to the introduction of an ETS in India is political acceptability, especially the concern of policy makers that an ETS could have negative effects on electricity supply / security, industrial production and economic growth. Offsetting is seen much more positively than emissions trading given the positive experiences with the CDM.

The following sections look at fundamental questions around these challenges and how they might be tackled:

- Does an ETS constitute a risk to security of electricity supply in the Indian context?
- What are the best-suited industry sectors for an ETS in India?
- What role can domestic offsetting play in the context of an ETS and what are its pros and cons?

7.3.1.1 Does an emission trading scheme constitute a risk to the electricity sector in the Indian context?

In some of the interviews conducted with Indian experts as part of the country case study, concerns were raised that an ETS could pose a risk to the – already weak[52] – electricity sector, which is seen vital for economic development and social wellbeing. Are those concerns justified? Whether or not an ETS constitutes a risk to electricity security or not generally depends on a number of parameters:

- The scope of the ETS system (is an inclusion of the power sector planned?);
- The concrete structure of and framework conditions in the power sector in the country – in particular if utilities are private- or state-owned and whether there is a regulated or deregulated energy market;
- Ability to pay higher electricity prices a) of end-consumers and b) industry; and
- The allocation method, i.e. free allocation such as grandfathering, or charged allocation such as auctioning.

Structure and framework conditions in the Indian power sector

The Indian power sector can be differentiated into large utilities, captive power plants in industry, off-grid solutions in remote areas (mostly renewable energies and diesel generators) and back-up solutions for power outages (mostly diesel gen-sets).

Roughly 31% of thermal and nuclear power generation capacity is owned by the central government; approx. 32% are owned by State governments, and 37% are private (Government of India 2017). In other words, roughly 2/3 of Indian utilities are in public hands. Approx. 60% of total installed capacity (330 GW including renewable energy sources) is coal-based. Captive power plants provide an additional 50 GW, of which again 60% is coal-based.

Average per capita electricity consumption in India was approx. 800 kWh/person in 2014 (IEA 2014), with strong regional differences: ranging from about 300 kWh/person in States like Assam, Manipur and Tripura to over 1500 kWh/person in Delhi up and over 2000 kWh/person in Gujarat. Electricity demand per person is expected to increase drastically in the forthcoming years due to a higher standard of living and an increasing use of appliances. In addition, the Indian population is expected to increase from 1.3 billion people in 2016 to 1.5 billion in 2030 and 1.7 billion in 2050 (PopulationPyramid 2018). At the same time it must be noted that currently approx. 30 million homes, equalling 160 million people, do not have grid electricity access.

[52] India faces challenges in electrical supply and delivery, and is frequently unable to meet demand.

Another key challenge of the India power sector is the instability of supply. While average electricity generation is theoretically sufficient to cover demand, outages are frequent in peak times. This leads to a situation where a large number of diesel generator sets are in use to serve as backup. According to recent estimates, "the millions of diesel generator sets working to meet the shortage in industrial and commercial units now add up to a cumulative capacity of 90,000 MW (Indian Express, 2018).

In India, both the central and state governments are involved in establishing policy and laws for the electricity sector. The Ministry of Power is India's central government body regulating the electrical energy sector. It is responsible for planning, political steering, making investment decisions etc. related to power generation, transmission and distribution. The Ministry of Power also administers the "Rural Electrification Corporation Limited" and the "Power Finance Corporation Limited". These public sector enterprises provide loans and guarantees for public and private electricity sector infrastructure projects in India.

The financial situation of the public power sector is poor. It has accumulated significant losses in the last 15 years and consequently, its ability to invest has suffered. These losses mainly result from historically strongly subsidized electricity prices for farmers: Since the 1960s, farmers have demanded free power supply for water pumping for agricultural irrigation. They were very successful in getting electricity at nearly no cost and succeeded to maintain these subsidies largely until today (Sagebiel et. al. 2016). This is due to policy makers' attempts to increase Indian food production and ensure food security.

Hence, public utilities and distribution companies (discoms) accumulated sizeable losses over the last decades[53]. The Indian government frequently needs to start bail-out initiatives in order to avoid bankruptcy and subsequent shut-down of utilities (Sasil 2015). Overall, this shows that the vast majority of public utilities and discoms do not have the financial reserves to absorb significant additional costs that might be associated with an ETS[54]. The potential to increase electricity tariffs generally must be seen as very limited due to the previously discussed situation (very low income levels and hence ability to pay of a large share of the Indian population, and traditionally strongly subsidized power prices for the agricultural sector). Thus, if an ETS was introduced, the Indian government would likely need to cover a good share[55] of additional costs for investments to comply with emission targets or for the acquisition of emission allowances.

The situation might be different for independent power producers (IPPs) that can theoretically achieve higher power prices. However, this is not always the case in practice: many IPPs operating coal power plants contractually agreed low long-term electricity tariffs with the Central or State Electricity Regulatory Commissions (CERC, SERCs) in the early 2000s when imported coal was still cheap, and they are now are challenged by strongly increased coal prices.

Captive power plants operated by industry are mainly fuelled by diesel or wind. The financial situation and options to pass-on costs to consumers for financing investments required under an ETS strongly varies by sector - e.g. are goods mainly produced for domestic use where pricing could be adjusted if international competition is absent; or are goods produced for export where international competition makes it difficult to increase product prices. In both cases it would be important to understand price elasticity. While a far more detailed analysis would be required for a quantitative assessment, one can assume that participation in an ETS is reasonable at least for a good share of IPPs and captive power plants.

[53] The accumulated losses of state-owned discoms increased by a factor of 7 between 2005 to 2014, when they reached ca. 885 million EUR. These losses have resulted in state discoms relying on short-term loans to fund their operations. Borrowings by state discoms rose from 1.9 billion EUR (Rs 158,003 crore) in 2007-08 to 6.7 billion EUR (Rs 545,922 crore) in 2013-14. Poor finances of the discoms affect their ability to buy power, thus leading to power deficits.

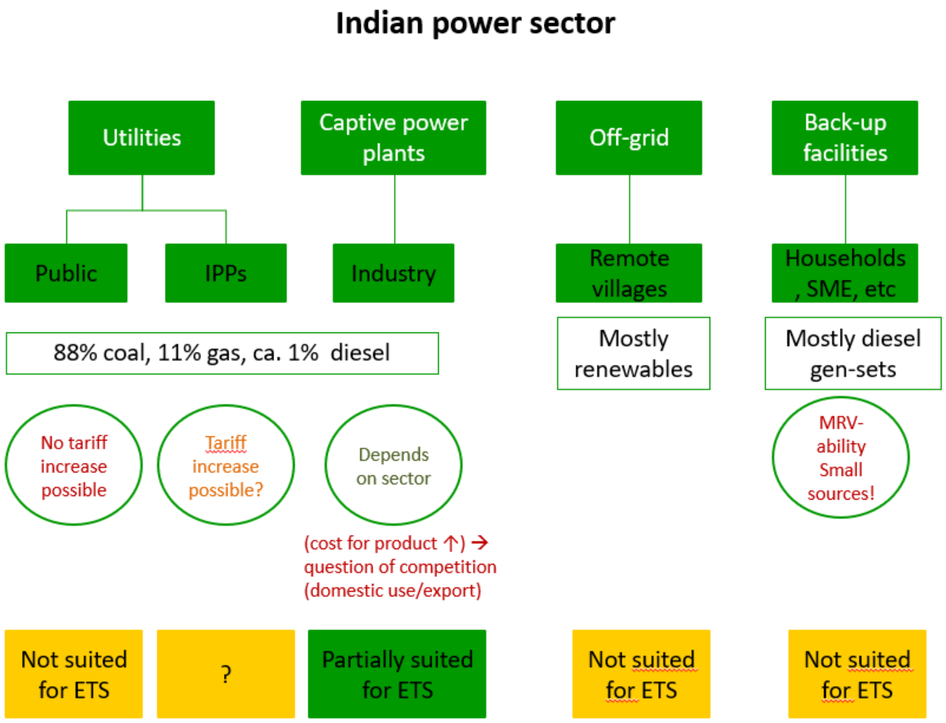
[54] Note that costs strongly depend on the allocation method (cost free- vs. allocation with costs) and cap stringency.

[55] With the scope again depending on the allocation method chosen.

Back-up facilities operated by households, small and medium enterprises (SME), hospitals etc. are mostly diesel generator-sets. As discussed above, these constitute an important, but highly distributed and thus more difficult to regulate source of emissions. In particular monitoring, reporting and verification (MRV) would constitute a key challenge. A solution could be an upstream approach for this sub-sector, but the question is whether a fuel tax might be a more appropriate instrument in this context.

Off-grid power solutions, e.g. in remote villages, are mainly based on renewable energies (PV, some wind/hydro) that do not have to be covered by an ETS as they cause no direct greenhouse gas emissions. Figure 38 visualizes the conclusions we draw from the discussion above:

Figure 38: ETS-feasibility of different segments of the Indian power sector



Source: Own illustration

For captive power plants in industry, an ETS could be economically reasonable and adequate. A more detailed sectoral analysis regarding the financial and economic implications by sector would allow making detailed recommendations – also with a view to allocation method and target stringency by sector.

Similarly, an ETS could be an interesting and adequate policy instrument for (some) IPPs. Currently, 8.8 GW of coal-fired «Ultra-Mega Power Plants» and 9.5 GW of gas power plants, i.e. 6% of total Indian electricity generation capacity (CEA 2016) might be a target. The economic reasonability depends mainly on the question if IPPs can realistically pass on (parts of) the costs related to an ETS to their customers. If this is not given, they will get into financial trouble and critics will argue that the ETS endangers electricity security. Hence, a careful analysis on the level of IPPs is required before providing a final recommendation.

In contrast to this, an ETS does not seem to be a good option for public power companies (with the understanding that few could pass on costs at the moment), for back-up facilities (MRV-ability), nor for renewable off-grid facilities.

At the same time, one needs to be very careful not to create competitive distortions within the electricity sector, or to create perverse incentives for electricity consumers. Distortions would result if ETS-covered IPPs would compete with non-covered public power companies – as long as the latter are not covered by an equivalent mechanism (that might be e.g. the PAT scheme). And industrial operators of captive power producers might decide to shut down their own plants and consume electricity from the grid (unless this is e.g. legally forbidden).

Moving the focus from the current situation to the future, one can expect a relative increase of the share of renewables[56] but, in light of the further increasing electricity demand, also a continuation of the utilization of existing and new fossil fuel power plants. Assuming low ability to pay and limited potential to pass on ETS-costs to private consumers, the situation for incumbent public power plants would remain unchanged.

Allocation method

An allocation with costs, such as auctioning or selling of emission allowances at a fixed price, provides a strong incentive for covered entities to reduce emissions. The higher the share of auctioning and the price of allowances, the higher the incentive is. Obviously, such approaches can result in a significant additional cost factor for the participants of the ETS, while they can become an additional source of income for the government.

In terms of financial and economic consequences for covered entities, a key question is whether they are able to (partially) pass on the additional costs to consumers. In liberalized electricity markets, utilities would increase electricity prices, resulting in higher costs for electricity users, especially households and industry. Secondary impacts of increased electricity prices on industrial competitiveness generally vary strongly by sector, the characteristics of the markets they serve and the role of export, import and products produced for domestic use (international competition). A concrete sectoral analysis would be required for providing an informed sectoral impact assessment. If costs cannot be passed on sufficiently to consumers, then utilities' financial performance will be impacted. As economic viability of many Indian power companies is already low, further financial burden might affect their ability to invest in new or more efficient power plants.

A cost-free allocation such as grandfathering reduces the cost burden for utilities, as they do not have to pay for all emission allowances but only for the allowances for the differential of their real emissions and the allocation. Note though that in liberalized electricity markets, the value of the allowances may still be passed on to customers, in spite of being allocated at no cost, as they would represent 'opportunity costs'[57]. This way, grandfathering/cost free allocation may lead to windfall-profits for utilities as has been observed in the context of the EU ETS (Grubb et. al. 2012, Sijm et. al. 2006).

In India, however, the potential for electricity tariff increases is very limited for utilities due to the structure of the Indian power market (see detailed discussion above) and the very limited ability to pay higher electricity prices for the major share of the Indian population[58].

An allocation based on benchmarking, e.g. where the most efficient power plants of a certain type get a cost-free allocation, and at the same time constitute an efficiency benchmark (kg CO_2/MWh) for all other installations of the same type, can be seen as middle-ground between cost-free and with-cost-allocation. Benchmarking also has the advantage of "awarding" the most efficient installations while giving strong incentives / need to act for operators of inefficient installations. There are numerous

[56] In its NDC, India has defined the target to generate 40% of its total electricity generation from non-fossil fuel sources by 2030.

[57] The cost associated with not making use of the opportunity to sell the allowances.

[58] The gross national income (GNI, formerly GDP) increased from 440 USD/capita in the year 2000 to 1670 USD/capita in 2016 (World Bank, 2018). Still, approx. 180 million people in India lived in poverty in 2014; approx. 750 million people had to live on less than 3.1 USD/day. Electricity theft due to poverty already is a serious issue in the Indian context (Golden et al., 2012), and would probably rise with increasing electricity tariffs. Another behavioural alternative to costly grid electricity would be an increased use of diesel generators for autonomous electricity generation, which would be counter-productive from an emission reduction point of view.

variations how a benchmarking-based allocation can be designed so that the financial burden for utilities is minimized while still maintaining proper incentives for reducing GHG emissions. Again, a detailed analysis of production and emissions data on installation level would be required for providing impact assessments of concrete design options and for giving informed recommendations.

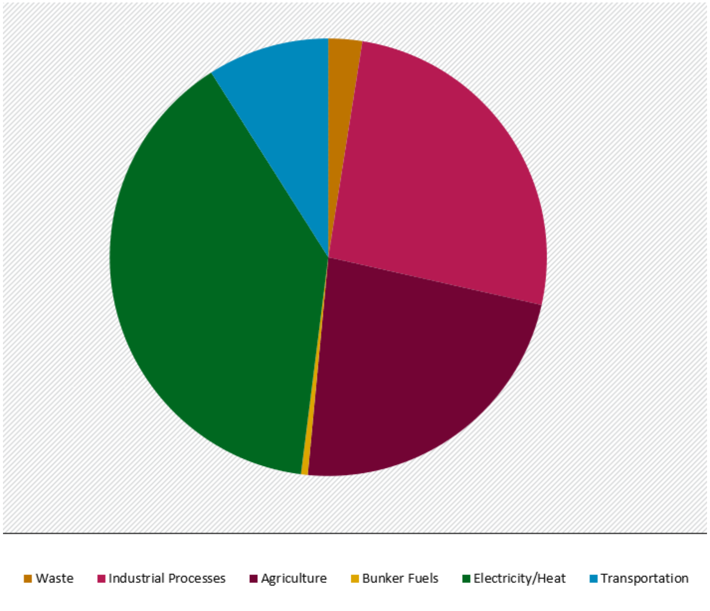
The target stringency (cap) is another factor influencing the (financial) efforts that the power sector needs to undertake in case of an ETS implementation. Under normal conditions, the target for an ETS-covered sector would be derived from the NDC target, where of course a sectoral differentiation is possible. A typically applied choice can also be to start with a relatively "easy" target (cap) and to make it more ambitious over time.

7.3.1.2 What sectors could be suitable ETS sectors in the Indian context?

There is a growing willingness to pilot market mechanisms in smaller sectors, which could eventually be expanded to the large sectors. For example, under the Partnership for Market Readiness (PMR), the Indian government wants to explore market mechanisms for the waste sector and small and medium enterprises. However, both are fields where in the past market mechanisms have not been particularly successful due to dispersed, small emission sources, highly diverse sets of stakeholders and high transaction costs for participation (MRV, compliance). Actually, small enterprises are often exempt from mandatory ETS participation.

As can be seen in figure 39, the highest share of GHG emissions in India results from electricity/heat-generation (39%), followed by industrial processes (26%) and agriculture (23%). Transportation is responsible for 8%[59], and waste for about 2%. Within the industry sector (figure 40), the subsectors with the highest GHG-contributions are iron & steel (43%), cement production (19%), non-metallic minerals (15%) and chemicals (8%).

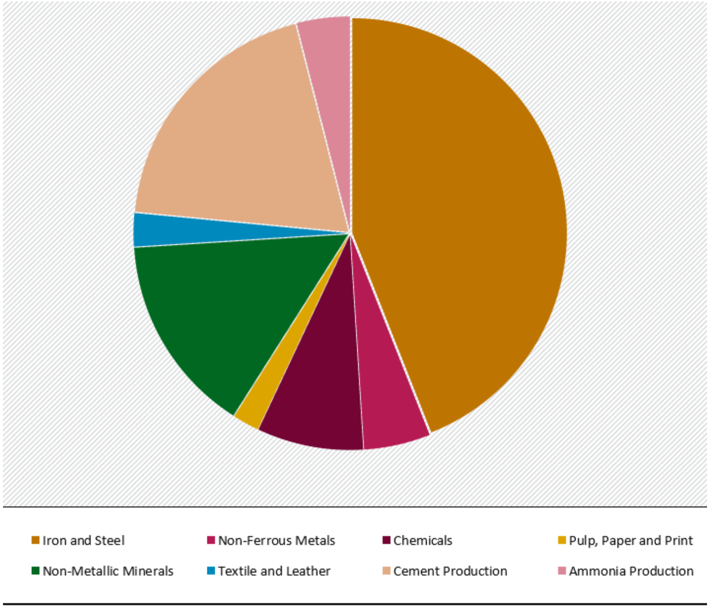
Figure 39: GHG emissions by sector in India 2014



Source: adapted from WRI (2015)

[59] For comparison, the transport sector accounts for roughly one quarter of total GHG emissions in the EU (Eurostat, 2018).

Figure 40: GHG emissions by industry sector in India



Source: adapted from Gupta et al. (2017)

Agriculture

The majority of agricultural GHG emissions occur at the primary production stage (Pathak et al. 2010), and are generated through the production and use of agricultural inputs, farm machinery, soil disturbance, residue management and irrigation.

Closely 60% of rural households depend on agriculture as their main source of income, and there are approx. 115 million landowners. The high number of farmers as potential participants of an ETS and the low amount of CO_2-emission per farmer due to the low level of automatization make an ETS in the agricultural sector unfeasible. Besides, a large share of agricultural GHG emissions is not CO_2, but methane CH_4 and N_2O – both difficult to quantify and MRV. However, farmers could still be incentivized to reduce their emissions within a domestic offsetting scheme (see discussion below).

Transport

From a GHG emissions point of view, the Indian transport sector is an important sector, and its relevance will keep increasing strongly in the future: from 2004-2016, emissions from road transport nearly doubled (from 118 to 230 Mt CO_2) (GHG Platform India 2017).

The typical challenge regarding the inclusion of the transport sector is the high number of small emitters. A downstream system defining car owners as direct participants is not feasible. An **upstream approach** targeting e.g. fuel stations or fuel companies would technically be possible. It needs to be noted that while those cannot directly influence the emissions of vehicles, an upstream ETS would lead to an increase of fuel prices and thus provide a financial incentive for car owners/users to reduce their emissions. Such an approach would automatically cover public and private bus fleets that are quantitatively very relevant[60].

[60] Buses take up over 90% of public transport in Indian cities (Pucher et al. 2007). Alongside the public companies are many private bus fleets: 2012, there were 131,800 publicly owned buses in India, but 1,544,700 buses owned by private companies (Open Government Platform India 2017).

Indian Railways provides another important mode of transport in India, transporting over 18 million passengers and more than 2 million tonnes of freight daily across one of the largest and busiest rail networks in the world. At the moment, about 42% of the rail system is electrified, the rest is fossil fuel-based (e.g. diesel). The Indian railway ministry aims at a 100% electrification in by 2021. If this can be achieved, ETS coverage of the relevant utilities could automatically cover this sector and an ETS, which can be seen as generally applicable in this subsector, will become unfeasible.

Iron and Steel

India is the world´s third largest producer of steel, contributing around 6% to the world´s total production. In 2016-17, finished steel production in India amounted to 101.8 million tonnes. The companies running the most important iron & steel units are Steel Authority of India, Rashtriya Ispat Nigam Ltd, Tata Steel, Essar Steel, JSW Steel and Jindal Steel & Power Ltd, together having a market share of roughly 58% (Joint Plant Committee 2017). Plant sizes of the industry largely depend on the type of steel production, see table 2.

Table 22: India-Crude Steel Production by main process types

Process	Number of plants	Production [MT/yr]	Production [Share of total (%)]	Capacity [MT/yr]
Basic oxygen converter	17	42	41	51
Blast furnace	58			80
Electric arc furnace	48	29	30	38
Electric induction furnace	1321	27	29	40
Total	**1444**	**98**	**100**	**209**

Source: adapted from Government of India 2018a

Average specific CO_2 emissions of the Indian steel industry are around 33% higher than the world average: 2.4 t/CO_2 per tonne of steel on average in India compared to 1.8 t/CO_2 per tonne of steel as the global average (AMCG 2011). Emission reductions are especially important in the light of the future growth of the Indian iron & steel industry. The government´s new steel industry targets a market capacity of 300 million tonnes by 2030 and to be a net exporter by 2025 (Government of India 2018,a).

A starting point for an ETS could therefore be to focus initially on blast furnace and electric arc furnace installations but leave out the smaller electric induction furnaces. Alternatively, a capacity threshold can be defined (x tonnes steel production per year) above which a participation in the ETS is mandatory. This would allow covering a large share of the emissions with a limited number of installations. At the same time, one would need to carefully avoid distortions within the sector, i.e. create an economic benefit for smaller installations due to non-coverage. A more detailed analysis would be required.

Cement

In the cement sector, there are about 180 plants with a total annual production capacity of over a million tonnes cement (Government of India 2018b), owned by over 40 companies. The emission intensity of the largest cement companies varies from approx. 0.5 to 2.1 tons CO_2/ton (Gilani (2010). Literature shows different average emission intensities: Gilani (2010) reports 0.85 t CO_2/t cement while IEA, WBCSD (2013) quote 0.719 t CO_2/t cement. This compares to world averages of 0.631 tCO_2/t cement in 2015 (GNR Project 2018) and 0.83 in 2007 (IEA 2007). So Indian cement production on average is more emissions intensive than the global average, but differences between companies are substantial.

Hence, a benchmarking approach based on BAT or based on the x most efficient companies/plants would be an interesting approach for an ETS.

In 2012, total installed capacity was around 320Mt. Average kiln capacity is currently 4500 tonnes per day (tpd), with the largest kilns reaching a capacity of 13500 tpd (Trudeau et al. 2011). Small cement plants in India account for a small share (ca. 5%) of the total installed capacity (Shakti, CII, BEE, 2013). One suitable option could be to start an ETS with the large, "professional" installations – i.e. all types listed in the table below except for the mini-vertical shaft kilns that can be considered rather semi-professional technology – and to add the latter only in a second phase or to phase them out mandatorily as was decided in China's National Climate Change Programme (2007). Another option would be to define capacity thresholds (installed production) for mandatory participation, and to lower this threshold over time.

Table 23: Technological Status of Indian Cement Industry as of Dec., 2007

	Mini-Vertical Shaft Kiln	Mini-Rotary kiln	Wet Process	Semi-Dry	Dry	Grinding Units
No of plants	193	17	26	4	107	29
Total Capacity (million tones)	1.51	3.11	5.71	1.8	146.56	20.3
Percent of total cement capacity	0.84	1.73	3.18	1.0	81.87	11.34
Average Kiln Capacity [TPD]	30-75	200-800	150-900	600-1300	2400-10,000	600-2500
Fuel consumption (Kcal/kg Clinker)	850-1000	900-1000	1200-1400	900-1000	670-775	Nil (except for captive power plants)
Power Consumption (kWh/tonne of cement)	110-125	110-125	115-130	110-125	85-92	35-45

Source: Indian Ministry of Environment and Forests (2010)

Chemicals

The chemical industry in India is dominated by ammonia production for nitrogen fertilizers. The ammonia industry accounts for more than half of the total energy use in the basic chemical sector, closely followed by petrochemicals (Trudeau et al. 2011).

In ammonia production, the type of feedstock (natural gas, oil, coal, water (electrolysis)) used plays a significant role for the amount of energy that is consumed and CO_2 produced besides the type of technology used[61]. The average specific emissions of Indian ammonia are 2.3 t CO_2/t ammonia; compared to 2.1 t CO_2/t ammonia in Western Europe and 2.9 t CO_2/t ammonia globally (IEDT 2018, table 3; own calculations). Given that this sector is characterized by a single, "standardised" product (ammonia) and an appropriate number of installations, an **ETS and also a benchmarking approach** appears feasible. A much more detailed, sub-sectoral analysis would be required for considering other products than ammonia.

[61] Steam reforming of natural gas produces on average 2.1 tCO_2/t NH_3, while in partial oxidation the emissions are about 3.3 tCO_2/t NH_3 when fuel oil is used and 4.6 tCO_2/t NH_3 when coal is used to produce hydrogen (IEDT, 2018)

Pulp and Paper

There are currently around 715 paper mills operating in India, most of which are small family-owned operations. Only 56 mills, i.e. 8% of the total number of mills, have a capacity of > 50,000 t/year, with an average capacity of 20,000 t/year (Confederation of Indian Industry 2013). An estimated additional 200 paper mills have been established in the unorganized sector[62] i.e. are very small and likely inefficient but difficult to grasp entities (Print Asia 2012).

Again, the regulation of a high number of small emission sources would be challenging. One option would again be to focus on larger installations initially and to exclude installations from the informal sector at least at the beginning. As in the sectors discussed previously, one would need to assess thresholds for participation in detail and also to ensure – e.g. through parallel measures for uncovered installations – that no competitive distortions and/or perverse incentives within the sector result.

Conclusions – ETS in the Industry Sector

From the macro-level analysis conducted above, a large share of the sectors iron and steel, cement and ammonia production seems to be ETS suitable. Note that these three sectors amount for roughly 2/3 of industrial GHG emissions. One of the key issues to be addressed is the question how to handle small installations (MRV-ability) and, if they are excluded, how to avoid intra-sectoral distortions of competitiveness. The pulp and paper sector has a high potential for emission reductions, but the high number of very small emitters makes an ETS inclusion challenging. Aluminium production is another industry sector with relevance for an ETS and strongly increasing production forecasts until 2050.

The agricultural sector does not appear suitable for an ETS. For the transport sector, an upstream ETS could be a solution. Overall, when designing an ETS for the Indian context, the interactions between these sectors, as well as interactions with and within the power sector need to be considered.

Table 24: Overview Industry sectors in India

Sector	Total emissions sector (million t CO_2-eq/year)	Number of installations	Average capacity per installation	Average million tCO_2/year/ installation	Average tCO_2/t product	World average tCO_2/t product	Included in PAT-scheme?
Iron & Steel	223	1166 (crude steel)	144,000 t/year	191,252	2.4	1.8	yes
Cement	96.08	180 (installations> 1 million tons/yr)	1,64 million t/year	533,778	0.78	0.83	yes
Pulp & paper	11.42	715	20,000 t/year	14,275	2.46-11.8		yes
Ammonia	29.6	32	418,750 t/year	925,000	2.23	2.87	yes (Fertilizer)

[62] In the Indian context, "unorganised sector" relates to unincorporated private enterprises owned by individuals or households engaged in the sale or production of goods and services operated on a proprietary or partnership basis and with less than ten total workers (National Commission for Enterprises in the unorganized sector; India).

7.3.1.3 What would be the pros/cons of allowing for domestic offsetting?

Domestic offsetting can play an important role in

a) containing costs for covered entities,
b) providing an economy-wide price signal for mitigation and
c) incentivising the private sector not covered by an ETS to take mitigation action.

Domestic offsetting would be highly relevant in India for involving the private sector and for incentivising the search for emission reductions in sectors that are not covered by an ETS. In the context of the CDM, the Indian private sector had probably the highest level of awareness of any host country. This was pushed by a highly active media scene reporting about pioneers benefitting from CDM participation. Indian entrepreneurs were highly versatile in mobilizing CDM projects of various sizes and technologies. Moreover, the "ecosystem" of CDM service providers was very elaborate and able to provide project documentation, audit and verification services at probably the lowest cost worldwide. While the price crash in the CDM market and subsequent "hibernation" of CDM market players has led to significant erosion of that ecosystem, there is still a critical mass of expertise available that could mobilize projects quickly under a domestic offset system. One can thus expect a significant supply of domestic offset credits building up quickly if the private sector has trust in the long-term stability of the system. Private sector engagement is urgently required for reaching the ultimate objective of the UNFCC.

Depending on the size of the ETS and the stringency of its cap, demand for offset credits can be much smaller than their supply. In such a situation, the price of offset credits is likely to be very low. An unlimited use of offset credits could then lead to a strong reduction of the price of emissions allowances, with the incentive for emission reduction by ETS-covered entities being reduced accordingly. On the other hand, a strong supply of offset credits would also reduce the financial efforts that ETS participants face. This means that a well-balanced use of domestic offsetting is important, and that the extent to which it is allowed should be reflected in the ambition level of the cap. Depending on the concrete design (e.g. with regard to additionality criteria; limits in crediting periods; and volume thresholds and/or project eligibility criteria[63]), domestic offsetting can help India to reduce emissions beyond the scope of the ETS.

7.3.1.4 Legal / Institutional track

India as a federal state has certain institutional features that are important to take into account in designing and implementing an ETS.

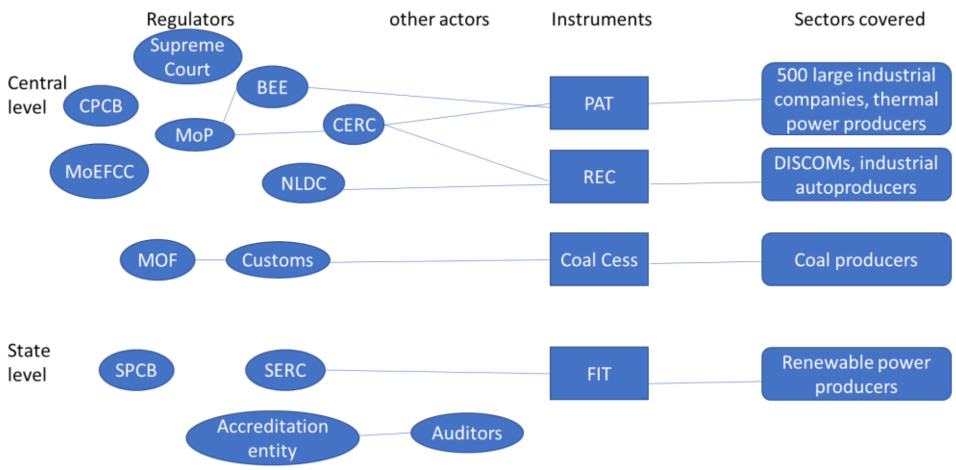
Formally, the policy instruments PAT, REC and coal cess are all anchored at the central level. PAT is overseen by the Ministry of Power, the Central Electricity Regulatory Commission and the Bureau of Energy Efficiency. REC is likewise under the authority of the Ministry of Power, the Central Electricity Regulatory Commission and the National Load Dispatch Centre. The Coal Cess is administered by the Ministry of Finance and Customs; with the latter being responsible for covering imports. The Ministry of Environment, Forests and Climate Change is indirectly involved in all instruments when it comes to MRV of emissions impacts due to the requirements for reporting under the UNFCCC and the Paris Agreement. The state level is important with regards to feed in tariffs for electricity; its State

[63] The classical means to prevent a situation where the allowance price is eroded by massive use of offset credits is a credit use limit as implemented in most ETS worldwide. One however needs to carefully choose the used threshold in order to both preserve allowance price containment as well as sufficiently attractive incentives for offset project developers. A second approach would be limiting the types of activities that can generate offset credits. Only activities with high sustainable development co-benefits could be eligible, with the definition using experiences from CDM project approval by the national CDM authority. But that experience also shows that safeguarding sustainable development co-benefits was never fully operationalized in the process of approving CDM projects in India as well as monitoring of their outcome. Last but not least, a stringent approach for additionality determination would reduce credit volumes significantly.

Electricity Regulatory Commissions can specify the tariff levels both for consumers and feed-in-tariffs (FIT) for RE producers.

With regard to enforcement, the Supreme Court plays a crucial role, even if it is only involved if a case is brought to its attention. It can enforce both on the central and state level. A case in point is the enforcement of compressed natural gas use for all public transport vehicles in Delhi. In 1998, three years after a court case filing the Supreme Court published a Directive that by April 2001 all buses, three-wheelers and taxis in Delhi would have to be converted to CNG (see Mehta 2001 for a detailed account of the case and reactions of the lobbies). When by April 2002 nothing had happened, the Supreme Court published a directive which imposed a penalty on the government for wasting the court's time, and in addition, a daily penalty for each diesel bus running. By December 2002, the last diesel bus had been replaced (see Rosencranz and Jackson 2003 for a critical review of the Supreme Court's action).

Figure 41: Institutional structure and covered sectors of PAT, REC, Coal Cess and FIT



Source: Own illustration

7.3.1.5 Is there a potential for an ETS pilot on state level?

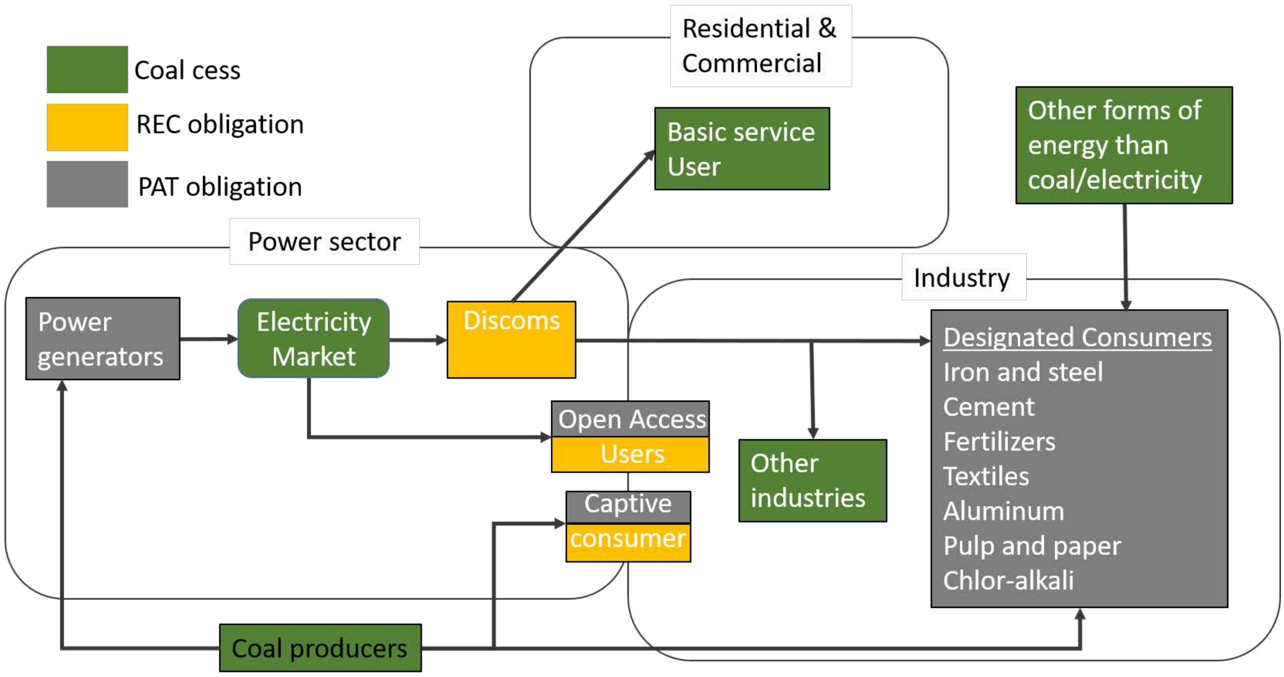
Principally, Indian states can introduce emissions trading systems on their own. Tamil Nadu and Gujarat were in discussions about this with GIZ in 2015-2016. Already previously, an ETS design for local air pollutants at the state level in Gujarat, Maharashtra and Tamil Nadu was proposed (J-PAL 2011). The proposal suggested that the Central Pollution Control Board (CPCB) would define technical standards for monitoring while the State Pollution Control Boards (SPCBs) would oversee the adoption of continuous emission monitoring systems and enforce the requirement of holding permits to emit. However, this proposal never proceeded beyond theoretical discussions. Given that Indian states see themselves as competing with each other, the appetite to unilaterally engage in potentially costly policy instrument testing is rather limited. This could already be witnessed in the context of the REC scheme, where enforcement is lacking due to perceived competitiveness issues of industry and electricity security and might be a show-stopper for ETS (pilots) on State level as executed in other countries.

7.4 What are the challenges and pitfalls of integrating an ETS into the Indian climate policy landscape?

7.4.1 Map of policy instruments

In India, three key policy instruments that could serve as stepping stones for an ETS are implemented on the central level – PAT, REC and the coal cess. These are overseen by various central government institutions. As visualised in figure 42 below, they cover diverse subsectors of the economy. The only relevant instruments implemented on the state level to date are feed-in tariffs for renewable energy specified by the State Electricity Regulatory Commissions (SERCs).

Figure 42: Overview of sectors included in policy instruments[64]



Source: Own illustration

7.4.2 How to integrate the ETS into the Indian climate policy landscape?

Depending on its design, an ETS for the energy and industrial sectors could overlap with all policy instruments discussed above. At the same time, the existing instruments could serve as important building blocks for an ETS – i.e. the experiences gained with establishing institutional infrastructure and legislative frameworks, data gathering and processing exercises, MRV systems and registry and trading systems (in case of PAT) would all be very useful for setting up an ETS. Given India's rich experience with these other policy instruments it can reasonably be argued that India could be ready for an ETS within the next couple of years. Politically, however, this is currently unlikely as the Indian preferred choice of policy instrument has a fundamentally different character than the core characteristic of the ETS: i.e. rather using energy efficiency/relative targets than absolute emission targets. The political willingness to adopt an ETS could be promoted if the international negotiations generated incentives for India, e.g. under Article 6.2 of the Paris Agreement.

7.4.3 Potential for coexistence of policy instruments and barriers for transition

Looking at the individual policy instruments, the PAT scheme would have the largest overlaps, as it is already covering all large industrial emitters and thermal power producers that are classically covered by a downstream ETS. Although PAT is already trading (energy efficiency) units, it is politically challenging to argue why it should be replaced by another trading scheme, trading GHG units.

However, the **PAT scheme** and an ETS can theoretically co-exist. Having two instruments in place that promote energy efficiency (EE) of different sectors would provide a higher incentive to implement EE

[64] Open access users are electricity consumers with a connected load of > 1MW that have direct access to the open electricity market.

measures. Sectors having participated under the PAT mechanism before entering the national ETS would have the advantage of being already more efficient, if this is properly reflected in the choice of allocation. The situation is comparable to the continent-wide EU-ETS where different individual countries had implemented domestic market-based instruments to enhance EE before ETS introduction or even in parallel (see chapter 8 below on the experiences made in Europe).

Often, concerns of double-burden come up when an additional policy instrument is introduced. This, however, strongly depends on the type of policy instruments and the stringency of targets in both policy instruments as the following examples show:

- In case of a cost-free allocation that is quantitatively aligned with the energy efficiency targets of the PAT scheme (e.g. 4% efficiency increase in cycle 1), no additional financial burden would result for entities that reach their PAT.
- In case of a cost-free grandfathering based on historical emissions[65], constant production and energy efficiency increases according to the PAT targets, participants of an ETS would even be able to sell surplus allowances – i.e. their financial burden would be reduced. If, however, production increases, ETS participants might need to buy emission allowances even if they meet their PAT targets.

Some of the Indian experts interviewed as part of this study were of the opinion that if co-existence of PAT with an overlapping ETS was envisioned, fungibility between the instruments would be important. Covered entities would be more willing to engage in multiple systems if these systems are intertwined. The basic rationale for linking different market mechanisms is to achieve efficiency gains when prices of the traded commodities equalize through trade, which would lower the cost for participants.

However, it is necessary to keep in mind potential pitfalls when linking different market mechanisms, a few of which are addressed in the following. The first question is how the different units of the schemes (e.g. ESCerts versus ton $CO_{2\text{-eq}}$) could be converted appropriately so that the integrity of the linked systems is not undermined. Secondly, the issue of double counting needs to be addressed if e.g. efficiency improvements yield both efficiency and carbon units (also see chapter 6.4.3.3). Regulatory implications in particular have been pointed out as pitfalls by researchers, as a high degree of complexity can arise when provisions for e.g. MRV, enforcement, penalty mechanisms and a joint (or interlinked) registry need to be established (Sterk et al. 2006). These are even more pronounced when considering the differing policy objectives of the different Indian trading schemes. Even when linking two already existing ETS systems, Flachsland et al. (2011) highlight that discrepancies in their objectives such as the emission reduction target, any price cap and/or floor, or borrowing arrangements can pose significant challenges. This is because the new overall system will become a mix of the individual systems' properties.

With regard to the **REC mechanism**, electricity distributors and industrial electricity autoproducers (generating electricity for their own consumption) would be covered by an upstream ETS. The same applies to coal producers and importers liable to pay the coal cess as well as FIT-receiving renewable power producers. Under a downstream system, only the autoproducers would be covered, depending on the installation size threshold used to define installations covered by the system. One would need to be careful to avoid double counting of emission reductions, meaning the REC targets should be taken into account in cap-setting for the ETS.

Whether coexistence between the **coal cess** and a potential ETS is feasible depends on the future use of revenues. If coal cess proceeds go into the general budget, companies will argue that a combination of a cess and an ETS represents unfair multiple coverage. In case the government uses the proceeds for

[65] For this example, we assume the same base year that applies under the PAT scheme.

the original purpose, companies are less likely to rally against double coverage. Note that, regardless the use of revenues, any double "burden" can also be seen as a double "incentive", i.e. instruments can nicely complement each other in awarding companies/players that effectively reduce their GHG emissions (note that this applies to all policy instruments, not only the coal cess).

The **CDM** could co-exist with an ETS and even experience new momentum from supporting demand created for CERs under an ETS; however, the national regulation for the ETS would need to specify eligible sectors / activities / regions for offsets to be utilized under the ETS. Double-counting of emission reductions in ETS sectors should be avoided in case Indian CDM projects are eligible for use in the Indian ETS, i.e. new projects should only be allowed in non-ETS sectors. If credits can be used for compliance in the ETS, this should be reflected in the cap-setting to avoid over-supply in the market. Here, the Chinese case could serve as an example, both with regards to the nature of the traded unit as well as the institutional anchoring:

China introduced the concept of Chinese CERs (CCERs) that can be used as offsets in the provincial trading schemes. CCERs can be issued for projects in China, which got a Letter of Approval from the Chinese Designated National Authority but are not yet registered at the CDM Executive Board, registered CDM projects applying for issuance of credits generated before the date of registration and for registered CDM projects for which the CDM Executive Board never issued any emissions reductions. They can also be issued for newly developed projects not registered under the CDM. The National Development and Reform Commission (NDRC) oversees methodologies – most of which are directly copied from the CDM - and issuance of CCERs, and administers a national registry. In order not to generate oversupply, provinces defined maximum usage thresholds as well as eligible vintages, project types as well as regional sources. The former range between 5 and 10% of allowances, CCER generation date needs to be after 2013, non-CO_2 gases are often excluded and most provinces prefer projects in their own jurisdiction.

7.5 Key findings on India

In the previous sections, we analysed how existing policy instruments could contribute to the development of an ETS in India in the future and discussed several issues relevant for considerations of political economy in the Indian context. Subsequently, we conclude on India´s readiness for introducing an ETS in this regard.

Contribution of Existing Policy Instruments to ETS Implementation

The **PAT mechanism**, a national baseline-and-credit white certificate scheme for most energy intensive industries, is perceived as relatively successful mechanism despite low market liquidity and supply overhang. Regarding the preconditions for establishing an ETS as defined in chapters 2 and 3, experiences made under the PAT scheme can contribute to the technical and legal/institutional tracks. Engagement and participation of the covered industries have been very high. Although several stakeholders expressed their concerns that the targets of PAT cycle-I have not been ambitious enough, many interviewees felt that PAT's first phase was intended to test whether the underlying processes would result in a functioning mechanism. A closer look at the mechanism shows that it can contribute to several ETS building blocks. Due to its trading component, PAT has created a functioning market of ESCerts, online platforms and exchanges where participants need to register to trade environmental commodities. A registry in which ESCert balances of covered entities are stored has been established. PAT contributes to understanding the market actors and required infrastructure for trading of certificates. Eight sectors are covered already and the scope will be expanded over the course of the next cycles. The available sectoral baseline data could contribute to the cap setting process. In order to keep track of companies' performance under the scheme, an institutional framework for MRV with external audits has been established, along with capacity in public and private enterprises.

While the monitoring of an ETS would need to be different from the current one used in PAT, the shift to monitoring CO_2-emissions would be easy, as PAT takes into account how much fuel (coal, gas, etc.) was consumed for generating a specific product output and calculates companies' Specific Energy Consumption (SEC).

Since PAT is a baseline-and-credit mechanism, credits are only issued to entities that exceed their target; thus, no allowances have to be allocated to all individual entities. The process of setting baselines is based on the past SEC performance of entities. This combination of grandfathering and benchmarking can generate experiences that benefit ETS allowance distribution. Trading of phase-I ESCerts has ended on 19 January 2018 and a total volume of 1,298,904 ESCerts have been bought by DCs that missed their targets, which represents a compliance rate of 90%. This relatively high compliance has been expected due to the strong engagement of covered entities and seemingly "easy targets". When designing an ETS, replication of the success factors that allowed for a broad participation in the scheme should be ensured, while limiting "too easy targets" as they would not deliver the desired environmental benefit. The experience gained during development of the **PAT scheme** is very relevant regarding the key building blocks of an ETS. Most importantly, lessons learnt with establishing the institutional infrastructure, allocation data and methodology, MRV system, registry and functioning markets could be helpful for an ETS.

The **REC mechanism** is perceived as less successful compared to PAT, because trading has been very limited over the last years due to a massive supply overhang linked to lack of enforcement. With respect to the preconditions for establishing an ETS as defined in chapter 2, the experiences made under the REC scheme can nevertheless contribute to the technical and legal/institutional tracks. The lacking enforcement is due to the fact that the regulation of the electricity sector falls under the responsibility of the state governments, whose first priority is ensuring electricity access for their population. REC shows that incentives need to be set right for the institutions involved in setting/enforcing targets. To achieve effective incentives, the national body that would implement the ETS would need to work closely with state level agencies responsible for enforcement. In addition to the lack of enforcement, the supply overhang was increased by the fall in PV prices to levels so low that electricity producers would rather go for direct renewable energy generation to fulfil RE targets instead of purchasing REC certificates. Renewable energy generators can apply for issuance of REC on a web-based IT platform that is connected to a registry where the amount of electricity supplied to the grid is specified. These technical processes for trading and MRV can be seen as building blocks for potentially similar structures for a country-wide ETS. The same applies to the monitoring and reporting of electricity generation data at installation level.

The **coal cess** is a tax on produced and imported coal and related products from mines. It thus operates like a pure fuel tax. The cess could principally inform a national ETS scheme regarding the regulation of the system, as well as regarding the established MRV system; i.e. concerning the preconditions for establishing an ETS (see chapter 2), experiences made under the coal cess can contribute to the technical and legal/institutional tracks. Enforcement of the cess, which has been unproblematic and is supported through random sample check of compliance, is another area where a nationwide ETS could benefit from experiences made under this instrument. Overall however, the cess is not regarded as priority instrument to consider when establishing emissions trading.

The **Clean Development Mechanism** offers some useful lessons. Not only has it raised awareness of the private sector for possible revenues from GHG mitigation, but also has it established strong **capacities in the area of MRV**. Although this capacity has predominantly been created among environmental consultancies and not throughout the entire private sector, it is still within the country and could benefit an ETS that would require expertise regarding emission reduction methodologies. To a limited extent, the CDM activities in the country have contributed to firms understanding their **marginal abatement cost curves**, which is an exercise that is very relevant in the context of an ETS. Thus, given the preconditions for establishing an ETS, the experience with the CDM could principally contribute to the technical and legal/institutional tracks. Entities covered by an ETS, however, are likely to be quite different than for the CDM, due to the voluntary nature and sectoral focus of the latter.

Table 25 captures the contribution of the four policy instruments to the eight ETS building blocks. The four existing policy instruments can contribute most in terms of the MRV, market and registry arrangements of an ETS. Also, with regard to enforcement of targets, lessons can be learnt from the current mechanisms, which in some cases suffer from non-compliance. With regard to other ETS building blocks, such as cap setting and allocation of allowances, the existing policy instruments provide only limited insight.

Table 25: Contribution of selected policy instruments to ETS building blocks

	Cap	Offsetting	Market	Scope/ PoR	MRV	Registry/ IT-sys	Allocation	Enforcement
PAT	+	0	++	+	++	++	+	+
REC	0	0	+	0	+	+	0	+
Coal cess	0	0	0	+	+	0	0	0
CDM	+	++	+	o/+	+	0	0	0

Source: Authors

India's Political Willingness to Implement National ETS

Introducing an ETS is not only a matter of technical and institutional capabilities but depends on the political willingness to implement a national system with the primary goal to reduce GHG emissions. India is currently overtaking China as the world's most populous country, and undergoing a rapid urbanization process. This leads to a significant GHG emissions increase. At the same time, a large share of the Indian rural population still lives in abject poverty and lacks access to modern energy. Thus, India still has a very low per capita emission, just a third of the Chinese value. The political narrative is therefore that India should not yet face significant mitigation responsibilities. While the willingness of the Indian government to implement measures that promote climate action has increased over the last decade, the **government still sees climate policy as subordinated to social and economic development**. India's NDC thus refrains from setting an absolute GHG emissions reduction target and sets an intensity target instead.

The framing of mitigation policy as *"***luxury item***"* has led to the inability to introduce a domestic policy instrument that specifically targets GHG emissions in India. All three domestic policy instruments assessed in this study focus on energy. The REC mechanism promotes renewable energy, the PAT mechanism energy efficiency and the coal cess reduction of coal use. In addition, the ongoing ETS pilots in the three states Gujarat, Tamil Nadu and Maharashtra are targeting classical air pollutant concentration based on SO_2 and NOx.

Given these conditions, **political willingness** to introduce a domestic ETS in India in the short and midterm appears **very limited**. The recent announcement from MoEFCC to plan a voluntary carbon market with assistance from the World Bank (CarbonPulse 2017) is probably more intended to harness international financing through revenues from sales of emissions credits than a serious effort to lay the basis for a mandatory ETS. This interpretation is corroborated by the recent tenders of the World Bank "Partnership for Market Readiness" Initiative. India received 8 million USD in early 2017 for establishing two crediting mechanisms in the waste sector and in the area of small and medium sized enterprises (World Bank 2017b), with a view of selling credits abroad.

Furthermore, this interpretation is underpinned by several of the interviewed stakeholders who stress that India would do much better without an ETS, although the **country has the ability to implement it**. Many stressed that it made no sense to scrap the existing array of policy instruments which – if compliance was ensured – would contribute to the NDC targets. Stakeholders stated that a concerted effort to enhance PAT and REC in terms of compliance and target stringency would be more suitable to the Indian context than setting up a new ETS. Both mechanisms have been developed and refined over the course of the past 5-7 years but none of them has matured yet. Cancelling them now in favour of a domestic ETS would alienate involved entities from the public and private sector given the amount of effort they spent on setting up the mechanisms, according to these stakeholders. The existing policy instruments could also co-exist with an ETS, and eventually be transitioned into one.

Nevertheless, many stakeholders acknowledged that **ultimately having all sectors covered under a single mechanism, such as an ETS, would be an option** if political willingness was strong enough. Having a single mechanism rather than an array of partially overlapping sectoral schemes would facilitate compliance and accounting while reducing transaction costs. In case India at some point decides to have one overarching ETS, it can benefit significantly from existing structures and experiences from current policy instruments.

Limited ETS potential in the Indian power sector?

Considering India's national priority to support and enhance energy security and power supply, one might conclude that introducing an ETS in the Indian power sector is not a political option. However, as the analysis above showed, there might be an ETS-potential in some of the segments of the Indian power sector:

- for captive power plants in industry,
- for (some) independent power producers (IPPs). Currently, 8.8 GW of coal-fired «Ultra-Mega Power Plants» and 9.5 GW of gas power plants, i.e. 6% of total Indian electricity generation capacity (CEA 2016) might be a target.

In both cases, a more detailed sectoral analysis regarding the financial and economic implications could lead to more detailed recommendations – also with a view to allocation method and target stringency by sector. In contrast to this, an ETS does not seem to be a good option for public power companies (with the understanding that few could pass on costs under the current framework), for back-up facilities (MRV-ability), nor for renewable off-grid facilities. At the same time, one needs to be very careful not to create competitive distortions within the electricity sector, or to create perverse incentives for electricity consumers.

High potential for an ETS in the Industry Sector?

Our initial, birds-eye analysis concludes that a large share of the sectors iron and steel, cement and ammonia production seems to be ETS suitable. These three sectors amount for roughly 2/3 of industrial GHG emissions. One of the key issues to be addressed is the question how to handle small installations (MRV-ability) and, if they are excluded, how to avoid intra-sectoral distortions of competitiveness. The pulp and paper sector has a high potential for emission reductions, but the high number of very small emitters makes an ETS inclusion challenging. Aluminium production is another industry sector with relevance for an ETS and strongly increasing production forecasts until 2050.

It must be noted though that the existing PAT scheme covers those sectors as well as it is explicitly focussing on energy intensive industries. Hence, a situation of overlap of the two policy instruments could result. As we discussed in the previous sections, there are ways how to deal with a double-coverage of sectors and how to avoid "unfair" double-burden or double-counting. In the end, it will always be a matter of political will.

8 Excursus: Co-existence of climate and energy policy instruments in the EU

8.1 At the EU level

EU policies & targets

In the EU, the EU Emissions Trading System (EU ETS) is considered by the European Commission as the 'corner stone' of the EU's climate policy and 'its key tool' for reducing greenhouse gas emissions cost-effectively in the affected sectors (European Commission 2018a). However, separate policy targets and instruments have been in place at the EU level in parallel, addressing total (economy-wide) GHG emissions, the share of renewable energy (RE) in total energy consumption and energy efficiency (EE) improvement. Even though various impact assessments suggested total higher mitigation costs for such a combination of targets[66], this was done as other, non-GHG policy targets are also considered important. Such other targets include, amongst others, security of supply in the electricity sector, reduced import dependency for fossil fuels, addressing (other) air pollutants, innovation in clean technology, jobs and green growth (European Commission 2018b; 2018c). Actions towards meeting these policy targets are in turn also expected to help support the longer-term transition to low-carbon development in the ETS sectors.

As a result of the above, some ETS sectors are affected by more than one policy (target). The energy sector, for example, is expected to play an important role in reaching renewable energy targets. Similarly, industry in general also has to contribute to energy efficiency (and biofuels) targets. However, the EU renewable energy targets are generally[67] translated into renewable energy targets at the member state level and achieved through individual policy instruments implemented by member state governments. The specifics of such national policies ultimately determine which stakeholders are affected and the effort required. A specific renewable energy policy may focus for example on EU ETS participants, on specialized renewable energy producers or suppliers (not covered by the ETS) or on consumers as regulated entities. The choice for e.g. portfolio standards or investment subsidies determines the 'burden' for the entities addressed by the policy. So the extent to which EU ETS participants are subject to additional compliance and/or reporting requirements due to other policies depends on the EU member state, as is the extent to which mitigation activities taken in EU ETS installations are also awarded by other policies.

In terms of the EU ETS target (the cap), the emission reduction effect of other targets and policies has in principle been taken into account in the setting of the EU-wide cap[68] (as far as they were in place at the time of cap-setting). In other words, emission scenarios and mitigation costs that were used to decide on the level of the cap included some measures to achieve also the other policy targets for total GHG emissions, renewable energy and energy efficiency. While no individual policy measures were identified in this context, it can be argued that as long as the EU targets on renewable energy and energy efficiency are not yet reached, implemented RE/EE policies are the vehicles towards achieving these targets, and are therefore reflected in the cap.

The economic crisis, a larger than foreseen use of international offset credits and the prevailing banking rules in the EU ETS resulted in a large over-supply in the market. A number of measures have been adopted to reduce this over-supply and its impact on carbon prices in the future. This includes the

[66] Compared to a GHG-only target, see e.g. the Impact Assessments for the 2020 Climate & Energy Package (European Commission 2008) and for the 2030 Climate and Energy Framework (European Commission 2014).

[67] With the exception of biofuel targets, which are defined at EU level

[68] i.e. since the start of Phase 3 in 2013. In the preceding two phases, each Member State's allocation was also supposed to be done 'in line with other policies & measures' (criteria for National Allocation Plans as laid out in the first Commission Guidance document). However, this was not always adhered to.

market stability reserve, operational as of 2019, which temporarily removes allowances from the market once the over-supply reaches a certain threshold[69]. While not introduced for dealing with the effect of co-existing policies, this mechanism could be helpful in this regard as well. The revised ETS Directive, applicable as of 2021, contains the provision that EU member states can voluntarily cancel equivalent amounts of allowances it can auction "In case of closure of electricity generation capacity in their territory due to additional national measures" (Art.12.4) (European Commission 2018e).

EU ETS and JI projects

Aside from using international offset credits for EU ETS compliance, there is another link between the EU ETS and offset mechanisms in the case of Joint Implementation (JI). JI allows all Annex I countries under the UNFCCC to implement emission reduction projects to generate ERUs[70] for use by other Annex I countries. As these projects were expected to occur in countries in transition (Eastern Europe, Russia, Ukraine, etc.) and not in the EU, this was not considered an issue when the EU ETS Directive was adopted in 2003. This changed, however, with the accession of the new member states from Eastern Europe in subsequent years. In addition, some Western European countries also allowed JI projects on their territories. With this, JI became a de facto (regional) domestic offset mechanism, co-existing with the EU ETS. This led to concerns of potential double-counting of emission reductions in case of JI projects in EU ETS sectors, i.e. emission reductions that would result in both ERUs as well as excess EU allowances that could both be used for compliance or sold separately. To prevent this, the so-called 'Double-counting decision' was adopted, as part of the Linking Directive[71] that regulates the relation between the EU ETS and the Kyoto Mechanisms.

The main principle of the decision is that greenhouse-gas emission reductions (or limitations) should not be allowed to be counted (and sold) twice. As the Acquis Communautaire requires accession countries to adopt all EU legislation, compliance under the EU ETS should be considered the baseline for JI projects. The decision therefore prescribes that no ERUs (or CERs) can be issued for reductions (or limitations) of GHG emissions that take place in installations participating in the EU ETS. An exception was made for early projects already committed to by Member States, as contractual obligations would already have been in place for such projects. ERUs/CERs could be issued until 31 Dec 2012 on the condition that corresponding amounts of EU allowances are cancelled. Note that this cancellation was required for both 'direct' JI projects (projects in EU ETS installations) and 'indirect' JI projects (projects indirectly affecting emissions from EU ETS installations, e.g. through electricity conservation).

8.2 At the Member State level

At the national level, several national policy instruments were introduced while the EU ETS was operational to support additional policy objectives. Also, some policies were already in place at the EU ETS introduction and continued to exist in parallel, in some cases in revised form. Here we will discuss a number of examples across different types of policy instruments.

8.2.1 The UK Carbon Pricing Support mechanism[72]

The UK's Carbon Pricing Support (CPS) mechanism imposes a carbon tax on fossil fuels used to generate electricity in the UK. It was implemented in 2013 to support the EU ETS and strengthen its carbon price incentive as to contribute to the UKs long-term GHG targets. The CPS basically introduces a

[69] In number of allowances, see for more details (European Commission 2018d)

[70] Emission Reduction Units, the certified carbon credits resulting from emission reduction activities in a JI project.

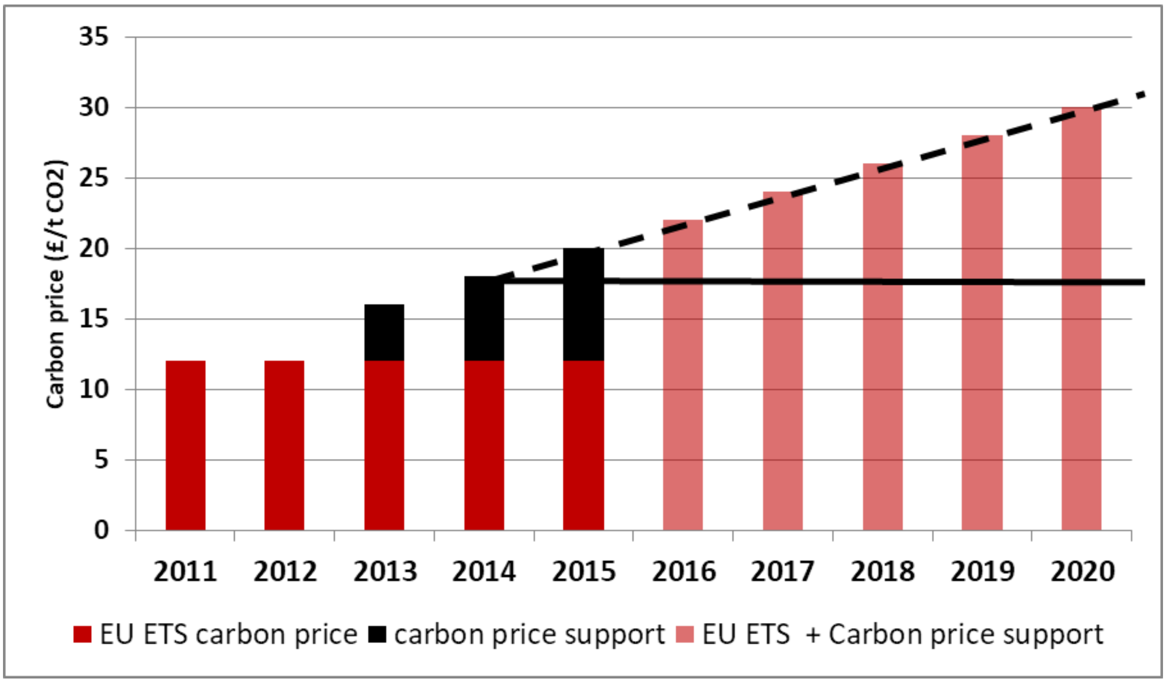
[71] Formally a 2004 amendment of the 2003 ETS Directive (European Commission 2004).

[72] See e.g. (HM Revenues & Customs, 2018; House of Commons 2018, IIP 2018a)

carbon price floor for the electricity sector in the UK. As the prevailing EU ETS carbon prices were deemed insufficient to drive low carbon investment, the Carbon Price Floor (CPF) was introduced to establish a minimum price level, which increases over time, and provide investors with more long-term certainty. The price floor consists of the EU ETS allowance price and the Carbon Support Price, which tops up the EU ETS allowance prices, as projected by the Government, to the carbon floor price target. This target level was set at GBP 9/tCO_2 at its introduction in 2013, increasing to GBP 18/tCO_2 in 2014. While initially intended to increase to 30/tCO_2 in 2030, competitiveness concerns led to a freeze of the CPF at this level until 2020. The CPF is implemented as part of the Climate Change Levy (CCL)[73]. All revenue from the CPF is retained by the Treasury.

Figure 43 illustrates the concept of the carbon price floor described above, showing the actual EU ETS carbon price development between 2011-2015 (red bars), the carbon price support top-off in 2013-2015 (black bars) and the expected total carbon floor price (EU ETS carbon price + carbon price support) up until 2020 (black lines[74]).

Figure 43: Concept of carbon price floor and carbon price support calculation



Source: adapted from House of Commons (2018), IIP (2018a). The dashed diagonal line shows the planned increase of the CPF at its introduction, the solid line indicates the CPF freeze at of 2014 levels agreed in 2014.

The CPF uses Carbon Price Support rates to establish the regulated entities' tax liability. CPS rates, which are set three years in advance, are provided for different fuel types on a GBP/kWh basis[75]. This is calculated by multiplying the difference between the target carbon price and the market price[76]. This

[73] The Climate Change Levy (CCL), introduced in 2001, is a tax applied to energy consumption by companies and public sector organisations, automatically added to their energy bills. Regulated entities can be partly exempt from paying the CCL by participating in Climate Change Agreements (CCAs), voluntary agreements with the UK government with targets for energy efficiency improvement or CO_2 emission reductions. Before the introduction of the CPF electricity generation was exempted from the CCL.

[74] The figure shows both the planned increase of the CPF at its introduction (dashed diagonal line), as well as the CPF freeze at 2014 levels, agreed politically in 2014 (the solid horizontal line).

[75] Three rate categories are distinguished: 1. gas of a kind supplied by a gas utility; 2. any petroleum gas or other gaseous hydrocarbon in a liquid state; 3. coal and other solid fossil fuels (petroleum coke, lignite, coke and semi-coke of coal or lignite), see (HM Revenues & Customs, 2018).

[76] Calculated from the average annual Intercontinental Exchange – European Climate Exchange -Ebenchmark end of day settlement price for carbon for delivery in the target year.

represents the CPS rates by carbon content (i.e. per tonne of CO_2, the black bars in Figure 43. This is then multiplied by standard carbon emission factors (in tCO_2/kWh), which gives a CPS rate per KWh, which is paid by electricity generators. Note though, that at the same time, the UK government has sought to shield energy-intensive industry from the increased price of electricity, by extending its 'Energy Intensive Industries Compensation Package'[77] to include not only the effects of the EU ETS, but also of the CPF. This includes GBP 110 million to compensate for the impact of the EU ETS (GBP 2.50/MWh) and GBP 100 million for the UK's Carbon Price Floor (GBP 10.50/MWh) for the period April 2013 to March 2015 (House of Commons, 2018; House of Commons 2016; EEF, 2017).

8.2.2 The Netherlands' negotiated agreements on industrial energy efficiency[78]

The Netherlands has a long history of using voluntary – or rather negotiated – agreements between industry and government as part of its energy policy. As of 1999, the energy-intensive industry (<0.5PJ/yr) and the electricity sector were covered by the Benchmarking Agreement[79]. Instead of the annual efficiency improvement rates used in previous agreements, the benchmarking agreement adopted an energy efficiency level to be reached in the target year 2012, defined in terms of 'top-of-the-world' performance[80]. The rationale for this approach was that once companies belong to the 'top-of-the-world' limited further improvement efforts could be required from them.

When the EU ETS started, the Dutch government kept in place the Benchmarking Agreement, but sought to account for early efforts by its participants in the national allocation decision by adopting a bonus/malus approach[81]. Here, companies participating in the agreement that are closer to the benchmark performance level are given a more generous allocation than companies that are further removed from the benchmark or that do not participate in the agreement[82]. At the same time, the Dutch government strove towards getting explicitly benchmark-based allocation approaches adopted more broadly in the EU ETS to allow the recognition of early action across all EU ETS participants. Such approaches were ultimately adopted in the (draft) revised ETS Directive of 2008-2009, effective as of 2013.

With the policy approach now very similar to the EU ETS, the Benchmarking Agreement was no longer needed to ensure fair treatment of early action by Dutch companies participating in the EU ETS. The agreement was replaced in 2009 by the 'Long-term agreements on Energy efficiency for EU ETS companies' (LEE, operational till 2020), in which participants are still required to implement all profitable measures[83], but only 'soft' (not binding) energy efficiency improvement targets are included. Companies are to investigate long term energy-saving possibilities at the strategic level, including measures outside plant borders and across their value chain. As such, the LEE agreements aim to support the short-term incentive to reduce emissions for its participants in case of insufficient carbon prices (requirement to implement profitable measures) as well as the long-term incentive to influence transition in both ETS sectors and the wider economy (long-term measures, supply chain measures).

In all cases, participants in the negotiated agreement are/were required to report separately for the agreements and the EU ETS. Reporting for the former focuses on energy consumption levels and implemented saving measures, and is integrated into the existing mandatory annual environmental

[77] Aimed at providing support to eligible energy intensive industrial sectors to assist with impact of energy and low carbon policies on energy bills. A support package worth GBP 250m was announced in 2011 originally due to start in 2013. It was approved by the European Commission as in line with State Aid guidelines in 2015

[78] See e.g. (IIP, 2018b); Phylipsen, 2010)

[79] Corresponding closely to the future ETS participants.

[80] Set at the best 10% of the world, i.e. equivalent to the 10%-ile value of a benchmark curve of comparable peers.

[81] This decision was in part informed by an extensive 2003 analysis of the potential interaction between the EU ETS and existing national policies and possible scenarios for co-existence, carried out by ECN (ECN, 2003).

[82] Implemented as an increase (bonus) or a decrease (malus) in allocation compared to the base allocation, so that in total allocation does not increase and allowances are only redistributed to benefit those have undertaken early action to reduce emissions.

[83] with payback periods of five years or less as identified in the mandatory energy efficiency plan.

report of the companies[84]. The energy data used for the reporting of (energy-related) GHG emissions under the EU ETS will overlap with the data monitored and reported for the agreements, though both also contain instrument-specific elements[85].

8.2.3 Italy's white certificates scheme[86]

The Italian Tradeable White Certificate (TWC) scheme was the first to be implemented in the world in 2005 with the aim to improve energy efficiency and reduce emissions in all energy end-use sectors. Under the scheme, distribution companies must meet specified energy savings targets, either by implementing energy conservation projects with their customers, thereby generating white certificates, or by purchasing white certificates on the market[87]. The white certificates are issued after certification that savings have occurred and are eligible under the scheme. The system also allows voluntary participation by e.g. energy service providers. The latter have actually been responsible for a large share of the achieved energy savings[88], subsequently selling the resulting white certificates to the regulated distributors. Distributors can pass the costs incurred by the scheme on to customers, within limits imposed by the regulator[89]. Note that the TWC scheme is separate from the EU ETS, i.e. certificates cannot be used for ETS compliance (or vice versa), though achieved emission reductions are rewarded under both systems (see discussion below).

Savings achieved under the scheme must be additional to measures that would normally be implemented, including those implemented to meet new legal requirements (i.e. the baseline is continuously updated). The additionality of energy efficiency measures is determined by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development by defining a market and regulatory baseline for each technology. The baseline takes into account the average performance of the technology on the market, the expected technological progress, minimum legal requirements and the energy consumption before project implementation. In the early phases of the system, the additionality of certain eligible measures was questionable (e.g. CFLs) and this was likely a factor in a significant oversupply of white certificates and subsequent low certificate prices at that stage[90]. To address additionality concerns, eligibility criteria for CFLs were gradually tightened, until they became ineligible in February 2011.

Over the years, various legislative changes were implemented, extending the duration of the scheme, increasing the ambition level of the energy saving targets, revising the eligibility of saving measures and changing the period over which projects can generate white certificates. At the end of 2011, 60% of the certificates issued since the launch of the mechanism were from electricity saving activities. This led to criticism of double counting, or at least double rewarding, the effects of measures implemented in the electricity sector, where also ETS allowances are freed up as a result of those measures. In 2012, the rules for the amount of certificates that a project generates changed[91], resulting in improved

[84] The basis for national reporting under various international reporting obligations, such as the UNFCCC (national GHG inventories), the Aarhus Convention, the EU Large Combustion Plant Directive, the National Emissions Ceiling (EU, UN) and the European Pollutant Release and Transfer Register (E-PRTR).

[85] Non-energy related GHG emissions, material consumption, activity data for the EU ETS, energy consumption data outside installation borders, information on improvement measures for the agreements.

[86]See e.g. Energy Efficiency Watch (n.d..); EEA (2009); Bertoldi, 2011

[87] The target for individual gas/electricity distributors is fixed at the beginning of the year in proportion to its market share (the energy delivered to its end users two years before).

[88] Estimated at e.g. 80% of certified savings were delivered by energy service providers between January 2005 –May 2008(EEA 2010).

[89] I.e. distributors are partly compensated for the costs of the energy saving projects through a surcharge on the energy tariffs paid by end consumers.

[90] CFLs accounted for 50% of the cumulative savings between 2005 and 2010 (DIW 2016).

[91] The change allowed projects to also generate certificates for future (discounted) energy savings beyond the original set period of (usually) 5 years, acting as a multiplier (e.g. 2.65 for a 15-yr project means crediting 2.65 toe of savings for every toe of energy actually saved per year during the 5-yr period. The rule change was implemented to address market shortage and high certificate prices resulting from tightening the eligibility of measures to address additionality issues.

economics of energy efficiency investments and a strong surge in industrial energy efficiency projects and a significant overlap with industrial ETS sectors [92]. In 2017, this rule change was reversed again, abolishing the multiplier factor and further tightening additionality rules (JDSUPRA 2017).

8.3 Synthesis

The above EU examples suggest there are different reasons for co-existing policies in parallel to an ETS (see also: ECN 2003):

- Achieving multiple policy objectives: governments have multiple policy objectives, which cannot be achieved by any individual policy, for example the economy-wide energy saving objectives of the Italian white certificate scheme;
- Reducing market failures to improve the efficiency of the EU ETS, such as an insufficient carbon price incentive, insufficient possibility of cost pass-through or high transaction costs. The UK Carbon Price Floor Mechanism is an example of such co-existing policies, while for long-term innovation also policies such as R&D or investment subsidies are relevant;
- Improving the design of the ETS, for example to achieve a fairer allocation, such as the case of the Benchmark agreement in the Netherlands or to provide more flexibility in compliance by means of using offset credits;
- Honoring existing agreements or contracts by governments or obligated entities, such as the voluntary agreements in the Netherlands and JI projects in new EU Member States.

As shown by the above examples, negative impacts of policy overlaps on the ETS can be prevented by smart policy design, including:

- Taking the impact of other policies into account in the cap-setting for the ETS;
- Incorporating price or supply control mechanisms to limit unintended downward pressure on the carbon price (price floor, market stability reserve, voluntary allowance cancellation by government);
- Establishing requirements to avoid double-counting or –rewarding, in order to maintain effectiveness of the schemes, e.g. strict definition of additionality in the case of white certificates or cancellation of corresponding amounts of ETS allowances in the case of domestic offset mechanisms with linked markets;
- Adopting qualitative or quantitative limitations on the eligibility of e.g. energy saving and/or emission reduction activities in a white certificate schemes or domestic offset mechanisms[93].

It the context of double rewarding (also called 'double dipping'), it needs to be considered to which extent, or in which cases, this poses a problem. When an emission reduction measure is sufficiently incentivized by an individual policy instrument to be implemented, rewarding the same action through another policy instrument would comprise a waste of public money[94]. However, if the incentive provided by a single policy instrument is insufficient to result in implementation of the measure, a second policy instrument can strengthen the incentive, thereby supporting the realization of the measure. This can be seen as achieving synergy, rather than double-rewarding.

[92] The share of certificates from industry rose from 6% in 2007 to 62 % in 2015. Predominant industrial sectors in 2013 and 2014 were paper, glass & iron and steel. (DIW 2016).

[93] Qualitative restrictions refer to limiting the type of activities that can generate certificates and/or credits (e.g. no CFLs in the Italian white certificate scheme, no HFC, forestry or large hydro in CDM), or of which the certificates/credits can be used in the EU ETS, qualitative restrictions refer to the amount that can be generated or used.

[94] Providing more financial support from public means than is needed to get the measure implemented is an inefficient use of those public resources, as the same effect could have been reached with fewer public resources.

9 Concluding remarks

This study combined analytical work in which selected policy instruments were assessed on a generic basis with an empirical part that included in-country analysis in Mexico and India. This methodological approach allowed contrasting the generic analysis of policy instruments with empirical findings in two countries that are at very different stages in terms of ETS development process.

Findings from generic policy assessment

The first analytical part of the study explored how non-ETS policy instruments can assist the ETS development process in principle. For this purpose, we first identified the different building blocks of an ETS, its core elements. Each of these eight building blocks requires a specific set of preconditions to be in place. These preconditions, which can be structured along three different tracks (political, institutional/legal and technical tracks) have been used for assessing how other policy instruments could in principle contribute to the ETS development process. The focus of the analysis has been put on economic policy instruments, in particular market mechanisms, while other types of instruments, such as regulatory approaches have only been briefly covered. The assessment's findings indicate that there are significant differences regarding how non-ETS instruments can contribute to the ETS development process. Instruments combining mandatory obligations with a trading component (green and white certificate trading schemes) have generally been found to have the greatest overall potential for being used as a basis for ETS development, followed by carbon taxes and performance standards. While the contributions of these policy instruments could be further increased by adapting their design to the requirements of an ETS, other policy instruments (technology standards, GHG crediting mechanisms and voluntary agreements), in contrast, provide considerably less contributions to the preconditions of ETS development. The analysis further revealed that actual contributions of instruments may be largely contingent on their design and the national situation in which they are implemented.

Findings from case studies and overall conclusions

In order to explore the actual potential of instruments to contribute to the ETS development process, two case studies were carried out, focusing on India and Mexico. For the analysis, desktop research has been complemented by interviews held in Mexico City, New Delhi and Bonn with representatives from federal ministries, research institutions, the private and public sector as well as civil society. The findings indicate that India and Mexico are currently at very different stages in terms of the ETS development process. While in India the introduction of an ETS is rather a theoretical option, the ETS process in Mexico is considerably advanced.

In general, the case studies confirm the findings from the generic analysis: Several of the policy instruments analysed – especially green and white certificate trading schemes - have potential to provide strong contributions to the ETS development process. In **Mexico, the CEL system** with its trading component could deliver a particularly strong contribution providing critical political experience and institutional knowledge relevant for establishing some of the ETS building blocks, notably cap setting and market. In **India, the Perform, Achieve, Trade (PAT)-mechanism** could provide the strongest contributions, as it has many features that lead to similar technical, institutional and political requirements as an ETS.

Actual contributions, however, depend on the specific design of the individual policy instrument as well as on the envisaged design of the planned ETS. The existing instruments' maturity can also limit the potential contribution: In Mexico, for instance, the recently introduced CEL system could well serve as a basis or model for developing several of the ETS building blocks. Interviews held with stakeholders involved in the CEL process also indicated that there is a general openness to contribute to the ETS development. However, the CEL system is currently in its first year of compliance and operational experience is limited. Given that Mexico is currently advancing with its ETS at unprecedented speed, it remains to be seen whether the structures established by the CEL system will actually inform the ETS development process.

The Indian example shows that while existing instruments, such as the REC scheme, might well hold the technical potential to contribute to the ETS development process, they partially suffer from poor compliance in a national political context focussed on further advancing economic development. More generally, the main issue in the Indian context is a lack of political will to focus on absolute greenhouse gas emissions rather than on relative energy intensity targets. While the political rationale for this, i.e. the objective to ensure economic growth and energy security in a national context where millions of people live in poverty, is well-understandable, it is the current key barrier to implementation of an ETS.

Building an ETS on existing policy instruments can provide synergies, although these potential synergies do not automatically occur or might be difficult to tap in practice. If, for instance, participants under the Mexican ETS are required to register with a system that builds on the structure of the S-CEL registry, participants from the power sector will be able make use of the experiences with this registry under the clean energy certificates scheme. Using such synergies could further facilitate the coexistence of non-ETS policy instruments with an ETS. Operating existing policy instruments in parallel with the newly established ETS is also in line with the case study findings, which indicated a clear preference of stakeholders not to abolish non-ETS instruments when introducing the ETS. The reasons for opposing the discontinuation of existing instruments are manifold: While some stakeholders may benefit from the current system and fear these benefits will be reduced under the ETS, others may have vested interests because they were involved in the design of the existing non-ETS instruments or have made large efforts to understand their functioning. Hence, at least from the start, abolishing existing instruments when introducing an ETS does in most cases not seem politically feasible.

A challenge for policy makers designing an ETS is to decide which elements of the existing policy instruments will actually provide a useful basis for an ETS and to identify cases where it might be preferable to develop new structures that align better with the actual ETS functions. While the development of new structures might come with significant costs and require additional time, new structures could be more suitable than existing ones which were designed for a different purpose and whose flaws could be transitioned into the ETS. One example here is the Mexican RENE, a database for emitters, which has struggled with data gaps and methodological deficiencies in the past and which is being constantly improved in order to serve as a basis for the new ETS. While one could argue that developing a new database from scratch might have been the more efficient route, stakeholders have already become familiar with and invested in this instrument and developing a new one could raise resistance in terms of the efforts made to align internal processes with the existing system.

Aside from stakeholder preferences, there are several other arguments that speak in favour of operating other policy instruments in parallel to an ETS: An ETS cannot address all the different market failures that lead to a GHG emissions intensive economy and tackling these requires more than one instrument. Furthermore, some policy instruments are associated with specific non-climate benefits which may be at risk by transitioning these instruments into an ETS. Combining the existing non-ETS instrument with an ETS may therefore be considered a more promising way of addressing the different barriers to low-carbon development, assist in achieving multiple non-climate related policy objectives and secure political support from stakeholders. The co-existence may in some cases also be of a transitory nature, i.e. with the need for parallel instruments reduced over time. An example is the abolishment of the Benchmarking Agreement on energy efficiency improvement in EU ETS participants in the Netherlands, which was deemed unnecessary after running in parallel with the ETS for 8 years. Due to changes in the ETS design and implementation (including the adoption of benchmark-based allocation rules), the instrument was considered redundant as its objectives were being met by the ETS under its new design.

At the same time, if the ETS is operated in parallel to the existing instruments, those companies affected by multiple instruments may raise concerns of double burden. The validity of these arguments will, however, depend on the general incentive structure that applies to them and there might be cases that require a double incentive to achieve the desired effect. The coexistence of policy instruments also raises concerns about economic inefficiencies in terms of one instrument reducing the mitigation impact of a second one. As highlighted in the study, such concerns can be addressed by considering the impact of other policies during the design and operation of the ETS, for instance at the moment of defining and readjusting the cap of the system. In this regard, the experiences in Europe and in other regions with an ETS running in parallel with other instruments can be valuable for countries now introducing their own ETS. Dealing with potential negative impacts of co-existing policy instruments properly and from the beginning is important for achieving an effective policy mix and transitioning towards a low carbon economy.

10 Annexes

10.1 Annex 1: Tables with policy instrument's contributions to the preconditions of ETS development

Table 26: Contribution to the preconditions: Green certificates trading

No	Precondition	Contribution to the preconditions of ETS development
1	Balancing policy goals	**Strong:** Balancing environmental with economic and social goals is key when designing the renewable energy trading scheme, e.g. when deciding on the level of ambition, as it might interfere with other policy objectives such as fighting energy poverty, ensuring security of supply etc. Green certificates trading schemes might therefore provide strong contribution to this precondition despite the fact that the regulation will only affect the power sector and (large) electricity consumers, while other types of industry will not be affected.
2	Capacity to involve stakeholders	**Strong/Medium:** On the one hand, the government deals with stakeholders at two different levels if obliged entities and renewable energy producers are not the same. On the other hand, the exchange with stakeholders will most probably be limited to the power sector, even if large electricity consumers will also be affected indirectly.
3	Commitment to address climate change	**Medium:** While the establishment of the scheme might be associated with significant costs, non-climate benefits might have played key role during introduction.
4	Functional market economy	**Strong:** A green certificates trading scheme does also require a functional market economy to work properly. Similar considerations regarding price-pass through, number of market participants and dominance of individual players can inform ETS development.
5	Decision making authority	**Medium:** The establishment of a green certificates trading scheme requires strong decision making authority in the power sector that could provide a basis for the development of an ETS in this sector. However, the authority is limited in scope to the power sector, while ETS scope is usually broader.
6	Institutional capacities	**Strong:** The operation of the instrument requires performance of functions such as certification, creation, issuance, trading, tracking and cancellation of certificates which are also needed under an ETS.
7	Rule of law and law enforcement	**Strong:** Renewable energy obligations are legally established and the trading component provides a legal basis or at least a precedent in terms of creating and overseeing an artificial market with virtual assets, and how to deal with certificates and transfers in terms of ownership, tax, etc.
8	Trading capabilities	**Strong:** participants and the regulator gain experience in trading and there is a trading infrastructure in place with trading rules, oversight institutions, etc. Elements of this structure could be of use in the ETS context.
9	Modelling capacities	**Medium:** While there is a need for impact assessments during the introduction and operation of the scheme, modelling is not covering GHG emissions. In addition, modelling will be limited to the power sector and –potentially - household as well as large industrial power consumers.

10	Sectoral data and processing capacities	**Medium/Strong:** Sectoral data is usually limited to the power sector and focused on renewable energy potential and costs. However, this may also include energy scenarios, including expected electricity production and consumption, fuel use and potentially GHG emissions. This information and the final decision on the quota level can inform the ETS cap setting process.
11	MRV capacities/experience	**Medium/Strong:** Entities covered by the scheme must monitor and report the electricity produced, sold and/or used. Renewable energy producers (sometimes being equivalent to covered entities) monitor and report the renewable energy produced. Third party verification (as in the US) as well as investigations and audits (as in Australia) are applied. These elements can be used as a starting point under an ETS. However, as the MRV system of an ETS focuses on GHG emissions, additional data processing capacities and potentially other institutions might be required, because of the additional sectors included in an ETS and the higher complexity of MRV for GHGs.
12	Carbon markets experience	**Weak:** no contribution
13	IT infrastructure and capacities	**Strong:** A green certificates trading scheme requires a registry with similar functions as an ETS registry. The required functions of an ETS registry depend on the ETS design and its complexity. Therefore, when deciding on whether to use the REC registry or elements thereof, the functions needed and the functions of the existing registry must be compared. In terms of trading platforms, the ETS could further build on the IT infrastructure used for trading green certificates.

Table 27: Options to increase contributions: Green certificates trading

No	Precondition	Options to increase contribution
1	Balancing policy goals	Formalise processes for balancing policy goals and record experiences made. This would entail the publication of documents that provide transparency about how different impacts of the policy instrument are weighted and how this weighing influenced the final design of the instrument.
2	Capacity to involve stakeholders	Define portfolio obligations for entities that are not the producers of RE, (for instance energy suppliers). This will lead to a broader participation and increase interaction with stakeholders.
3	Commitment to address climate change	Contribution cannot be strengthened through design, but demonstrated success of renewables expansion may strengthen political support for transforming energy sector. Use of GHG metrics in addition to green electricity metrics in scenarios, impact assessments, and the communications on targets might further strengthen political support.
4	Functional market economy	An effective and efficient green certificates scheme in which price incentives work and costs are passed on provides a strong contribution to this precondition that cannot be strengthened further.
5	Decision making authority	The contribution to this precondition can be further improved by establishing solid legal mandates for institutions that strengthen decision-making authorities in the power sector.
6	Institutional capacities	To further strengthen the contribution to this precondition, policymakers could design institutions in a way that allows to perform functions that are relevant under an ETS. Institutions could for instance process GHG data and take climate change impacts of the policy instrument into account.

7	Rule of law and law enforcement	The contribution to this precondition can be further strengthened by making available sufficient resources and capabilities (human, financial, technical) to facilitate meaningful compliance checking and enforcement.
8	Trading capabilities	Establish spot market instead of over-the-counter market, allow broader access to trading (financial actors, brokers, etc.)
9	Modelling capacities	Develop and use strong economic modelling capacities to design scheme, including also GHG emissions in scenarios and impact assessments.
10	Sectoral data and processing capacities	Contribution could be further increased by gathering/monitoring additional sectoral information on emissions, mitigation potential, etc.
11	MRV capacities/experience	In addition to report electricity data (MWh), obligated entities could be required to monitor and report their emissions.
12	Carbon markets experience	Contribution cannot be strengthened through design.
13	IT infrastructure and capacities	Ensure IT system cannot only process energy data but also GHG data. Make sure system can be upgraded in order to deal with larger number of participants, more and faster transactions.

Table 28: Contribution to the preconditions: White certificates trading

No	Precondition	Contribution to the preconditions of ETS development
1	Balancing policy goals	**Strong**: Balancing environmental with economic and social goals is key when designing a white certificates trading scheme, e.g. when deciding on the level of ambition of the scheme.
2	Capacity to involve stakeholders	**Medium/Strong**: The government usually deals with stakeholders at two different levels, at the level of energy efficiency projects and at the level of obliged entities. Capacities to involve stakeholders might however be more limited if the scheme is limited to energy suppliers, which in turn deal with their clients.
3	Commitment to address climate change	**Medium**: Non-climate benefits may have played key role during the introduction of the scheme, given the large co-benefits of energy efficiency.
4	Functional market economy	**Medium:** While having a market economy in the targeted sector might be beneficial, market dominance of individual players, pass trough of price signals, etc. are less of a concern in the design of a white certificate scheme as the market is not limited to one sector.
5	Decision making authority	**Strong:** The introduction of energy efficiency obligations requires a strong decision making authority in the power sector.
6	Institutional capacities	**Strong:** The instrument requires performance of functions such as certification, issuance and cancellation of credits; Institutional functions required under a white certificates trading scheme are similar to those of an ETS, though on the participants' side this may be more limited subject to the system scope.

7	Rule of law and law enforcement	**Strong:** Energy efficiency obligations are legally enshrined and trading requires a functioning jurisdictional system to be in place in order to create an artificial market with intangible assets, and provide legal clarity in terms of ownership, tax treatment, etc.
8	Trading capabilities	**Strong**: Participants and the regulator gain experience in trading that could provide a starting point for the ETS.
9	Modelling capacities	**Medium:** While impact assessments are needed during the introduction and operation of scheme they do not model GHG data.
10	Sectoral data and processing capacities	**Medium/Strong:** Data is gathered and processed before the introduction and during operation of the scheme. The data gathered during operation may well go beyond the energy sector and could in principle provide a broader picture of the company or utility where the project is being implemented. However, with projects being implemented on a voluntary basis, the data set will presumably display large gaps and not cover all entities of a specific sector or product/process. Therefore, the extent to which data can be used for ETS development varies significantly.
11	MRV capacities/experience	**Medium/Strong**: The MRV system is usually operational at two levels, obligated entities and energy efficiency projects. The latter is where most data is gathered. However, depending on how obligations are defined, MRV on the demand side can be very simple and for instance be limited to comparing the different levels of electricity invoices.
12	Carbon markets experience	**Weak:** no contribution
13	IT infrastructure and capacities	**Strong**: requires registry with similar functions to that of an ETS registry and Data gathered by the MRV system must be fed into a data management system. The extent to which the technical trading infrastructure of the white certificate trading scheme can be used under the ETS depends on the design and complexity of scheme (number of participants, trading platforms, etc.).

Table 29: Options to increase contributions: White certificates trading

No	Precondition	Options to increase contribution
1	Balancing policy goals	Formalise processes for balancing policy goals and record experiences made.
2	Capacity to involve stakeholders	Capacities to involve stakeholders are particularly strong if the white certificates trading schemes operates at two levels (suppliers and consumers). Hence, such a structure could increase capacities to deal with stakeholders. The processes at these two levels could be used to gather views on ETS and existing capacities. By formalising/institutionalising the exchange with stakeholders, capacities might be further increased.
3	Commitment to address climate change	Positive demonstrated success of efficiency measures may strengthen political support for reducing GHG emissions, in particular if GHG metrics are being used in addition to energy efficiency metrics in scenarios, impact assessments, communications on targets.
4	Functional market economy	Broaden the scope of the white certificate trading scheme to ensure market liquidity and other requirements are met in the sector of the obligated entities.

5	Decision making authority	The contribution can be further improved by establishing solid legal mandates for institutions that strengthen decision-making authorities in the sectors targeted by the white certificates trading scheme.
6	Institutional capacities	In order to allow institutions to perform similar functions under an ETS, key differences between the two schemes in terms of institutional functions should be taken into account, such as the fact that under an ETS institutions deal with GHG. White certificates trading institutions could then be designed with these differences in mind, allowing institutions to perform these additional functions in an ETS context.
7	Rule of law and law enforcement	Contribution can be strengthened by ensuring that sufficient resources and capabilities (human, financial, technical) are available to facilitate meaningful compliance checking and enforcement.
8	Trading capabilities	Establish spot market instead of over-the-counter market, allow broader access to trading (financial actors, brokers, etc.)
9	Modelling capacities	Develop and use strong economic modelling capacities to design scheme, including also GHG emissions in scenarios and impact assessments..
10	Sectoral data and processing capacities	When designing the white certificates trading scheme, data gathered and processed could not only include energy efficiency potential but also cover emissions data and emission reduction potential. During operation, obliged entities as well as those in charge of implementing energy efficiency projects could be required to monitor and process additional data on production, emissions, etc.
11	MRV capacities/experience	A more complex white certificates trading scheme will provide stronger contributions to this preconditions. Hence, the scheme should make the implementation and monitoring of actual energy efficiency projects a requirement for the generation of certificates, instead of just leading to invoices with lower amount of electricity purchased. In addition, energy efficiency saving obligations could be determined in GHG metrics, establishing climate MR capacities among obliged entities. Alternatively, entities could be required to provide information needed to translate energy saving into emissions data.
12	Carbon markets experience	Contribution cannot be strengthen through design.
13	IT infrastructure and capacities	Ensure white certificates registry cannot only process energy efficiency data but also GHG data. Make sure system can be upgraded in order to deal with larger number of participants, more and faster transactions.

Table 30: Contribution to the preconditions of ETS development: GHG crediting

No	Precondition	Contribution to the preconditions of ETS development
1	Balancing policy goals	**Weak**: GHG crediting schemes do not place a burden on any particular domestic sector or activity, therefore limiting the need to balance different policy goals. Their allowed use, however, is usually the result of weighing different policy goals (environmental impact, cost effectiveness).
2	Capacity to involve stakeholders	**Weak:** Experience in involving project stakeholders might be beneficial for establishing an ETS. However, due to the voluntary and project-based nature of the instrument, contributions will be limited.

3	Commitment to address climate change	**Weak/Medium:** Strong involvement of the government in participating as a host country of the crediting mechanism may indicate certain commitment to act on climate change and have strengthened consciousness about the issue.
4	Functional market economy	**Weak**: Existence of a functional market economy is not a precondition for GHG crediting.
5	Decision making authority	**Medium:** Government does only need limited decision making authority to incentivise crediting activities as the incentive as such is established at the international level.
6	Institutional capacities	**Weak:** Main functions are usually performed by international institutions while only limited capacities are needed for the administration of domestic projects.
7	Rule of law and law enforcement	**Low:** Project proponents require legal certainty for participating in crediting mechanism but in general there is little need for developing domestic legal provisions. Participation in international GHG crediting instruments as a host country does not require a system to ensure compliance as there are no compliance obligations for participants.
8	Trading capabilities	**Medium:** Main part of trading taking place at international level. However, active involvement of companies in trading may lead to basic national trading infrastructure with market intermediaries, trading platforms etc.
9	Modelling capacities	**Weak**: Impact assessment usually not required as no obligation is placed on participants.
10	Sectoral data and processing capacities	**Medium/Strong:** Depending on the methodologies applied, for instance for baseline calculation, projects may provide relevant data which can provide a broader picture of the sector. However, experiences in processing this data will be limited.
11	MRV capacities/experience	**Medium**: Crediting mechanisms may establish important monitoring, reporting and verification capacities among project proponents as well as local validation companies. However, the scope of the capacities is limited to individual project proponents (rather than sectors) and no capacities are developed within the government.
12	Carbon markets experience	**Strong**: Experience exposes project proponents to carbon price formation and trading aspects, and establishes local capabilities among traders (if not done through international parties only).
13	IT infrastructure and capacities	**Weak:** Participation in international GHG crediting schemes does not require a national registry to be established and limited capacities are needed to oversee the domestic project pipeline.

Table 31: Contribution to the preconditions: Carbon taxation

No	Precondition	Contribution to the preconditions of ETS development
1	Balancing policy goals	**Strong**: Balancing policy goals is needed during design and operation of the tax, e.g. to determine tax levels vis-à-vis the impact on fuel consumers. Somewhat less than policy instruments with pre-described policy outcomes.
2	Capacity to involve stakeholders	**Medium/Strong**: Considerable capacities are required in dealing with interests from those affected by the tax. However, depending on the design of the instrument, the number of stakeholders might be limited, for instance if the tax is placed on fuel importers and sellers, while end consumers will usually not be involved.

3	Commitment to address climate change	**Medium**: Introduction of the tax might (also) be triggered by other goals (revenue raising) and GHG emissions are not directly controlled.
4	Functional market economy	**Strong**: Functional market economy is required if carbon tax is to be effective and the price signal to be passed on.
5	Decision making authority	**Strong**: A carbon tax is a mandatory instrument requiring strong decision making authority of the government to be implemented.
6	Institutional capacities	**Medium**: While the need to develop new institutions may be limited due to the carbon tax's integration into fiscal system, functioning institutions need to be in place. Key functions under an ETS are however, not needed under a carbon tax (allocation, issuance of allowances, etc.). Institutions related to MRV are needed, and may go beyond what is available in the fiscal system.
7	Rule of law and law enforcement	**Strong**: carbon tax is built into the taxation system and is therefore strongly integrated into the legal system. In order to function properly, a carbon tax requires strong law enforcement.
8	Trading capabilities	**Weak**: a carbon tax does not establish trading capabilities.
9	Modelling capacities	**Medium**: While modelling capacities can be important tools to determine the impact of tax levels in the design of a carbon tax, it is less likely to be used than for policy instruments with prescribed policy outcomes, such as an ETS, or green and white certificate schemes. In general, modelling an the ETS can also be much more complex, depending on the objective of the analysis.
10	Sectoral data and processing capacities	**Medium/Strong**: Applicability of the carbon tax data in the ETS context will highly depend on the design of the carbon tax, in particular, if data can be translated into emissions data and if data has a high or low resolution. A carbon tax not having a prescribed policy outcome (like ETS, green/white certificate schemes) may lead to more limited development of these capacities. See also under #9.
11	MRV capacities/experience	**Medium/Strong**: Contribution will be highly dependent on design of the carbon tax and the specific MRV requirements set. Companies may have established some M&R capacities and the regulator has developed the respective provisions. Depending on the design of the ETS, MRV activities might deviate significantly from those of a carbon tax.
12	Carbon markets experience	**Weak/Medium**: Use of international market mechanisms is possible in principle but not common.
13	IT infrastructure and capacities	**Weak**: While there might in some cases be a database in place, it cannot be used as a registry as it lacks key functions. Also, no trading platforms are used in a carbon tax.

Table 32: Options to increase contributions: Carbon taxation

No	Precondition	Options to increase contribution
1	Balancing policy goals	Formalise processes for balancing policy goals and record experiences made.
2	Capacity to involve stakeholders	Increasing the sectoral scope of the carbon tax and involving fuel consumers impacted by the carbon tax in stakeholder consultations requires additional capacities to involve stakeholders. In these processes, experiences in using robust data (and modelling results) when dealing with opposition of the carbon tax can be gained. The stakeholder involvement processes can also be used to gather views on ETS and gain insights into existing trading capacities. Experience with innovative interaction formats can be gained and exchange with stakeholders could be formalised, serving as a basis for the ETS development process.
3	Commitment to address climate change	Contribution cannot be strengthened through design, but experience with the tax may increase confidence about the economy's ability to handle carbon price. A carbon tax that is designed with a broad coverage (inclusion of all fuels), whose tax rates properly reflects different carbon contents and which ensures that carbon prices can be passed on shows stronger commitment to climate change.
4	Functional market economy	When designing the coverage of the carbon tax functional market economy aspects should be taken into account. This will not only facilitate a later transition towards an ETS but also increase the environmental impact of the tax. Include all fuels, ensure tax rates properly reflect different carbon contents, ensure carbon price can be passed on
5	Decision making authority	Contribution to this precondition can be strengthened by granting the key authorities with robust mandates.
6	Institutional capacities	When establishing new institutions and delegating authority to existing ones, functions and tasks that are relevant in the ETS context could be taken into account. Ensure tax rates properly reflect carbon content and that that is also monitored accordingly.
7	Rule of law and law enforcement	Contribution can be strengthened by providing sufficient resources and capabilities (human, financial, technical) to facilitate meaningful compliance checking and enforcement.
8	Trading capabilities	Consider introduction of tradable tax credits. Introduction of such credits would allow development of trading capacities.
9	Modelling capacities	Develop and use strong economic modelling capacities to estimate the (climate) impact of the tax in the design the carbon tax and use in stakeholder consultations. This could also allow to increase the environmental impact of the tax, for instance by setting a stronger tax rate.
10	Sectoral data and processing capacities	Contribution can be strengthened if the tax processes high resolution data which can be translated into emissions data.
11	MRV capacities/experience	Ensure tax rates reflect actual carbon content (with sufficient fuel diversification) and that MRV requirements allow for tracking the actual carbon content of fuels.
12	Carbon markets experience	Consider use of international offsets and/or or establishment of domestic scheme.

13	IT infrastructure and capacities	Record MRV data in database. Ensure database can technically be used as a basis for a registry at a later point in time by adding additional features.

Table 33: Contribution to the preconditions: Technology standard

No	Precondition	Contribution to the preconditions of ETS development
1	Balancing policy goals	Weak/Medium: Balancing of policy goals needed but much less complex than for an ETS due to limited scope of the instrument.
2	Capacity to involve stakeholders	Medium: Involvement of stakeholders will usually be limited to technology providers, as this allows the government to acquire industry knowledge. However, users of the technologies will usually not be involved. Consultations will therefore only involve a limited number of stakeholders.
3	Commitment to address climate change	Medium: Goal of technology standard is usually not climate change mitigation.
4	Functional market economy	Weak: A technology standard can also be implemented in a non-market context.
5	Decision making authority	Strong: The introduction of technology standards requires strong decision making authority due to its mandatory character.
6	Institutional capacities	Medium: Institutions must be designed to establish provisions and ensure compliance It is likely, though, that technical and implementing institutions are more involved than political decision-making institutions, compared to an ETS, as considerations in its design are more technical than political in consideration.
7	Rule of law and law enforcement	Strong: Technology standards are usually legally enshrined and non-compliance may lead to sanctions.
8	Trading capabilities	Weak: A technology standard does not establish trading capabilities.
9	Modelling capacities	Weak/Medium: Technology standards are usually limited in their scope and assessing their impact is less complex.
10	Sectoral data and processing capacities	Weak: Establishing a technology standard requires information about what is technically feasible. While sectoral data with high resolution on abatement options/costs of companies can support the process of establishing a technology standard, this information is not required.
11	MRV capacities/experience	Weak/Medium: MRV activities are limited to question of adherence to technological standard, while no production, energy consumption or emission data is gathered.
12	Carbon markets experience	Weak: no contribution.
13	IT infrastructure and capacities	Weak: While there might be a database with basic technology information in place, this cannot be used as a basis for a registry.

Table 34: Contribution to the preconditions: Performance standard

No	Precondition	Contribution to the preconditions of ETS development
1	Balancing policy goals	**Strong**: When introducing a performance standard and deciding on the performance level required, the additional costs and other (adverse) impacts must be balanced against the environmental benefits. Balancing policy goals can be complex as obligated entities will have a larger leeway when deciding on how to achieve the performance prescribed by the standard.
2	Capacity to involve stakeholders	**Medium**: Involvement of stakeholders is limited to stakeholders affected by the standard. However, stakeholder consultation is important for the government to acquire industry knowledge.
3	Commitment to address climate change	**Medium**: depending on design of the technology standard and its main purpose
4	Functional market economy	**Weak:** Performance standards do not require a functional market economy to be in place and do therefore not provide a basis for this precondition.
5	Decision making authority	**Strong**: The introduction of performance standards requires strong decision making authority due to its mandatory character, but scope can be limited to the activities covered by standards.
6	Institutional capacities	**Medium/Strong**, Strong institutions must be designed to establish provisions and ensure compliance, but scope can be limited to the activities covered by standards.
7	Rule of law and law enforcement	**Strong**: Performance standards are usually legally enshrined and non-compliance with standards may involve sanctions.
8	Trading capabilities	**Weak:** Performance standards do not have a trading component and can therefore not be considered as supporting respective capabilities.
9	Modelling capacities	**Medium/Strong**: With companies being able to decide on how to achieve the performance required by the standard, modelling capacities are needed to assess the impact of their decisions. However, potential use of these modelling capacities under an ETS depends on what is being regulated. Contribution will be much higher if the standard regulates emissions performance of especially industrial plants and power plants.
10	Sectoral data and processing capacities	**Medium/Strong**: Contribution is highly dependent on how the performance standard is defined. While regulators may use figures regarding the current performance of emitters for specific activities to be able to set the standard, a performance standard can also simply be based on best practice technology, without in-depth assessment of mitigation potential and costs. If gathered, the information used for a performance standard can also serve under an ETS as a basis for allocation (sectoral data) scope (e.g. activities and sources covered, identification of obligated entities), the point of regulation (information regarding the structure of the sector).
11	MRV capacities/experience	**Medium/Strong**: The applicability of the data gathered depends on what is being regulated and which metric is used. Information gathered can serve as a basis for emissions reporting, in particular in case of emission performance standards.

12	Carbon markets experience	**Weak:** No contributions.
13	IT infrastructure and capacities	**Weak**: There is usually no database that could be used as basis for an ETS registry. There are no trading platforms.

Table 35: Options to increase contributions: Performance standard

No	Precondition	Options to increase contribution
1	Balancing policy goals	Formalise processes for balancing policy goals and record experiences made
2	Capacity to involve stakeholders	Formalise stakeholder involvement processes and use exchange processes to gather views on ETS and capacities for participating in trading activities.
3	Commitment to address climate change	Contribution cannot be strengthened through design, but positive demonstrated success of measures may strengthen political support for reducing GHG emissions. By expressing the standards in GHG emission metrics this relationship can be further strengthened.
4	Functional market economy	Design coverage taking into account market economy aspects, such as good pass-through of price-signal, large number of market participants, market liquidity, etc.
5	Decision making authority	The contribution can be further strengthened by establishing solid legal mandates for institutions in the sectors targeted by the performance standard.
6	Institutional capacities	When establishing new institutions and delegating authority to existing ones, functions and tasks that are relevant in the ETS context could be taken into account. Contribution could be strengthened if a GHG-based performance standards is established.
7	Rule of law and law enforcement	By providing sufficient resources and capabilities to ensure compliance and enforcement, this contribution can be further strengthened.
8	Trading capabilities	Contribution cannot be strengthened through design.
9	Modelling capacities	Use models to assess the impact of proposed standards in instrument design and stakeholder consultations. Contribution can be strengthened if the standard regulates emissions performance.
10	Sectoral data and processing capacities	Base performance standards on the actual population of activities (obligated entities) covered by the standard, i.e. benchmarked against the population's performance curve.
11	MRV capacities/experience	Define obligations as emissions performance standards or require obligated entities to monitor and report emissions data.
12	Carbon markets experience	Contribution cannot be strengthen through design.
13	IT infrastructure and capacities	Database with performance data could be used to record additional (emissions) data. IT system should be upgrade-compatible or allow for data to be exported.

Table 36: Contribution to the preconditions: Voluntary agreements

	Precondition	Contribution to the preconditions of ETS development
1	Balancing policy goals	**Weak/Medium:** While the decisions to introduce voluntary agreements can be a result of weighing costs and benefits and effectiveness of different policy instruments, voluntary agreements place no obligation on individual entities and there are no costs which the government would have to balance against the environmental benefits besides the administrative costs of the agreements.
2	Capacity to involve stakeholders	**Medium**: Voluntary agreements are usually negotiated between the government and industry representatives. This is also the case in the example of Chile's APLs. Hence, the government gains some experience in dealing with stakeholders. However, voluntary agreements place no top-down obligation on companies. While this will on the one hand reduce private sector opposition, the government will also have to ensure the design is adapted to the private sector needs.
3	Commitment to address climate change	**Weak/Medium:** The voluntary character of the instrument could be interpreted as a lower political commitment to act on climate change than imposing mandatory obligations. However, VAs are often chosen in situations where a negotiated target setting is deemed to lead to more ambitious targets than feasible under a mandatory instrument. The establishment of MRV processes and institutions needed for voluntary agreements can be seen as providing a relevant contribution to the commitment.
4	Functional market economy	**Weak:** There is no market economy required, though VAs are seen as a way to distinguish oneself positively from its competitors.
5	Decision making authority	**Medium**: Voluntary agreements need a representative of the government who is authorised to sign on its behalf and who can deliver the incentives to the participants. Therefore, a certain level of decision making authority is needed.
6	Institutional capacities	**Medium:** Whether voluntary agreements establish strong institutional capacities depends on their design and complexity. In the case of Chile's APLs, institutions responsible for overseeing the reporting and judging performance against targets are established. By installing these institutions, voluntary agreements can contribute to developing certain institutional capacities. Using these capacities in the ETS context is, however, limited by the scope (no full sector coverage) and because no trading component exists.
7	Rule of law and law enforcement	**Weak/Medium:** Voluntary agreements are usually contracts between the governments and the private sector that have a legal basis. This is also true for the APLs in Chile. However, the instrument as such is – in Chile - not legally enshrined and there are no sanctions on companies that fail to meet the agreed targets. This is not necessarily the case in other countries. Therefore, voluntary agreements contributions to this precondition depend on the design.
8	Trading capabilities	**Weak**: voluntary agreement does not introduce a trading infrastructure or elements thereof.
9	Modelling capacities	**Weak/Medium**: Modelling and impact assessments are usually not part of the process of introducing voluntary agreements. However, with voluntary agreements becoming more complex, impact assessments could be implemented.

10	Sectoral data and processing capacities	**Weak/Medium**: In Chile, voluntary agreements are limited to a small fraction of a sector. Therefore, the information gathered and the data reported in the context of the APLs is limited and no major contributions can be expected in terms of data. However, actual contribution will depend on sectors covered and whether targets are individual or sectoral.
11	MRV capacities/experience	**Medium**: Voluntary agreements can assist in establishing some basic MRV capacities, as the example of APL shows, where business associations sign an agreement committing to monitor and report their production processes. With this, certain minimum MRV capacities are being established and the regulator gains experience in validation/verification processing of data.
12	Carbon markets experience	**Weak**: No contributions.
13	IT infrastructure and capacities	**Weak:** Data measured and reported by entities participating in a voluntary agreement is usually recorded in a database. Such database will, however, only provide a very limited number of functions, requiring substantial work In order to use such a database as a starting point for an ETS registry.

10.2 Annex 2: Dealing with benefits of non-ETS instruments that are at risk due to ETS introduction

Table 37: Benefits at risk and ETS design options: Green certificates trading

Beneficiary	Benefits at risk	Potential reduction of benefits with ETS introduction	ETS design options to address reduction of benefits
Renewable energy producers	revenues from selling green certificates	If the renewable energy portfolio obligation was abolished in parallel to the introduction of the ETS, renewable energy producers would no longer be able to sell any green certificates. However, entities that formerly had to comply with a renewable energy portfolio obligation would now be covered by the ETS and be obliged to use allowances. With this, they are disadvantaged in comparison to renewable energy producers. Hence, renewable energy producers would still have a comparative advantage on the power market as long as the allowance price is high enough to equate the losses due to the foregone revenues from green certificates selling.	With the introduction of price control measures, such as a floor price, regulators could ensure that the relative competitiveness of renewable energy producers does not decrease due to introduction of the ETS.

	planning security	In addition, a renewable energy portfolio obligation sets a clear target for the expansion of renewables and thus provides planning security for renewable energy operators. Planning security means lower cost of capital. This planning security would be lost.	Such price control measures could ensure a certain level of planning security. Planning security would however be much more limited than that provided by a renewable energy portfolio obligation.
Government, different ministries	Non-climate policy goals and benefits associated with the deployment of renewable energy, including reduction of dependence from energy imports, health benefits and economic benefits such as job creation and international competitiveness, technological progress	If the scope of the ETS goes beyond the power sector, other mitigation options that are financially more attractive could reduce the attractiveness of renewable energy production as a mitigation strategy. Short-term cost optimisation by economic operators may thus undermine long-term decarbonisation of the energy sector. In addition, some portfolio standards have minimum shares for different renewables technologies to make sure that all technologies are promoted. This benefit would be lost as an ETS creates a uniform carbon price.	One option to minimise the loss of these benefits is to limit the scope of the ETS to the power sector. However, this would not prevent entities covered by the ETS to implement other mitigation actions, such as fuel switch or energy efficiency measures, in order to reduce their emissions and the need to buy additional allowances. These measures would also reduce the demand for electricity from renewable energy and reduce the non-climate benefits associated to their deployment. Hence, the effect cannot be fully avoid but only mitigated. A minimum carbon price to keep renewables competitive would help maintain health and economic benefits of renewables expansion, but would not be able to promote specific technologies.
Producers of renewable energy technology	Revenues from selling renewable energy technology	With the abolishment of the renewable energy portfolio obligation, demand for renewable energy technology could be reduced. This would also negatively impact the planning security of technology producers.	Limiting the scope of the ETS to the power sector and a minimum carbon price could mitigate the adverse effect from ETS introduction to a certain extent. However, reduced demand would still adversely impact producers of renewable energy technologies.

Brokers and validators	revenues from trading green certificates	If brokers and validators formerly involved in renewable energy certificates trading would not be allowed to also participate in the trading of allowances, revenues from trading would be eliminated.	If brokers and validators are allowed to participate in trading of allowances, lost revenues from green certificates trading could be compensated by revenues from allowance trading.

Table 38: Benefits at risk and ETS design options: White certificates trading

Beneficiary	Benefits at risk	Potential reduction of benefits with ETS introduction	ETS design options to address reduction of benefits
Proponents of energy efficiency projects and programmes	revenues from developing energy efficiency projects	Demand for white certificates would be eliminated and projects would have to be stopped/no new projects could be started.	With energy efficiency measures leading to emission reductions, capped entities could implement their own energy efficiency measures in order to reduce costs for purchasing allowances. Hence, there would still be some demand for know-how for certain energy efficiency measures. In addition, a domestic offsetting scheme could be introduced that exclusively targets energy efficiency. With this measure, demand for certificates from efficiency projects could be maintained. However, without a specific efficiency target as is the basis of white certificates trading, the demand for efficiency projects would not necessarily be the same. Another option to further promote energy efficiency projects consists in using a share of the revenues from auctioning to finance such projects.

Government	Policy goals and benefits associated to energy efficiency, including reduction of energy imports, cost savings, health benefits due to reduced use of fossil fuels, reduced pressure on national grid	With the introduction of the ETS, energy efficiency activities would decline as many efficiency options lie outside the typical scope of an ETS and other mitigation options may be more attractive to operators. While the carbon price of the ETS may lead to EE improvements downstream, the overall amount of EE projects and their economic, social and environmental benefits would be reduced.	See above
Large energy consumers, households	Reduced energy costs	Under the white certificates trading scheme, energy consumers benefit from efficiency projects that result in reduced costs for energy services. With the termination of these projects, the benefits would be eliminated.	To some extent, the domestic offsetting option described above would allow the continuation of energy efficiency projects.
Companies producing energy efficient products	revenues from selling energy efficient solutions (technology and services)	Under the white certificates trading scheme, producers of energy efficiency benefit from demand for their products and services. With the discontinuation of these projects, demand would be eliminated.	To some extent, the domestic offsetting option described above would allow the continuation of energy efficiency projects. Demand for energy efficiency products could be sustained.
Validators of energy efficiency projects	revenues from validation of energy efficiency projects	Demand for services from companies that validate energy efficiency project proposals and verify their outcome would be reduced with the discontinuation of the projects.	Depending on the design of the system and the respective qualification requirements, validators could engage as verifiers under the ETS. The domestic offsetting option above would allow the continuation of energy efficiency projects. Former validators under the white certificate trading scheme could validate these domestic crediting projects.
Brokers	revenues from trading white certificates	If brokers formerly involved in white certificate trading would not be allowed to also participate in the trading of allowances, revenues from trading would be eliminated.	If brokers are allowed to participate in trading of allowances, lost revenues from white certificates trading could be compensated by revenues from allowance trading.

Table 39: Benefits at risk and ETS design options: Performance standard

Beneficiary	Benefits at risk	Potential reduction of benefits with ETS introduction	ETS design options to address reduction of benefits
Producers of mitigation technology	Revenues from selling technical solutions for meeting the standard	With the abolishment of the performance standard, demand for the technical solutions for meeting the standard may be reduced in case other mitigation options are considered to be more attractive.	Limiting the scope of the ETS to the sector previously targeted by the performance standard and a minimum carbon price can mitigate these adverse effects from ETS introduction to a certain extent. However, reduced demand to implement actions in the (sub-) sector can still adversely impact producers of technical solutions.
Government	Non-climate benefits associated with meeting the standard in the (sub-)sector targeted by the performance standard, such as reduced air pollution.	With the introduction of the ETS, other mitigation options (in other sectors) that are financially more attractive may reduce pressure to implement mitigation activities in the (sub-)sector previously targeted by the performance standard; social and environmental benefits may be reduced and increase government costs, for instance, for the health system.	Limiting the scope of the ETS to the sector previously targeted by the performance standard and setting a minimum carbon price can mitigate these adverse effects from ETS introduction to a certain extent. However, output of substances previously regulated by the performance standard could still be higher under the ETS.

Table 40: Benefits at risk and ETS design options: Carbon taxation

Beneficiary	Benefits at risk	Potential reduction of benefits with ETS introduction	ETS design options to address reduction of benefits
Government, ministry of finance	tax revenues	Revenues from the tax would be reduced with free allocation of allowances under the ETS.	If allowances are auctioned, the revenues from these auctions could compensate the foregone carbon tax revenues. Whether they would be able to fully compensate the carbon tax revenues or just minimize the losses, depends on how ETS building blocks are being designed, including cap, scope, price control measures and offsetting. While allowance prices are not predictable, with the design of these parameters and the introduction of a price floor, risks of foregone losses could be reduced.

Beneficiaries of tax revenues	financial means linked to tax revenues	Programmes financed by carbon tax revenues could be discontinued if the tax is transitioned into an ETS. Hence, beneficiaries of these programmes would be worse off with the introduction of the ETS.	If allowances are auctioned, the government would continue receiving revenues (see above). If these revenues are earmarked for being used for programmes that formerly have been financed with the carbon tax, the beneficiaries of such programmes could continue benefiting.
Government	control over how individual fossil fuels are being charged	If a carbon tax is designed as a tax on fossil fuels, the government can either charge all fossil fuels according to their content of carbon (or CO_2 potential) or establish individual tax rates for each type of fuel. With the latter option, the government can give preference to or disadvantage individual fuels. With the introduction of the ETS, all fuels are treated according to their CO_2 emissions potential. The government would loose the option to discriminate individual fuels.	The government could compensate the loss of control by designing the allocation approach in line with its policy preferences: Entities that are using fossil fuels that should be given preference to could receive (a larger share) of emissions for free, while others would be required to purchase all allowances.
Fossil fuel consumers	benefits associated to lower tax rates for specific fuels	Under a carbon tax, a fossil fuel consumer can benefit if the fuels he uses is charged a lower tax rate compared to other fuels. With the introduction of the ETS, all fossil fuels would be treated according to their emissions potential, possibly resulting in higher costs for the fossil fuel consumer.	With free allocation, entities using fuels that had been charged with a lower tax rate could benefit from (a share of) the allowances being allocated to them for free. With such a decision, however, there is a risk of transferring design flaws from the carbon tax to the ETS.
Covered entities, proponents of mitigation measures	Planning security	A carbon tax provides a stable price signal which an ETS does not	With the introduction of price control measures, such as a floor price, regulators could provide certainty about the long-term price signal, though not as much certainty as a tax

Annex 3: Anonymous list of interviewees met during trip to Mexico (01-06 October 2017) and at the occasion of COP23 in Bonn (8 November 2017)

Table 41: Anonymous list of interviewees met during trip to Mexico and Bonn

Interviewee number	Interviewee	Date of the interview
1	Government representative	02 October 2017
2	Research representative	02 October 2017
3	Research representative	03 October 2017
4	Government representative	03 October 2017
5	Public company representative	03 October 2017
6	Business representative	04 October 2017
7	Civil society representative	04 October 2017
8	Research representative	05 October 2017
9	Federal agency representative	05 October 2017
10	Research representative	05 October 2017
11	Government representative	08 November 2017

Source: Own compilation

10.3 Annex 4: Anonymous list of interviewees met during business trip to Delhi, India (21-29 September 2017)

Table 42: Anonymous list of interviewees met during trip to India

Interviewee number	Interviewee	Date of the inter-view
1	Senior consultant at an environmental consulting firm	25 September 2017
2	Interview of three carbon market representatives of a public bi-lateral implementing entity	22 September 2017
3	CEO of an NGO active in the field of energy and climate policy	22 September 2017
4	Former leader of environmental division under the Ministry of Power	23 September 2017
5	CEO of an NGO active in the field of voluntary carbon markets and forestry	26 September 2017
6	Interview of three representatives of the trading administrator of one of the examined mechanisms	27 September 2017
7	Senior consultant at an environmental consultancy	28 September 2017
8	Former government representative involved in establishing the CDM in India	28 September 2017
9	Member of the Indian UNFCCC delegation of negotiators	28 September 2017
10	Employee of a globally active NGO in the field of carbon pricing	29 September 2017
11	Senior consultant at an environmental consulting firm	29 September 2017
12	Government representative from the Ministry of Power respon-sible for the implementation of one of the existing mechanisms	29 September 2017

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