UNIVERSIDAD AUTÓNOMA DE SAN LUIS POTOSÍ

FACULTAD DE CIENCIAS QUÍMICAS, INGENIERÍA Y MEDICINA

PROGRAMAS MULTIDISCIPLINARIOS DE POSGRADO EN CIENCIAS AMBIENTALES

TESIS QUE PARA OBTENER EL GRADO DE

DOCTORADO EN CIENCIAS AMBIENTALES

PROGRESS AND LIMITS OF CARBON MARKET IN MEXICO: ANALYSIS OF THE NATIONAL EMISSIONS TRADING SYSTEM

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ENERO DE 2021

AGRADEZCO A CONACyT EL OTORGAMIENTO DE LA BECA-TESIS

Becario No. 814559

EL DOCTORADO EN CIENCIAS AMBIENTALES RECIBE APOYO ATRAVÉS DEL PROGRAMA NACIONAL DE POSGRADOS DE CALIDAD (PNPC)

AGRADECIMIENTOS

A mi director de tesis el Dr. Humberto Reyes Hernández, por las enseñanzas que me transmitió y sus relevantes revisiones. De igual forma quiero reconocer la confianza y la libertad que me dio en mi investigación, lo que permitió desarrollar al máximo mi reflexión personal.

A mis dos asesores, el Dr. Miguel Aguilar Robledo y el Dr. José Santos Zavala. Las pláticas que tuve con ambos fueron de gran apoyo y me siento afortunado de haber disfrutado de sus conocimientos.

A los Programas Multidisciplinarios de Posgrado en Ciencias Ambientales, por aceptarme como estudiante de doctorado, y su equipo administrativo por su gran apoyo en los diferentes tramites a lo largo de estos años.

Al Dr. Alain Karsenty y la Dra. Loraine Roy, quienes me guiaron al principio de mi trabajo. Ambos son grandes investigadores y estos intercambios de ideas fueron factores clave para mi investigación.

A la cooperativa Ambio e ICICO A.C por recibirme en sus campos de trabajo y enseñarme el funcionamiento de los proyectos de captura de carbono. Así como a las comunidades de Villa las Rosas en Chiapas y de San Juan Lachao en Oaxaca. Sin la información y la experiencia que me transmitieron, este trabajo no hubiera sido posible. Muchas gracias por recibirme en este ambiente tan acogedor, fue una experiencia inolvidable.

A Motu Economic and Public Policy Research, por aceptarme para esta estancia tan decisiva en Wellington. No sé cómo agradecer a Catherine Leining por asesorarme en esta estancia y compartir sus infinitos conocimientos conmigo. Las largas conversaciones que tuvimos fueron indispensables para mi trabajo y me abrieron a nuevas reflexiones sobre la implementación de políticas ambientales. Es sin duda una de las más sobresalientes expertas en el tema de tarificación del carbono en el mundo.

A la Facultad de Ingeniería de la UASLP, por su confianza mientras realicé este trabajo de doctorado. Me siento muy orgulloso ser parte de esta institución.

A mi familia, por los valores que me transmitieron. Gracias a mis papás, por enseñarme a superarme y por su apoyo incondicional en cada decisión que he tomado, y a mis hermanos por siempre creer en mí y aceptar el rumbo que le he dado a mi vida. A mi abuelita por cuidarme y guiarme desde el cielo.

A mis amigos de México y de Francia, en particular a Víctor y a Rodrigo, mis roomies, con quién compartí momentos inolvidables. A Charlotte, sin ella mi vida en México hubiera sido diferente. A Thibaut por ser mi eterno compañero de primera investigación y un amigo con quien descubrí mi amor por México, y a Michal por seguir siendo mi mejor amigo después de tantos años sin importar la distancia.

A Andrea, fuiste la parte más importante de mi vida y no sé cómo agradecerte porque sin ti no sería el hombre que soy hoy. Eres la persona mas virtuosa y generosa que hay en este mundo. Un infinito agradecimiento a la familia Gaitán Delgadillo por hacerme sentir en casa en mis primeros años en México. Merecen lo mejor.

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AFOLU Agriculture, Forestry, and other Land Use

BAU Business as Usual

CARB California Air Resources Board

CDM Clean Development Mechanism

CO_2 Carbon Dioxide

CONAFOR Mexico National Commission for Forestry

EITE Emissions Intensive and Trade Exposed

ETS Emissions Trading System or Emissions Trading Scheme

EU ETS European Union Emissions Trading System

GDP Gross Domestic Product

GHG Greenhouse Gas

GIZ Deutsche Gesellschaft für Internationale Zusammenarbeit (German Development Agency)

ICAP International Carbon Action Partnership

INDC Intended Nationally Determined Contribution

LGCC Ley General de Cambio Climatico (Mexico's General Law on Climate Change)

LULUCF Land Use, Land-Use Change and Forestry

JI Joint Implementation

MBI Market-Based Instrument

$MtCO_2$ Million Metric Tons of Carbon Dioxide Equivalent

NDC Nationally Determined Contribution

NZD New Zealand Dollar

NZ ETS New Zealand Emissions Trading System

NZUs New Zealand Units

PES Payment for Environmental Service

PMR Partnership for Market Readiness

REDD+ Reducing emissions from deforestation and forest degradation

RENE Mexico National Emissions Register

RGGI Regional Greenhouse Gas Initiative

SEMARNAT Ministry of Environment and Natural Resources of Mexico

tCO_2 Tonne of Carbon Dioxide

tCO_2e Tonne of Carbon Dioxide Equivalent

UNFCCC United Nations Framework Convention on Climate Change

USD US Dollar

ABSTRACT

The evolution of environmental policies has followed the neo-liberalization trend of the international economy. The concept of the market stands out in sustainable development discourse and the shape of international agreements about climate change. Market-based instruments are inspired by neoclassical theory, which praises price incentives and the optimal effect of free negotiation between stakeholders. There are some limits in the enforcement of such instruments, mainly in the tradeoff between efficiency and conservation. In the theory, the critics are focused on monetization and commodification and the structural limits of capitalist functioning. In Mexico, the state is obvious in environmental policy, but hybrid forms of environmental governance are in effect. The implementation of market-based instruments in Mexico reflects some limits stressed in the scientific literature. Tradeoffs between economic efficiency and ecological target, conflicts caused by utilitarian behavior, and the subjective practices of monetization are observed in Mexico. Given the primitive stage of the national Emissions Trading System (ETS), these conclusions make the future evolution of Mexican carbon policy an issue of interest.

The forestry projects registered in the Mexican voluntary carbon market are instruments based on the commodification of ecosystem services and the sale of carbon credits with prices set on the market. These projects constitute an environmental governance scheme emancipated from the state, including the agreement between various stakeholders, with sharp differences in the functioning structures established in the contracts. The type of land ownership is a potential source of conflict in implementing this type of project, which also depends on the capacity for cooperation in the communities where they are undertaken. Such projects incorporate local initiatives to solve a problem on a global scale through the democratization of environmental management. However, their neoliberal basis means the market drives these projects and that

paradoxically, a solution mechanism is sought in the same monetary language that caused the environmental crisis.

ETSs are the political instruments that most of the industrial world has adopted to control greenhouse gas emissions. Many jurisdictions are currently implementing ETSs, and countries, where they are already enforced, are improving their systems. New Zealand has the second oldest ETS in the world. The NZ ETS is quite singular because it covers the most economic sectors of any such scheme, the points of obligation are based on an upstream selection, and there is no cap on emissions on the national scale. The current functioning of the NZ ETS results from a long and sensitive democratic process that involved the participation of multiple economic sectors in defending their interests. The NZ ETS firmly deals with the transition to a low-emissions economy by the management of free allocation. It is hard to achieve the theoretical functioning of the ETS. Setting a cap on emissions is the milestone to guarantee environmental efficiency, but the NZ ETS has failed on this point so far. The weak incentive effect of the price incentive and the generous allocation scheme has affected the environmental efficiency of the NZ ETS.

The NZ ETS is the only case of an ETS integrating forestry as a mandatory actor. This is the result of prolonged political discussions and the characteristics of New Zealand forestry. Forest landowners are liable to surrender allowances for deforestation and can potentially receive allowances for the level of carbon sequestered. This scheme created new opportunities for forestry activities and impacted the decision-making tradeoffs related to land-use changes. In Mexico, implementing an ETS in 2020 is evidence of the country’s commitment to control domestic emission under the Paris agreement. Nevertheless, for now, the forestry sector is not involved as a liable actor, but it is possible to envision the integration of forest sector because of the extensive forest cover in the country. Mexico has the experience and institutional framework to integrate forestry into national emission accounting and forest carbon projects in the voluntary market. Environmental impacts are positive because forest areas can help mitigate emissions, but intensive carbon farming disrupts native forests and biodiversity. The economic impacts would be highly favorable for forest landowners if market volatility were controlled, but there is a potential loss of public revenue for the state. Finally, carbon forestry can cause conflict between economic sectors involved in land use and among participating communities. The provision of industrial free allocation can be one of the most technically challenging and politically fraught elements of designing an ETS. Free allocation is a political instrument used to avoid economic disruption and carbon leakage caused by carbon pricing. The government can use different types of allocation according to the political target. The jurisdictions enforcing free allocation use the same equation to determine the level of allocation with different technical parameters and phase-out strategies. Mexico starts its ETS with full free allocation and will have to decide the kind of allocation in the next steps. This choice will determine the transition rate to a low emission industry and the economic impact of the ETS.

Enforcing ETS is a logical political choice in a capitalist market economy. However, it will not be sufficient to solve the climate change issue resulting from a structural model of production in the industrial countries. State intervention to support the transition with complementary programs, budget policies, and new legislation are necessary to drive the economy to a low emission model.

KEYWORDS

Emissions Trading System, Market, Carbon sequestration, Climate change, Governance

RESUMEN

La evolución de la política ambiental ha seguido la tendencia neoliberal de la economía internacional y el concepto de mercado aparece como un factor clave en el discurso de desarrollo sustentable y en la elaboración de acuerdos internacionales sobre el cambio climático. Los instrumentos de mercado inspirados de la teoría neoclásica promueven el incentivo de los precios y el efecto óptimo de la libre negociación entre actores. La aplicación de dichos instrumentos tiene limitaciones empíricas, principalmente en el balance entre eficiencia económica y conservación. En la teoría, las críticas se enfocan en el proceso de monetización y mercantilización, así como en las limitaciones estructurales del funcionamiento del capitalismo. En México, el Estado la política ambiental, manifiesta formas hibridas de gobernanza. La aplicación de instrumentos de mercado en el país refleja algunos problemas descritos en la literatura. Se pueden observar la existencia de balance entre eficiencia económica y objetivo ambiental, conflictos provocados por el comportamiento utilitario de los individuos y la practica subjetiva de la monetización. Dado que el sistema de comercio de emisiones (SCE) en México iniciando, estas conclusiones son de gran interés para el futuro de la política mexicana para emisiones de carbono.

Los proyectos forestales inscritos en el mercado de carbono voluntario en México son instrumentos que se basan en la mercantilización de un servicio ecosistémico y consisten en la venta de créditos a un precio establecido en el mercado. Los proyectos de captura de carbono en el mercado voluntario representan una forma de gobernanza ambiental emancipada del Estado, basada en el acuerdo de varios actores con papeles específicos, con marcadas diferencias en los esquemas de funcionamiento establecidos en los contratos. El tipo de tenencia de la tierra es una fuente potencial de conflicto en la aplicación de este tipo de proyectos, los cuales dependen además de la capacidad de cooperación de las comunidades donde se

emprenden. Tales proyectos integran iniciativas locales para solucionar un problema a escala global a través de la democratización de la gestión ambiental. Sin embargo, su fundamento neoliberal implica que estos proyectos estén en función del mercado y que, paradójicamente, se busque un mecanismo de solución en el mismo lenguaje monetario que ha causado la crisis ambiental.

Los SCE son instrumentos políticos que una gran parte de los países industrializados adoptaron para controlar las emisiones de gases a efecto invernadero. Actualmente, varias jurisdicciones están elaborando sus modelos, y otras donde esta política existe, están perfeccionando su sistema. Nueva Zelanda tiene el segundo SCE más antiguo en el mundo resultado de un proceso democrático largo y delicado, que involucró la participación de varios sectores económicos. El NZ ETS cubre más sectores económicos, sus puntos de obligación son al inicio de la cadena productiva, y no existe un tope de emisiones a nivel nacional. El funcionamiento del NZ ETS resultó de un proceso democrático largo y delicado que involucro la participación de varios sectores económicos defendiendo sus intereses. Sin embargo, enfrenta el problema de la transición hacia una economía baja en emisiones con el manejo de asignación gratuita de permisos. Aplicar el funcionamiento teórico de un SCE es difícil. Establecer un tope de emisiones es una parte decisiva para garantizar la eficiencia ambiental, una meta incumplida por el NZ ETS. Por otro lado, los bajos incentivos económicos y la asignación gratuita muy generosa limitaron su eficiencia ambiental.

El NZ ETS es el único caso de un SCE con el sector forestal como participante obligatorio. Es el resultado de una larga discusión política y de las características del sector forestal en Nueva Zelanda. Los propietarios forestales deben entregar permisos al gobierno cuando deforestan y pueden obtener permisos según el nivel de carbono capturado en su bosque. Este esquema crea nuevas oportunidades para las actividades forestales e impacta la toma de decisión relacionada al uso de suelo. En México, el sector forestal no está implicado en el SCE a la fecha, aunque cuenta con la experiencia y un marco institucional relevante para su inclusión en el registro nacional de emisiones y la presencia de proyectos forestales en el mercado voluntario de carbono. Los impactos ambientales de esta integración serian positivos por el potencial del sector forestal en la mitigación de emisiones, aunque los incentivos pueden alterar la superficie de bosques nativos y la biodiversidad. Los impactos económicos serian favorables para los propietarios forestales participantes si la volatilidad del mercado se controla, pero se estima una pérdida de ingresos públicos para el Estado. Finalmente, las actividades de captura de carbono pueden causar conflictos entre actividades económicas relacionadas al uso de suelo, y dentro de las comunidades participantes.

La asignación gratuita de permisos de emisiones puede ser uno de los elementos de diseño de SCE más complejo técnicamente y más conflictivo a nivel político. Este elemento es un instrumento político adoptado para evitar impactos económicos negativos y la fuga de carbono provocados por la tarificación del carbono. Las jurisdicciones que aplican asignaciones gratuitas usan la misma ecuación para el cálculo de permisos, pero diferentes parámetros técnicos y estrategias de salida gradual. México arrancó su SCE con una asignación gratuita completa y debe tomar decisión sobre la modalidad futura de asignación. Esta decisión va a determinar el ritmo de transición hacia una economía baja en emisiones.

La aplicación de un SCE es una orientación política lógica en una economía de mercado capitalista pero no será suficiente para resolver el problema del cambio climático que resulta de la estructura del modelo de producción en los países industrializados. Una intervención estatal para apoyar la transición con programas complementarios, políticas presupuestarias, y nuevas legislaciones es necesaria para conducir el sistema económico hacia un modelo bajo en emisiones.

PALABRAS CLAVES

Sistema de Comercio de Emisiones, Mercado, Captura de carbono, Cambio Climático, Gobernanza

CHAPTER 1: INTRODUCTION AND OBJECTIVES

I. FRAMEWORK

The United Nations Climate Change Conference held in Paris in 2015 (COP 21) concluded to limit global warming to well below 2°C and pursue efforts to reach only 1.5°C (United Nations, 2015). This is a new paradigm of target setting for climate change since there is no quantitative goal for CO_2 emission anymore on a global scale, unlike the Kyoto Protocol. Each country must set its target of carbon emission reduction (Nationally Determined Contribution).

The efforts proposed by the participating countries are not enough to achieve the 2°C goal, and there is an urgent need for deeper measures (UNEP, 2017). Following the Paris international agreement, Mexico aims to reduce its emissions to 25 % below the business-as-usual scenario for 2030 (Gobierno de la Republica, 2015). This objective has been set as national law since 2012 (WRI, 2016). The countries to achieve their objectives can choose to enforce the political instrument independently to other countries' decisions. However, carbon pricing is the type of instrument recommended since the Protocol of Kyoto (1997). Emission Trading System (ETS) is the most common instrument for carbon pricing.

Greenhouse gas emissions impose a cost on the economy, which is not accounted for in standard market transactions. As a result, producers and consumers receive the economic benefits of emitting activities while the environmental costs are distributed globally and over time. Similarly, those who take action to reduce emissions face the costs but do not receive the benefits which are distributed globally and over time.

An ETS is designed to integrate a price on emissions into market transactions, creating incentives for producers and consumers to choose lower-emission alternatives and enabling innovators to compete. Under conventional ETS design, the government imposes a limit (cap) on the total emissions in covered sectors of the economy and issues tradable emission units equal to the level of the cap. Each unit corresponds to one ton of emissions, and regulated participants must surrender emission units to cover the emissions for which they are liable. The establishment of a trading market and a fixed number of units generates a unit price. Constraining unit supply relative to demand raises emission prices, and incentivizes behavior change (Leining et al., 2019; PMR & ICAP, 2016).

"Allocation" refers to the process by which the government issues emissions units into the trading market. Allocation generally occurs through three mechanisms: selling units at auction, distributing units to market participants for free, or awarding units for eligible activities (e.g., conducting emissions removal activities within the ETS). Some systems also accept units from external offsetting (typically project-based) mechanisms. The market sets emission prices based on the balance between total unit supply and demand; this is not affected by how units are distributed into the market. However, the method of allocation affects how the costs of compliance with ETS obligations are distributed across the market and can affect participants' level of exposure to emissions pricing and relative incentive to change behavior. Free allocation also has fiscal implications for the government, which forgoes the auction revenue that would otherwise be received.

In most ETSs, the regulator sells a portion of units through auctions and distributes the other portion through free allocation. Among the 21 ETSs in force in 2020, 11 include a mix of auctioning and free allocation, while nine use only free allocation, and one uses auctioning (ICAP, 2020). The ETSs currently using only free allocation are recent models. Some ETSs started with 100 percent free allocation and have introduced auctioning over time (Narassimhan et al., 2018).

As a continuation of the Protocol de Kyoto, the Paris agreement and the NDC paradigm encouraged some countries to follow this orientation and open national carbon markets. Mexico did it by implementing the first national ETS of the continent. Table 1 lists the 29 jurisdictions under an ETS in the world and the geographic scope. The jurisdictions where an ETS is in force make up 42% of the global Gross Domestic Product (GDP), and these ETS cover 9% of the global emissions (ICAP, 2020).

Table 1. Jurisdictions covered by and ETS in 2020

Supranational	Countries	Provinces and states	Cities
EU ETS : *EU Member States* + *Iceland* + *Liechtenstein* + *Norway*	Kazakhstan Mexico New Zealand Republic of Korea Switzerland	Regional Greenhouse Gas Initiative (RGGI): *Connecticut* *Delaware* *Maine* *Maryland* *Massachusetts* *New Hampshire* *New Jersey* *New York* *Rhode Island* *Vermont* California Nova Scotia Québec Fujian Guangdong Hubei	Beijing Chongqing Saitama Shanghai Shenzhen Tianjin Tokyo

Source: ICAP, 2020

The Kyoto Protocol also created the Clean Development Mechanism (CDM) and Joint Implementation (JI) mechanisms to allow international flexibility and credit transfers to achieve their carbon objective. The purpose was to complete the compliance emission trading system by integrating offsets from mitigation projects in clean energy production and carbon capture in the forest. The offsets generated in the project can be sold in the local market or other (international market). A company from an industrialized country finances a project that reduces or compensates carbon emissions in a developing country in a CDM.

The carbon reduction achieved is considered for the industrialized country's objective converting it into carbon credit tradable in the market. The mechanism is the same in a JI, but the cooperation is between two industrialized countries under the Protocol of Kyoto commitment. In 2008, the United Nations elaborated the REDD+ program (Reducing Emissions from Deforestation and Forest Degradation in Developing Countries). REDD+ aims to finance projects in developing countries to reduce the carbon level in the atmosphere improving carbon capture by forests.

The carbon sequestered in REDD+ projects is converted into carbon credits that the promoter can trade in the market (UN-REDD Program, 2016). However, REDD+ projects can also be financed by international funds. Since the Kyoto Protocol, there is an international carbon market for offsets trades. In this market, the countries trade offsets through several organizations that certificate carbon reduction projects with their standard recognized by offsets buyers and countries. The CDM organization of the United Nations is one of them.

Articles five and six of the Paris Agreement states the determination to promote carbon capture project based on REDD+ results at a local and international scale. The new paradigm named *international transfers of mitigation outcomes* (ITMOs) looks to consider the failures and weaknesses of previous offsets projects, particularly in the monitoring, reporting, and verification (MRV) process (Shishlov et al., 2016). The CDM was based on six points for its application: additionality (defined hereafter), baseline setting, monitoring, verification, transparency, timeline, and permanence. Mainly, additionality and permanence are the two keys features in which the CDM was criticized (Shishlov et al., 2016).

The ITMOs aim to improve the failures on these points and integrate governance and transaction costs issues. The transaction costs in CDM projects are not directly induced by the project achievement, such as administrative formalities for certification and monitoring of emissions reductions, accounting, and verification. The problem with transaction costs is their variation according to the scale and the sector. Bigger scale projects tend to have lower transaction costs (Shishlov et al., 2016).

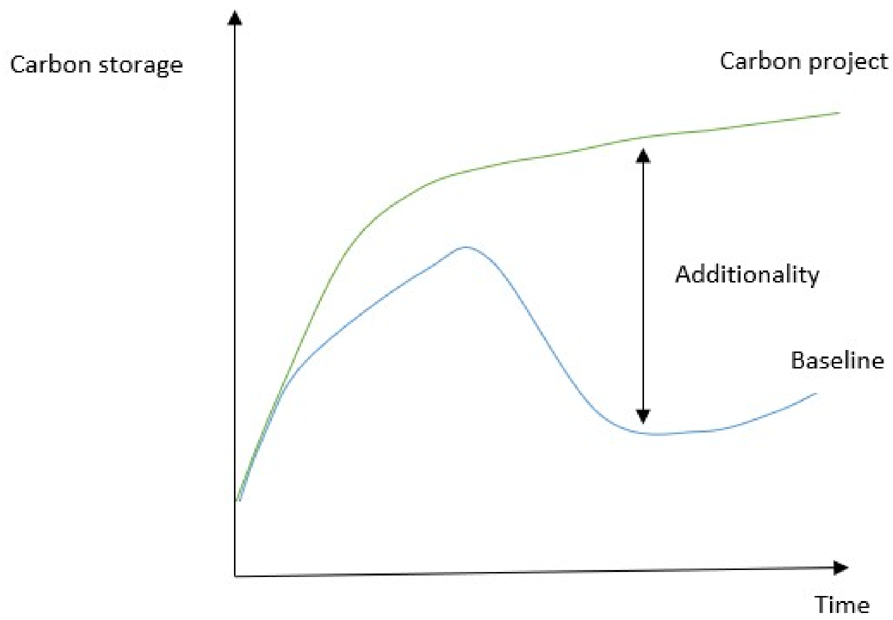

Figure 1. Additionality in a carbon capture project

Source: Author

The additionality of a project refers to the real GHG abatement compared to a baseline scenario where there is no carbon reduction project (Figure 1). In forestry, the anticipated tendency of carbon capture in the "business as usual" scenario is crucial. After all, they will determine the number of credits created by the project. The additionality does not refer only to the gap in carbon emission or capture between a baseline and the project impact but also to economic additionality. That refers to the financial benefits of carbon credits sales.

A project is economically additional when the rentability depends on the carbon credits sale. This issue is essential for a productive project that generates income without carbon credits sale, such as energy production. This is not the case for carbon capture. The permanency of the project is another important issue. Forestry or agriculture projects are well exposed to this problem because there is a risk of release in the stock captured after a fire or land-use change. The remuneration for carbon capture will have to integrate this risk (Shishlov et al., 2016). The New Zealand Emissions Trading Scheme (NZ ETS), created in 2008, is the only ETS that integrate the forest sector in the national carbon market. Like other ETSs, the NZ ETS forces companies of critical sectors such as transport or energy to trade credits in the national compliance market (Leining & Kerr, 2018).

The forest owners are involved in the market accounting afforestation, reforestation, and deforestation. The NZ ETS is relevant because of the integration of permanence in the afforestation and reforestation contracts (Sartor et al., 2010). When the forest is destructed, the owner must repay the same level as carbon released by deforestation. Initially, the NZ ETS was linked to the international market, and the price suffered from the low demand for international units (Leining et al., 2016). Since 2013, the NZ ETS has been de-linked to the international market, and local units' prices have increased.

Mexico was one of the biggest CDM project recipients with 316 projects until 2015, corresponding to 27 million carbon credits (IETA, 2015). Since 2007, Mexico developed a carbon mitigation project in the forest sector (carbon capture) with its national voluntary market. This market receives carbon credits from the national project under several certification standards: *Plan Vivo, Climate Action Reserve, Clean Development Mechanism, Verified Carbon Standard, Gold Standard* (Mexico2, 2020). However, a voluntary market is not an instrument that helps to comply with the NDC but a way for companies to give visibility of corporate social responsibility. In this work, the Mexican carbon market scheme is the term that covers the ETS and the voluntary carbon market and the link between them.

II. JUSTIFICATION AND ASSUMPTIONS

The Emission Gap Report (UNEP, 2017) warns about the inadequate political ambitions. Current NDC's only cover one-third of the emissions reduction needed to be on a least-cost pathway for the 2°C goal. Figure 2 shows the different GHG emissions trajectories under the baseline scenario, current policy, NDC achievement, and the needed trajectories for the Paris agreement's goals. The first observation is that current policies only allow achieving around 50% of the GHG emissions reduction needed to comply with the NDC's.

The current NDC's for 2030 will already be far from the Paris agreements' trajectories. It is necessary to enforce cost-effective policies to follow a trajectory consistent with NDC and then set quickly more ambitious NDC's. Carbon removal and sequestration, inducing biological and technological solutions, are among the most severe options suggested by the Emission Gap Report (UNEP, 2017). Indeed, land use can reach an annual reduction of emissions between 4 and 12 GtC02/e.

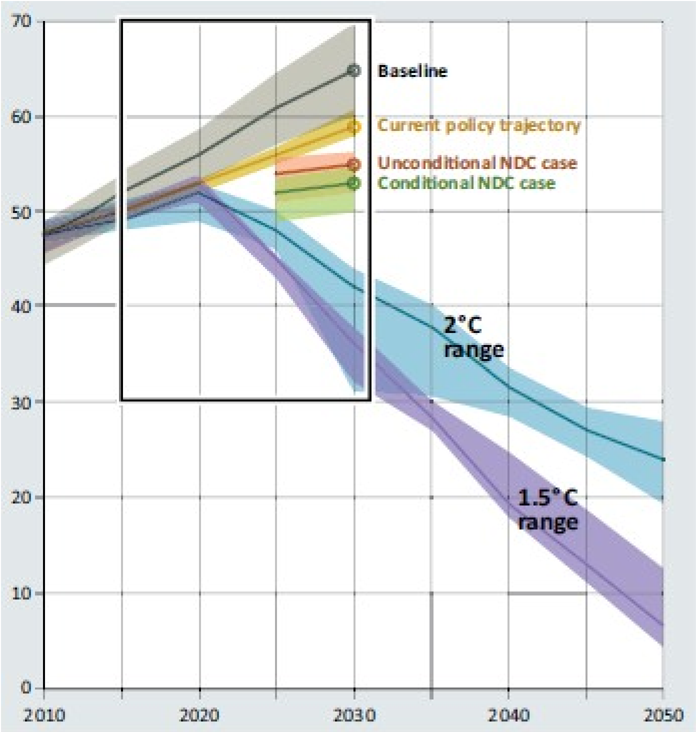

Figure 2. Global greenhouse gas emissions under different scenarios and the emissions gap in 2030

Source: The Emissions Gap Report 2017 – The emissions gap and its implications, UNEP

Mexico is one of the countries likely to require new actions to achieve its NDC's. The country is developing its national policy to contribute to the international effort against climate change since it has joined the Paris agreement. A national carbon market for compliance will open in 2018. Mexico can learn from other cases in the world to inspire the elaboration of its scheme. The European market is the oldest and shows that some factors limit the instrument's efficiency (fiscal fraud, false accounting, an excessive number of credits emitted). Mexico must learn from the problems that the European market faces. On the other hand, the NZ ETS offers positive results on the functioning of a market that links the forest sector and industrial actors. Then, research on the functioning of existing carbon markets will be relevant to support the enforcement of the Mexican scheme.

The use of MBI inducing commodification presents some limits, as presented earlier. These limits highlight the ideological approach of such an instrument. Some authors denounce the risk in the conception of MBI as a neoliberal position and the research to extend the capitalist market field rather than environmental conservation willingness (Van Hecken et al., 2015). The MBI study must overcome the neoclassical beliefs that lead to the international context. The carbon projects sector is recent and represents a new opportunity for capital accumulation and labor exploitation. In parallel, a large part of the rural Mexican population living in forest areas see in the carbon sector as an income opportunity.

The necessity to find out solutions for the ecologic crisis drives to change human schemes to preserve natural systems (themselves source of well-being to humans). Laurent (2012) describes the role of economics as an area of the transformation of behavior that causes environmental problems. Environmental sciences warn about the impact of humans on ecosystems and propose technical solutions. However, they do not propose efficient incentives to guide policies and social behaviors. The combination of environmental sciences and economics must be a solution to link knowledge about the ecological crisis and human systems management.

The environmental policy involves knowledge of legal, natural sciences, and social sciences areas. Such policies impact society at several scales, and economic choice theories are not enough to explain this impact. In the scientific area, there is a call for research on MBI enforcement with a multidisciplinary focus in response to the merely economic approach of the socio-environmental relation and reconsider the local scale in the environmental policy schemes (Van Hecken, 2015). This call is also linked to the need to consider the definition of ecosystem services in political areas that involve only economic aspects. A new political scheme emerged from multidisciplinary research on the functioning, and the creation of markets for ecosystem services could include complementarity of MBI with political commitment and rules to oppose these factors (Douai et al., 2015).

This work will try to answer the following questions:

- How can the Mexican carbon market scheme learn from other countries' experiences?
- Will the Mexican scheme overcome the problems faced previously in other markets, or will it repeat them?
- What efficiency can we expect? (economic, environmental)
- How the stakeholders interact in this scheme? How do they can match their own interests and goals? What kind of relationship will we observe?

III. OBJECTIVES

General

To produce a critical analysis of the implementation of the Emissions Trading System in Mexico on the base of other experiences to propose recommendations for the enforcement of policy instruments against climate change.

Specifics

1- To present the theoretical and practical limits of market-based instruments in the scientific literature and link them with the experience in Mexico.

2- To define the governance structure of forest carbon projects in the Mexican voluntary carbon market

3- To examines the political construction of the NZ ETS to make comparison and estimations for the Mexican ETS.

4- To estimate the potential for Mexico to establish an ETS with the inclusion of forestry and the likely impacts, using the experience of New Zealand.

5- To determine the issues about free allocation from the experience of the European Union, California, and New Zealand.

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CHAPTER 2: THEORETICAL AND PRACTICAL ISSUES OF THE MEXICAN CARBON POLICY

I. INTRODUCTION

Environmental governance evolved with the integration of new stakeholders into the management of natural resources and environmental impacts. Communities and the private sector have become involved and new forms of management have been created with the idea that the state cannot control everything (Agrawal and Lemos, 2007). Therefore, the participation of the private sector in environmental management has integrated market mechanisms into environmental policy.

Market rhetoric has been quite redundant in the international dialogue about sustainable development. In the Bruntland Report (1987) it is mentioned as “expansionary policies of growth, trade and investment” (WCED, Art. 24); the 1992 Rio Declaration called for an “open international economic system that would lead to economic growth and sustainable development in all countries” (UNCED, 1992, Principles 12 and 16). The Johannesburg Declaration on Sustainable Development in 2002 also mentioned the “benefit from opening of markets” (Principle 18), and the declaration of the 2012 “Rio+20” Earth Summit stated that “international trade is [the] engine for development and sustainable economic growth” (UNCSD, 2012). More recently, the 2015 Paris Agreement still encouraged the use of “internationally transferred mitigation outcomes to achieve nationally determined contributions” (United Nations, 2015).

The integration of market-based policy in environmental policy is also a key feature in the scientific agenda. At the beginning of the 2000s, the concept of market-based instruments gained popularity and economists included several economic instruments under this category

(Pirard and Lapeyre, 2014). In the 1990s a connection developed between ecosystem function studies and economic value literature (Costanza *et al*., 1997). Monetary valuation was justified by the implementation of market mechanisms and the need for public and private funding for ecosystem conservation (Weber, 2002). The dominant thinking is that assigning a monetary value to ecosystems seems to be necessary for environmental political decision-making and conservation because people might be more likely to react to a monetary variable. The literature focusing on MBI mostly concerns PES and carbon pricing. Some authors present their functioning and impacts (positive or negative) through quantitative analyses or propose to classify them through different typologies (Pirard and Lapeyre, 2014; Hahn *et al*., 2015). Others criticize their neoliberal bases and denounce the risks in the commodification of ecosystem services.

Carbon markets and other market-based instruments (MBI) to fight climate change have gained popularity in the political arena. In 2017, the World Bank reported 67 carbon-pricing initiatives worldwide at national and sub-national levels (World Bank and Ecofys, 2017). Payment for environmental services (PES) programs, price incentives to promote ecosystem services, have evidently also become predominant in the political agenda (Fletcher and Büscher, 2017).

Markets for greenhouse gases (GHG) and Emissions Trading System (ETS) are environmental policy instruments that have been recommended since the Kyoto Protocol (1997). Moreover, the Paris Agreement encouraged international carbon offsets as carbon sequestration incentives (Art. 5). But scientists already warn that current policies only would allow achieving around 50% of the GHG emissions reduction needed to comply with the NDCs. Besides, current NDCs for the year 2030 will already be far from the Paris agreements' ambitious goals (UNEP, 2017). It is necessary to enforce efficient policies to follow a path consistent with the NDCs and then quickly set more ambitious targets. Carbon removal and sequestration, achieved with biological and technological solutions, are a serious option for solving the problem. Indeed, land use changes could achieve an annual emissions reduction of 4 to 12 Gt CO_2e[1] (UNEP, 2017).

Mexico aims at reducing its emissions to 25% below the business-as-usual[2] (BAU) scenario for 2030 (Gobierno de la República, 2015), which has been set as national law since 2012 (WRI, 2016). Mexico is the tenth largest GHG emitter in the world with 665 million t CO_2e in 2013 (MEXICO2 *et al.*, 2018). Electricity production and transport are sectors where emissions need to be controlled first. But land use and forestry give a real potential to achieve emission targets (Veysey *et al*, 2016). The Mexican government has been developing its national policy to contribute to the international effort against climate change since the country joined the Paris agreement. Actually, Mexico has already adopted the MBI paradigm in its environmental policy against climate change. This country hosts one of the most representative cases of PES for hydrological services and carbon sequestration, a voluntary carbon market exists for carbon mitigation or sequestration projects, a carbon tax for emissions from fossil fuels has been enforced since 2014, and the country is preparing the implementation of an ETS.

This chapter aims to highlight the theoretical and practical limits of MBIs in the scientific literature in order to present the difficulties to face for the political practices on carbon emissions and mitigation in Mexico. We present the theoretical bases of MBIs and their advantages from the neoclassical approach and examine the criticisms and limits of MBIs and specifically of commodification of nature from the ecological economics and political ecology literature. Finally, we analyze the implementation of MBIs in Mexico and discuss the link between MBI literature limits and observation in the Mexican case study.

[1] Carbon dioxide equivalent.
[2] A scenario where nothing is changed in policy-making and people's behaviors.

II. MBI: DEFINITION, WEAKNESSES AND STRENGTHS

The rise of MBIs in the political arena is explained by the weight of ideological frameworks in environmental sciences and political agendas (Gómez-Baggethun and Muradian, 2015). The evolution of environmental policy instruments has the same roots as the global economic system, aligned with mainstream neoclassical theory. Market environmentalism was not only a political trend but also a scientific one (Anderson and Leal, 2001). This approach advocates well-defined property rights of ecosystem services, monetary valuation ecosystem services and promotion of MBIs as political instruments (Gómez-Baggethun *et al*., 2010).

The negative externalities (pollution) or positive (environmental services) explain the origin of environmental taxes (Pigou, 1932). However, one of the main bases of the theory of MBIs is the Coase Theorem, which posits that bargaining between the parties involved will lead to an efficient outcome, as long as the transaction costs associated with bargaining are negligible (Coase, 1960).

This theory states that the market, as a place of bargaining, is preferable to state intervention. Further, the environmental economics approach says that ecological impacts from human activity are due to market failures. These market failures do exist because of the absence of assigned prices for ecosystem services and goods. One solution would thus be to estimate an economic value of ecosystem services or at least give them a market price (which paradoxically means state intervention), since the functioning of the market leads to optimal allocation at minimum costs thanks to bargaining between agents and the natural rules of demand and supply in neoclassical theory.

In the theory of MBIs, the main advantage is that the price signal guides human behavior and allows environmental impacts to be controlled and financial opportunities to be provided for conservation (Pirard and Lapeyre, 2014). Human rationality attempts to solve the imbalances (externalities) with market instruments as long as access to information such as prices is guaranteed (Barkin, 2008). Individuals can decide about consumption choices, technology development and efficiency improvement, which allow them to achieve an environmental goal at minimum price (Farley *et al*, 2015). Neoliberal capitalism would be both the problem and the solution to ecological crisis (Fletcher and Büscher, 2017).

The Millennium Ecosystem Assessment (MEA, 2005) determined the direction of environmental policy. The paradigm of ecosystem services and MBI based on this initiative suggested an instrumental view of nature that leads to its commodification, which is defined as the trade of goods and services that were not previously conceived as marketable items (Hahn *et al*., 2015). In other words, commodification transforms non-economic goods/services into tradeable ones. Monetary valuation and market functioning are not always required in the process of commodification, but it implies at least the establishment of an exchange value. A commodity is defined "a good or service exchanged in a market. By commodification we refer to the institutional, symbolic, and material changes through which a good or service that was not previously meant for sale enters the sphere of market exchange" (Kallis *et al*., 2013: 97).

Not all MBIs conform to the exact characteristics of markets. Several studies have tried to show their diversity and categorize them. Pirard and Lapeyre (2014) classified MBIs according to intrinsic aspects and their relation to markets. The first category, "direct market," is the closest to market creation for ecosystem services since it includes all markets where recreational, cultural, or provisional (agricultural production) ecosystem services are directly sold. A "tradable permit" is the most enforced category (Pirard and Lapeyre, 2014) and includes the mechanism mentioned in the Kyoto Protocol and some REDD+ projects. The third and last categories, "voluntary price signal" and "regulatory price changes," consist of using price incentives through existing markets that were not previously created for ecosystem services (Table 2).

Another classification of MBIs considers two characteristics: the relationship between buyers and sellers of ecosystem services, which can be direct, or through intermediaries (state, NGO or private companies); and if whether or not participation is mandatory. In some instruments, actors have no choice and must be part of the transaction (taxes or tradeable permits), and in others the transactions are voluntary (payments for environmental services, voluntary carbon markets, certification programs) (Vatn, 2015).

Table 2. Classification of MBIs for ecosystem services by Pirard and Lapeyre (2014)

Category	Exclusive properties	Specificities	Relation to the market
Direct markets	A market where an environmental product can be directly traded between producers and consumers (or processors)	Can be framed at the international level with specific rules for each country and a great variety of deals (genetic resources), or as a more classical market with more or less processed products (NTFP)	Proximity to the market definition depends on cases and the degree of commodification
Tradable permits	An *ad-hoc* market where users of an environmental resource need to purchase "permits" that can be further exchanged among resource users, thereby creating artificial scarcity	Designed to either serve a clear environmental objective (with bio- physical indicators) or based on acceptable social costs (market price for carbon)	Creation of a specific market for a given environmental objective; information is expected to be revealed
Reverse auctions	A mechanism whereby candidates to service provision set the level of payment (if accepted) in response to a call by public authorities to remunerate landholders	Aimed at revealing prices and avoiding free-riding and rent seeking	Creates an auction-based market that favors competition among bidders for achieving cost-efficiency
Coasean-type agreements	Ideally, spontaneous transactions (free of public intervention) for an exchange of rights in response to a common interest of the beneficiary and the provider	Requires clear allocation of property rights, highly site-specific and difficult to replicate on a large-scale	Usually not following market rules, more of a contractual nature
Regulatory price changes	Consists of regulatory measures that lead to higher or lower relative prices	Part of a fiscal policy (including subsidies) with environmental objectives and complete control by public authorities	Based on an existing market
Voluntary price signals	Consists of schemes whereby producers send a signal to consumers that environmental impacts are positive (in relative terms) and consequently gain a premium on the market price	Still limited as an incentive for action due to relatively low willingness to pay by consumers	Uses existing markets to identify and promote virtuous activities

Source: Pirard and Lapeyre 2014

The relationship between commodification and MBIs is a key issue, and authors generally admit that MBI for ecosystem services implies commodification. However, commodification does not inevitably imply marketization. In Hahn's six-category classification (Hahn *et al*., 2015), the fourth category corresponds to taxes and subsidies, and the fifth includes markets for ecosystem services (voluntary or mandatory) and market-like PES. Indeed, the PES scheme can vary. In most cases, it is a subsidies-based program driven by the state (Muñoz-Piña, 2008; Vatn, 2015; Hahn *et al.*, 2015; Fletcher and Büscher, 2017). The sixth category involves financial instruments corresponding to a direct market for ecosystems or ecosystem services (Table 3).

Table 3. Classification of political instruments for ecosystem services according to the degree of commodification by Hahn, et al. (2015)

Degree of commodif.	Main category	Examples
0	Moral suasion and regulations justified by intrinsic value	• Information appealing to moral responsibility. • Recognising social equity and nature's intrinsic value, e.g. endangered species acts and nature reserves
1	Non-monetary regulations based on instrumental arguments	• Nature reserves and other land-use plans focusing on nature's instrumental value to human wellbeing
2	Non-monetary regulations based on physical metrics (units of nature)	• Ecological compensation with no role for price signals or market transactions
3	Non-monetary regulations designed to maximise economic efficiency	• City park designed and managed to maximise calculated recreation values
4	Economic instruments (not traded)	• Taxes and subsidies • Subsidy-like PES paid by governments
5	Economic instruments (voluntary market trade)	• Market-like PES • Markets for ecosystem services (MES), e.g. biodiversity offsets trading conservation credits
6	Financial instruments	• Forest bonds • Biodiversity derivatives

Source: Hahn, et al., 2015

About carbon emission and storage, the most used instruments are carbon tax, ETS and PES. In a carbon tax system, the government sets the emission price, while in ETS it sets the supply and price is adjusted by the interaction with demand. PES programs can vary but generally, the government determines the demand, price, and supply adapt the ecosystem service provision (Farley *et al*, 2015)

Adapting the Coase Theorem in the relationship between supply and demand to an ecosystem service, we can assume that MBIs offer the possibility to access the environmental goal at minimal cost. One advantage of MBIs aside from the ecological ramifications is the positive impact for poverty alleviation. At the international scale, programs such as the Clean Development Mechanism (CDM) and REDD+ would help fight rural poverty and low-carbon industrialization (McAfee, 2012). Indeed, some authors have made a strong case for a “win–win” in advocating carbon trading at the international scale as a way to address two of the biggest problems of the twenty-first century: global warming and poverty in developing countries (Osborne, 2015).

At present, REDD+ programs and some PES set their payments according to land users’ opportunity cost considering the assumption that both public and private agents are self-interested and make their calculation of costs and benefits linked with various options. This point enables ecological conservation to be enforced without affecting rural livelihoods. However, when the monetary income from carbon credits is higher than the opportunity cost and transaction cost, there is a “carbon rent” representing a surplus of value created in the transaction. It represents a new income opportunity for developing countries and rural populations (Karsenty, *et al*., 2014).

Several examples can be documented, in Mozambique, there is evidence that PES recipients have more cash income than non-recipients (Hegde and Bull, 2011). In China, the Grain for Green program targeting the poorest rural population had a significant positive effect on poverty alleviation (Uchida, *et al.*, 2007). Wunder and Alban (2008) analyzed how PES programs in Ecuador improved recipients’ welfare through higher incomes.

III. MARKET AND COMMODIFICATION OF NATURE

Theoretical critics of MBIs, and more widely of market environmentalism, mostly come from ecological economics and political ecology (Gómez-Baggethun and Muradian, 2015). Besides theoretical considerations, the literature highlights the limits in the enforcement of such policy besides theoretical considerations.

People with low incomes are more likely to suffer inconvenience from MBI enforcement than the wealthy (Farley *et al*, 2015). Tradeoffs between efficiency and equity in the implementation of MBIs limit the argument that MBIs present an opportunity to solve ecological problems with minimal cost and at the same time alleviate poverty. Specifically, in the design of CDM projects, criticisms are focused on the preference for market efficiency over sustainable development. In programs on the national scale, such as PES, studies point out the lack of ecological efficiency due to preference for lowest-cost targets, social development goals or the focus on a specific ecosystem service (Börner *et al.*, 2017).

The implementation of MBIs tends to cause conflicts in rural communities where forest owners suffer inequity, and the rules of the instrument are not adapted to the local context. In Tanzania, implementing the REDD+ program caused conflict despite the good intentions of a community participation scheme and local development. In particular, the enclosure of communal forests involved in the program provoked disputes about access to and use of natural resources (Scheba and Rakotonarivo, 2016).

International carbon market on mitigation projects also gave opportunity for opportunist behaviors leading to a kind of "carbon colonialism" in the transfer of climate responsibility to under-developed and developing countries and the appropriation of land by northern companies (Bachram, 2004; Lohmann, 2006, as cited in Osborne, 2015).

From a market dynamic approach, efficiency of MBI on ecosystem service could be limited by the characteristics of supply and demands. Most of ecosystem services are essential and non-substitutable that makes the demand inelastic to a price variation. This is mostly observed in marginal areas. They are also subject to biophysical constraints that make the supply inelastic (Farley *et al*, 2015).

More structural criticisms come from the fields of ecological economics and political ecology. On the one hand, ecological economics criticism focuses on the MBI itself and the methods and practices of commodification and monetization it induces; on the other hand, political ecology emphasizes the neoliberal model and the functioning of capitalism that leads to such an instrument being enforced (Kallis, *et al*., 2013).

In the literature, some contradictions emerge about the concept of commodification. Usually, commodification is strongly connected to the enforcement of MBIs. However, the classification of environmental policies by Hahn, *et al*. (2015) contains six degrees of commodification, of which only three correspond to MBIs. Criticizing commodification is thus too general to solidly argue against MBIs. The ecological economics literature mostly argues that commodification of ecosystem services brings about a loss of real motivation for conservation by transforming the services into economic goods that call for utilitarian human behavior (Kallis, *et al*., 2013). However, one of the strongest assumptions in neoclassical theory on which MBI are based is that the social utility is the sum of individual utilities is limited. Individuals can make different choices when they think for the group rather than for their individual wellbeing (Holland, 1997; O'Neill; 1998; Sagoff, 1998, as cited in Farley, 2015).

Since the first studies to value ecosystem services with money appeared (Costanza, *et al*., 1997), divisions have existed between ecological economics and environmental economics regarding the monetization process. Kallis, *et al*. (2013: 99) argue that "assigning a monetary value to an ecosystem feature is necessary if it is to be exchangeable and *tradable* [emphasis added]"; while others claim that monetizing ecosystem services is not necessary because bargaining and trading give them a market value that could be totally different.

Assignment of a monetary value and the actual value assigned would be a political choice rather than the establishment of a real exchange value or intrinsic value (Harribey, 2013). However, monetization is clearly linked to commodification since the main purpose is to use price signals. The ecological economics literature argues against monetary valuation because of the impossibility of reducing the value of ecosystem services to a simple metric variable (Gómez-Baggethun and Muradian, 2015).

The interconnection of ecosystem services is very complex, and the relationship with human society is deeper than utilitarian motivations. However, monetization could be helpful if it enables environmental improvement, preserves, or encourages justice and equality and if it is coupled with plural value-articulating mechanisms (Kallis *et al*., 2013). The limits of environmental policies based on MBIs highlighted by ecological economics can be summarized into four categories: biophysical, institutional, ethical and right-based limits (Gómez-Baggethun and Muradian, 2015).

The biophysical limit is in incommensurability of ecosystem services that makes difficulty to assess them quantitatively and transcript them into monetary value. The institutional limit is in the inconsistency between the non-rival / non-excludable aspect of a private marketable good and the fact that ecosystem services generally do not meet these conditions (Farley *et al*, 2015). The ethical limit lies in the fact that monetary value is invading ecological areas where the decisions were made under non-monetary considerations. Right-based limits are in the modifications in land rights and the conflicts induced in the enforcement of MBIs in rural areas (Gómez-Baggethun and Muradian, 2015).

Polanyi's analysis of commodification and marketization of nature explains that market-based calculations of environmental governance are destructive because they do not consider social and cultural values, which cannot be estimated through monetization (Polanyi, 2001). Eco-Marxism, the application of Marx's theory to the analysis of human impact on ecosystems, proposes another explanation to the ecological crisis in opposition to the neoclassical theory, which explains it with market failures and externalities. The capitalist system would generate economic and ecological crisis; market functioning then generates an economic crisis by the destruction of the production factor (O'Connor, 1998).

Currently environmental crisis is somewhat of a logical consequence of the capitalist system and necessary for its functioning. Capitalism grows and reproduces itself by creating new commodities for the circulation and accumulation of capital (Kallis *et al.*, 2015). Some MBIs represent this characteristic by assigning a price to ecosystem services and encouraging enclosure of lands (Büscher, 2012; Osborne, 2015; Scheba and Rakotonarivo, 2016). The PES conceit presented by Fletcher and Büscher (2017) exposes that neoliberalism and capitalist system are sources of the ecological crisis and propose they can be the solution. ETS functioning is a relevant illustration of the application of market logic and abuses that can come out. The fiscal fraud applied to Value Added Tax (VAT) between 2008 and 2010 estimated around 10 billion euros (EuropaForum, 2015) in the EU–ETS is an example of an opportunist behavior that a market-based policy can cause.

Currently PES definition is: "voluntary transactions between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services" (Wunder, 2015: 241). The concept is dissociated from the market-like rhetoric since the terms 'sellers' and 'buyers' are left out. Another author proposes "the remuneration by an economic agent to another with the purpose to restore or preserve a specific ecosystem service through an institutional scheme managed by the state or civil society" (Karsenty and De Blas., 2014). In most cases, the PES scheme is non-market-based but simply a public system of taxation and subsidies (Vatn, 2015).

The liability aspect present in some PES schemes as an institutional design is in fact a strong condition for its effectiveness (Vatn, 2010). In an ETS, the cap represents state regulation of the market scheme, necessary to ensure the environmental target. In its definition, market implies flexibility in price and quantity. Environmental tax and ETS are different because the first consists of regulating the prices of pollution while the second is based on regulating the quantity of pollution. But they are similar in the sense that they cannot work without regulation (Harribey, 2013).

Despite the imperfect market definition in the design of MBIs, their use conforms entirely to a neoliberal and capitalist vision. Neoliberalism does not necessarily imply *laissez-faire* in the economy, but the enforcement of a market economy under active policy and regulation (Foucault *et al.*, 2008). The market can be efficient for environmental regulation when environmental goals are implemented. However, it could not work without control. Harribey (2013) explains the hazard in a capitalist society that the use of MBIs will induce an increase in labor force exploitation. He argues that consideration of MBI implementation within and between states must consider the regulation of capital circulation and value distribution. MBI can be efficient if they are shaped under democratic decision making instead of individual choices matching based on externalities internalizing (Farley *et al*, 2015).

IV. MEXICAN MARKET-BASED ENVIRONMENTAL POLICY

Forest ecosystem services in Mexico has benefited a lot from private sector funds (Ranero and Covaleda, 2018). Mexico adopted the international paradigm of market environmentalism in 2003 when the Mexican state enforced market-based policy on forest areas with a program of payment for hydrological services (PSA-H), and in 2004 for biodiversity conservation (PSA-CABSA). The National Forestry Commission (CONAFOR) funds and organizes the voluntary PSA program, financed by a federal tax on water consumption, and remunerates owners of eligible land for forest conservation and restoration. In cooperation with the National Institute of Ecology and Climate Change (INECC), CONAFOR set the amount of the payment according to the opportunity cost of the land by estimating the average revenue of crop and livestock agriculture per hectare. In 2019, the amount varied between 300 MXN (16 USD) and 1,000 MXN (52 USD) per hectare (CONAFOR, 2019).

Mexico has developed a voluntary carbon market at the national scale through private carbon capture or emission mitigation initiatives. At the time, forest carbon projects were a new opportunity. These projects seek to compensate carbon emissions by private companies with credits emitted by a certification agency. In these projects, an environmental organization proposes to support forest landowners (individuals or communities) with technical capability and funds to reforest, restore or conserve forest areas and generate carbon credits. Private companies can voluntarily buy these credits to compensate for their emissions. In practice, an agreement is established between the environmental organization and companies by a broker, who is the link between the seller and the buyer (MEXICO2, 2019a).

In 2013, CDM projects were not developed anymore by the European Union, while Mexico was one of the biggest CDM project recipients with 316 projects corresponding to 27 million carbon credits up to 2015 (EDF *et al.*, 2015). Hence, Mexican carbon projects expanded to the international carbon market and foreign companies were able to buy Mexican carbon credits in order to increase the demand. This market receives carbon credits from Mexican projects under several certification standards: Plan Vivo, Climate Action Reserve, Clean Development Mechanism, Verified Carbon Standard, Gold Standard (MEXICO2, 2019b).

In Mexico, most forested areas are under common ownership, and southern states, such as Chiapas, whose forest cover is more extensive, hold a large potential for carbon sequestration (De Jong *et al.*, 2000). Common property is supposed to be an advantage for overcoming tradeoffs between market efficiency and local sustainability (Chhatre *et al.*, 2009). This argument confirms the theory on collective action and natural resources management (Ostrom, 1990). Ostrom's theory on commons governance furnishes a response to the tragedy of the commons, which defends enclosure of natural resources against the negative effects of free access (Hardin, 1968; Gordon, 1954).

After a few years of operation, the voluntary carbon market is lagging, and prices are quite low (between 4 and 8 USD). This could be explained by the fact that there is no rule that forces companies to buy carbon credits for forest carbon projects. When the buyers are from a country where an ETS is enforced, they can use it as a carbon offset (according to the ETS rules) and compensate their emissions created in their own country. But for Mexican buyers, the purchase of carbon credits from forestry is just an action to promote corporate social responsibility. Hence, the voluntary market is not likely to help compliance with the NDC.

For NDC purposes, Mexico is developing an ETS that will be compulsory for companies in the most polluting sectors. This ETS is stipulated in Article 94 of the Climate Change Act, passed in 2012, and follows the commitments made in the Paris Agreement in 2015. For the development of the ETS, Mexican government has been working with MEXICO2, a voluntary platform for carbon trade and green finance. MEXICO2 performed an ETS exercise with 1,000 companies covering 67.8% of gross emissions. The exercise was a simulation of the functioning of a real ETS divided in three phases with different market configurations using the CarbonSIM tool of the Environmental Defense Fund (MEXICO2, 2019c). The Mexican government is published the operating rules of the Pilot Program through the Ministry of Environment and Natural Resources (SEMARNAT) in October of 2019 (SEMARNAT, 2019).

This first step does not represent a compliance mechanism for reaching the NDC because there will be no sanctions or financial impacts on the companies involved. The link with the voluntary carbon market provides the potential to compensate emissions with the purchase of offset credits from mitigation projects. The ETS rules allow companies to use 10% of their total credits per year as offset credits (SEMARNAT, 2019). Mexico already has a basis for the enforcement of the ETS in the creation of the National Emissions Registry (RENE), which estimates and monitors emissions from 3,000 facilities in different sectors (MEXICO2 *et al.*, 2018). At a regional scale, Mexico is taking leadership about carbon pricing. It is the first country of Latin America with a national ETS after the signature of the Carbon Pricing Declaration of the Americas in December of 2017 which seeks to promote regional carbon trade and homogenous pricing (SEMARNAT, 2017).

Since 2013, Mexico has enforced a carbon tax on fossil fuels. All economic agents pay around USD 3.00 per ton of CO_2 emitted from fossil fuel combustion. In 2017, companies gained access to a flexibility mechanism in which they can buy offset credits from mitigation projects in the voluntary carbon market up to 20% of their annual emissions. This allows the conservative effect of the tax to be increased, since tax income could be used for financing the public budget instead of climate change mitigation. Due to the low rate of the tax, there are no real incentive effects. The possibility to offset 20% emission with carbon credits could be seen as an opportunity to boost the voluntary carbon market. However, prices in the market are higher than the tax rate which leave interest for offsetting. The forthcoming ETS should apply a higher price of carbon allowances and by allowing offsetting as well could represent an opportunity for the voluntary carbon market.

Moreover, natural gas consumption is exempted from taxation when it remains below 25% of total emissions. Considering an increase of the tax rate, an efficient level for the climate change target would have negative effects on household welfare (Renner, 2018). Several countries in the world already enforce both ETS and carbon tax mechanisms (World Bank and Ecofys, 2017). A recent study found that an ETS would be more cost-effective and politically acceptable than a carbon tax to reach the 2030 NDC (Barragán-Beaud *et al.*, 2018).

V. DISCUSSION

By observing the four Mexican market-based instruments for carbon emissions/mitigation, we can recognize some limits identified in the literature: the tradeoff between environmental target and socioeconomic improvement, opportunist behaviors causing negative impacts, the rise of conflicts, the arbitrary approach of monetization, and the hybrid approach between market and state intervention.

We can identify tradeoff between environmental target and economic efficiency in the four instruments of the case study. In the PES program, ecological efficiency is controversial. Studies showed that the program instead of focusing on areas with high risk of deforestation gives more attention in communities with high level of marginality (Muñoz-Piña *et al*, 2008). However, it resulted that deforestation is more successfully avoided in areas of less marginality (Alix-Garcia *et al*., 2012). This observation is directly related to the inelastic supply of ecosystem services linked to basic needs in marginal areas (Farley *et al*, 2015). Then, Mexican government balanced the tradeoff between poverty alleviation and ecological efficiency in favor of the first part. The effect on forest covering seems to be efficient since target areas did not present high early risk of deforestation. But ecological additionality is very limited.

In forestry projects for the voluntary carbon market, tradeoffs are also observed between environmental target and economic efficiency. The project encourages producers to focus on short term forestry systems with a high level of payment but less impact on long-term carbon storage. Producers participating in the project are committed to preserve forest covering for 25 years which presents the risk of carbon release. 1,200 small producers split in 90 communities throughout the state of Chiapas are participating in the project (AMBIO A.C., 2019). The geographic scale of the project is very large comparing to its monitoring capacity. Then, compliance with the environmental target is not guaranteed.

In national carbon pricing schemes (ETS and carbon tax on fossil fuels), the tradeoff is between emission target and avoiding economic disruption. Carbon pricing programs can have an impact on gross emission either by encouraging to control emissions intensity of production through the relative advantage gained by lower-emitting producers, or by supporting the substitution of production from high-emitting producers to low-emitting producers again thanks to the relative advantage of the second ones and incentivizing the demand reduction for emissions-intensive goods and services (PMR & ICAP, 2016; SEMARNAT & GIZ, 2018).

Carbon pricing represents a direct increase in production costs that can affect assets value (in case of recent investment in emissions-intensive technology or process), firm competitiveness and the community (with higher prices and jobs destruction). The tax rate in the carbon tax (USD 3 / tCO_2) is very low not to provoke economic disruption but it is not incentive enough to have a real impact in carbon emissions. In the ETS implementation, Mexican government is dealing between complying with the emission target schedule and protecting the industry against the increase in production cost induced by carbon pricing. This explains the slow process since the announcement of the future implementation of an ETS by the Mexican government in 2016 (MEXICO2, 2016). The government's position in the tradeoff between emission target and economic disruption will also be reflected in the price management and the scheme of allocation of allowance during the actual implementation.

The presence of conflicts has been observed in some forestry project of the voluntary carbon market. The *Scolel'Té* carbon project in Chiapas works with individual landowners within the communities (villages) and generates conflicts between beneficiaries, non-beneficiaries, and community authorities. Indeed, changes in practices implied by project participation induced differences in land management goals among community members (Osborne, 2015).

One of these changes is about timber harvesting. The Mexican law does not allow forest landowner to harvest trees for commercial or private use without a logging permit. Under the project, harvesting and selling timber after carbon sequestration is allowed for forest owners without a federal permit. But non-participant forest owners and communities felt duped, and friction developed between them and the project participants. Local communities' rules and cultural perceptions on natural resources are often opposed to the logic of forest management based on carbon market efficiency (Osborne, 2015).

The *Scolel'Té* experience highlights the difficulty for carbon market forestry in dealing with the tradeoff between cost efficiency and local sustainability in the commodification of ecosystem services, given the strong link between ecosystem and socio-cultural values as described by Karl Polanyi (Osborne, 2015). Market-based programs produce utilitarian and monetary incentives that remove beneficiaries from permanent conservation behavior (Garcia-Amado *et al.*, 2013; Zabala *et al.*, 2017).

The scope of monetization for ecosystem services is also present in Mexican market-based instruments. The different practices in Mexico depict how monetizing ecosystem services (or environmental impacts) is a subjective policy implementation decision. In PSAH program, the payment is based on the opportunity cost of land (Muñoz-Piña *et al*, 2008). The limit in this functioning is to assign the value of the ecosystem service provided in forest land on the basis of the amount of money that the landowner renounce by not having agriculture activity. In carbon forestry project the value of carbon storage service is set on the exchange price which not necessarily correspond to the opportunity cost of carbon farming activity. The forthcoming ETS in Mexico is not planning to include forest offsets and the market price will set the payment attributed to forest storage services. The tax rate in the carbon tax (USD 3 / tCO_2) set by the Mexican government is an arbitrary decision about the cost of carbon emission.

The Mexican payment for environmental services program illustrates the lack of linkage between MBI conceptualization and its enforcement. Sixteen years after it was first implemented, the PSA program in Mexico shifted to a national subsidy focusing on other goals than conservation. This evolution is the result of the hybridization led by the political, institutional, social, and cultural characteristics that characterize the Mexican context (Shapiro-Garza, 2013). PSE in its general definition is a MBI (Wunder, 2015). But the Mexican program is neither a market nor an alternative to state intervention. Then it is hard to classify it in the MBI typology. However, its functioning works under assumptions from neoclassic theory about utilitarian basis of decision making by set the payment on the opportunity cost of land.

The functioning of the voluntary carbon market seems to fit with the PSE definition. Indeed, in each carbon project there are buyers and sellers that set an exchange price for the provision of an environmental service on the base of a bilateral agreement.

VI. CONCLUSION

The MBI paradigm in environmental policies is the result of the influence of the neoclassical economics thought that dominates all the world economy. Both politicians and scientists adopted market environmentalism, believing in the advantages of MBI presented by the environmental economics. These advantages genuinely exist if the strong assumptions of neoclassical economics are verified. The main argument for MBI is to reach ecological goals with the most cost-efficient instrument.

Tradeoffs put socioeconomic and ecological goals into opposition and can in some cases increase inequalities. The incentive for utilitarian behavior can drive to conflicts based on the opposition between individual preferences and collective strategies. Ecological economics argues against the implementation of MBIs, denouncing biophysical, institutional, and ethical boundaries in the practices induced, meaning monetization, marketization and commodification.

Four MBIs in Mexico participate in the achievement of the Mexican emissions target: the PSA program (payment for environmental services), the forestry carbon projects in the voluntary carbon market, the emission trading system, and the carbon tax for emissions from fossil fuel combustion. Limits about tradeoffs between economic efficiency and ecological targets are observed in these instruments. The instruments use different methods to monetize ecosystem services. The PSA program bases the payment on opportunity cost of land, the voluntary carbon market is based on exchange value and the carbon tax set the price of emission by arbitrary decision from the government. This observation depicts the subjective process of monetization that cannot reflect the real value of ecosystem services.

The enforcement of MBIs in Mexico clearly confirms the hybrid form they could adopt and the lack of clarity in market-based instrument conceptualization. The PSA program today works like a public subsidy for forest conservation and restoration. The voluntary carbon market includes forest carbon projects that have been operating for a long time. The mechanism observed in these projects corresponds more to the definition of PES and works without any state intervention.

Due to the lack of incentives to buy carbon credits in the voluntary carbon market, the carbon price is quite low, and projects have difficulty finding buyers. Implementation of the national ETS in Mexico will be an opportunity to galvanize the demand for forest carbon credits thanks to the possibility to buy offset credits for the companies involved. Mexico will need to set strong emission targets to enforce a dynamic ETS with a reasonable carbon price. Moreover, the country has already adopted a mandatory carbon pricing mechanism with the carbon tax. It is clearly based on market mechanisms but in fact displays the important function of the state, which is not necessarily inconsistent with a neo-liberalization of environmental management.

Mexico already has a relevant background about MBI, and carbon pricing and experienced limits denounced in the scientific literature. However, the country maintains the direction of carbon pricing with the implementation of the ETS. The way the government will tackle the tradeoff between economic disruption and emissions target in the ETS enforcement will explain its level of ambition. It is still too early to make conclusion about the program. The complexity of its application and its diversity in existing cases testify the importance of political orientation and national context. Analyzing the forthcoming evolution of carbon policy in Mexico and how the country could overcome the theoretical and field difficulties will be key issues for future studies.

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CHAPTER 3: PAYMENTS FOR CARBON SEQUESTRATION IN THE VOLUNTARY MARKET IN MEXICO: DIVERSITY AND COMPLEXITY OF IMPLEMENTATION IN CHIAPAS AND OAXACA

I. INTRODUCTION

The Kyoto Protocol and the Paris Agreement supported the development of carbon markets and other carbon pricing schemes. In 2017, there were 67 carbon pricing initiatives in the world (World Bank, 2017). In the long run, Mexico seeks to become the regional leader of carbon policy and to set regional price in Latin America for carbon unit trading. Since the 1990s mitigations projects have been developed with carbon capture in forest areas. At the beginning, most of the mitigation projects was established under the Clean Development Mechanism (CDM). However, in 2013 the EU ETS changed the eligibility conditions for CDM units to only accept units from projects in developing countries (MEXICO2 et al., 2018). Then Mexico opened its own organization to trade carbon units from mitigation projects with MEXICO2.

Forestry carbon projects start with the reforestation, restoration, or conservation work in forest property (private or common), with legal guarantee to generate carbon units. Carbon units are tradable goods verified by certification agencies. When the unit is emitted, it is possible to sell it to a company that wants to compensate for its emissions. Although it is not legally mandatory for a company to mitigate its emissions, they generally do it for corporate environmental responsibility strategy. The Paris Agreement encourages the production of forest offsetting units, including at an international scale (United Nations, 2015). Moreover, establishing an ETS in Mexico with the possibility to purchase offsetting units is an opportunity for developing forest carbon projects.

This chapter aims to define the governance structure of forest carbon projects in the Mexican voluntary carbon market. We present the theoretical basis behind the market-based instruments, the international negotiations, and agreements that shaped the environmental governance to tackle climate change. We analyzed the functioning of two forest carbon projects to link their governance structure with the problems they face. This chapter seeks to answer the following question: how do forest carbon projects work in Mexico and their impacts? We assume that these projects characterize a new environmental governance scheme, independent from the state intervention. The stakeholder's diversity and the diverse local contexts in the country induce that the functioning and the impacts are different between the different projects. Likewise, the lack of state intervention in these projects could be a problem for their success since the different stakeholders make decision according to their interests without any regulation.

II. METHODOLOGY

The methodology consists of the literature review and the use of semi-structured interviews with key actors. Literature includes a bibliography about theoretical concepts of environmental policy and market-based instruments to provide environmental services. This review also includes evolutive aspects of the international environmental policy paradigm through international agreements.

The bibliography also includes official documents in which regulations for payment programs for environmental services are established and those related to the emissions market system to understand the functioning of these instruments. Qualitative and quantitative information on two of the most relevant national forest carbon projects was obtained: the project *Scolel'Té*, in the state of Chiapas, in force since 1997 and implemented by AMBIO, S.C. de R.L.; and the CARBOIN project, in the state of Oaxaca, headed by the civil association Integrator of Indigenous and Peasant Communities of Oaxaca (ICICO). There are several forest carbon projects in the Mexican voluntary carbon market. Most are in the states of Chiapas and Oaxaca (Table 1). This chapter studies the cases of AMBIO and ICICO due to the experience they obtained in the field and the accessibility of the information they allowed.

Table 4. Forest carbon projects in Mexico

Name	Localization	Superficie	Standard	Organization
Sierra Gorda Biodiversity Carbon	Querétaro	21,491 ha	VCS - CCB	Grupo Ecologico Sierra Gorda
San Juan Lachao	Oaxaca	2,388 ha	Climate Action Reserve	ICICO A.C.
Sustainable Climate-Friendly Coffee	Oaxaca	292 ha	Verified Carbon Standard	UNECAFE S.C.
Carboin	Oaxaca	3,000 ha	NMX-SSA-14064	ICICO A.C.
Captura de carbono Santiago Coltzingo	Puebla	3,092 ha	Climate Action Reserve	ICICO A.C.
Captura de carbono San Bartolo Amanalco	Estado de Mexico	1,005 ha	Climate Action Reserve	ICICO. AC
Scolel'te	Chiapas	7,660 ha	Plan Vivo	Cooperativa AMBIO
Fresh Breeze Afforestation Project	Tabasco, Nayarit, Chiapas	4,270 ha	Verified Carbon Standard	Proteak UNO S.A.B. de C.V.

Source: http://www.forestcarbonportal.com/ - Interviews

The information needed is mostly qualitative which oriented the decision to adopt social sciences methodology with semi-structured and unstructured interviews. We made different interviews with Mexico2 during the year 2017 and it helped to understand the different actors we needed to contact to obtain the information about the functioning of forest carbon projects and the voluntary carbon market.

The two most essential intermediaries (broker) of the voluntary carbon market, MEXICO2 and PRONATURA, shared information about the market functioning (actors involved, responsibility and relationships between them) and the participating projects. After that, interviews were conducted with two organizations that implement forest carbon projects: AMBIO and ICICO. In this way, the information on the general operation of the market and the primary data of each project was confirmed: number of participants, surface area, amount of carbon credits, sales and prices, operating costs, buyers, compliance, relationship with peasants.

In February 2018, direct interviews were conducted with the environmental organizations and participant landowners of the projects. In Chiapas, AMBIO proposed to join a forest engineer responsible for the project in his monitoring fieldwork, which was the opportunity to obtain information in the meetings with local technicians in the Ocosingo region. Interviews were conducted with a local forest technician, a community president and a forestry producer (they are also project participants). In Oaxaca, the ICICO team held a forest management workshop in the San Juan Lachao community, consisting of a self-assessment of forest management progress and other natural resources in the community since they began their cooperation with ICICO.

The workshop joined around 50 members, which allowed to talk with different actors within it. There, the community president, a paid member of the forest brigade, and a peasant participating in forest management works. Even so, it was not easy to obtain accurate information concerning remuneration and working hours. The interview tackled other topics such as the community history, population, land tenure, land use, the functioning of the carbon project in the community, and other forest projects.

A structured interview has been prepared for these interviews (Appendix 2), but it was finally inconsistent with the information they could give and the needs of the research. Because we only met a few communities participating to the project, unstructured interviews were more consistent. Theses interviews have been applied to community presidents and member of the forestry team because they have an exhaustive knowledge about the functioning of the projects and the community organization. The transcription of the interviews on the forest carbon projects are in Appendix 1.

III. ORIGIN OF MARKET-BASED INSTRUMENTS

Environmental governance is defined as the exercise of authority over natural resources and the environment (WRI / UNDP / UNEP, 2004). It is about who makes the decisions and in what manner, considering democratic and transparent processes. The liberal economic thinking of the 1980s and 1990s oriented the political approach towards an anthropocentric vision of the environment, considering natural resources exclusively as usable assets. However, this approach diverged from environmental thinking and public opinion, which led the states to adopt a moderate approach of neoliberal environmentalism to satisfy as much as possible both the actors located in an anthropocentric position with the environment and the defenders of an ecologist vision (Foladori, 2000). Likewise, environmental governance evolved towards "a multilevel environmental governance paradigm" with the participation of new actors in managing natural resources and environmental impacts. Communities and the private sector were involved in the process, and new forms of management were born with the "Shrinking State" approach (Agrawal and Lemos, 2007).

In developing countries, the actors involved in environmental management multiplied. The interaction between the state, environmental NGOs, multilateral organizations, companies, and local actors is the origin of new forms of environmental governance (Bryant and Bailey, 1997). In the case of Latin America, the diversity of actors (local inhabitants, NGOs, private sector, state, and multilateral organizations) created a hybrid character of these programs: between private negotiation and government intervention, with agendas and objectives that are sometimes different (Flores-Aguilar *et al.*, 2018).

Consequently, the private sector´s participation in environmental control privileged the market mechanism as a political option. However, this orientation was criticized because, despite its initial intention to improve conservation through community participation, mixed management forms: community-based management and the market, had harmful impacts on the environment (Durand, 2014).

This emphasis on the market is found in international agreements on sustainable development (Gómez-Baggethun and Muradian, 2015). The Rio Declaration in 1992 encouraged “an open international economic system that would lead to growth and sustainable development” (UNCED, 1992; principles 12 and 16). The literature describes “market environmentalism” as the compromise between economic growth, efficient resource allocation, and environmental conservation (Anderson and Leal, 2001).

In 2000, the concept of market-based instrument became popular, and several economic instruments were categorized under this term (Pirard and Lapeyre, 2014). These instruments were integrated into a process of modernization of environmentalism due to the integration of new actors in environmental policy (private companies, individuals, communities, civil society). Its origin is based on the neoclassical theory, which justifies the impact of human activities established on the assumption that they are the consequence of market failures caused by the absence of prices on ecosystem goods and services. The solution would be to estimate an economic value for these goods and services so that the market proceeds to an optimal allocation with minimal cost. According to this theory, the price assigned to ecosystem goods and services influences individuals' behavior by controlling their environmental impact and offering a financial opportunity for environmental conservation (Pirard and Lapeyre, 2014).

However, it is important to note that not all market-based instruments present the exact characteristics of a market for ecosystem services. They disguise a new form of public subsidy for conservation (Shapiro-Garza, 2013; Corbera, 2015; Vatn, 2015). Market-based instruments cover a wide variety of environmental governance configurations. Several works seek to present the diversity of these instruments and to categorize them (Pirard and Lapeyre, 2014; Hahn et al., 2015; Vatn, 2015). Table 2 (chapter 2) presents the typology proposed by Pirard and Lapeyre (2014) for market-based instruments. Some are made from an existing market, and others consist of creating a new one. However, not in all cases, a real market is involved. This table includes the six categories of market-based instruments ordered according to their degree of similarity to a real market and of the commercialization of the ecosystem services involved. Tradable permits are the most popular category, containing carbon markets and the international emissions trading system included in the Kyoto Protocol. In these mechanisms, a specific market is created for an ecosystem service or for allowances to pollute. Coasian-type agreements are not applied under market processes but with a direct agreement between an environmental service provider and a buyer. The property rights and services that apply to each transaction must be well defined. Regulatory price changes consist of integrating the environmental impact or service in the price of a good through a tax or subsidy. The price signal is applied to give the consumer or producer an incentive and integrate the environmental cost into the production cost.

Besides, Vatn's categorization (2015) considers two characteristics: 1) the relationship between sellers and buyers of environmental services, which can be direct or indirect (through intermediaries) where the link in the indirect relationship can be the state, an environmental organization, or a company; 2) the obligation/ voluntary nature, some instruments are compulsory (taxes or permit), others are voluntary (payments for environmental services, voluntary markets, certification programs).

The influence of international agreements and the neoliberal vision of environmental management made market-based instruments prevalent in Latin America. Theoretically, the idea of the emissions market is quite suggestive, but its efficient enforcement is tough. The advantage of the market-based instrument is its ability to influence the three objectives of economic policy: the optimal allocation of resources, equitable distribution of wealth, and minimal environmental impact (Daly, 1992). The carbon market could be relevant if the environmental impact (level of allowances) and credits distribution were carried out in a truly equitable way. Furthermore, having an optimal allocation of resources (carbon credits) in the market implies having solid neoclassical hypotheses, such as perfect information (Agrawal and Lemos, 2007).

The resolution of several problems in society with a single political instrument (Daly, 1992) implies the difficulty of achieving efficiency, equity, and environmental preservation. Several problems imply different and complementary solutions. In Mexico, this "multi-objectivity" has been promoted in the federal program of payments for hydrological, environmental services (PSA-H).

The PSA-H of Mexico is one of the oldest (operating since 2003) and covered 2.54 million hectares in 2018 (Gobierno de la República, 2018; Flores-Aguilar et al., 2018). In 2004, the Program to Develop the Market for Environmental Services by Carbon Capture and Biodiversity derived services and Promote the Establishment and Improvement of Agroforestry

Systems (PSA-CABSA) was added. However, the carbon capture component was abandoned after 2010. Both programs are managed by the National Forestry Commission (CONAFOR).

Several authors highlight the limitations of the environmental efficiency of the PES due to its lack of ecological additionality (Muñoz et al., 2008). They show that the PES is applied, for the most part, in areas with low risk of deforestation and focuses more on areas of socioeconomic marginality. According to Wunder, the PSA is "a voluntary transaction where a defined environmental service (or the land use that ensures this service) is sold by one or more buyers from one or more suppliers, as long as the provision of this service is effectively ensured." (Wunder, 2005: 3).

The term "market-based instrument" has its limitations (Karsenty and De Blas, 2014). The Mexican PSA-H is not a market but a direct payment from the government to the forest owner to remunerate their conservation activities. This is more like a subsidy for a "green" job. Although the budget mostly comes from a tax on water price, it is not a direct exchange of supply and demand for environmental services. Finally, it is necessary to discern environmental services from ecosystem services. An ecosystem service is a direct relationship between nature and society. It refers to the goods and services of nature necessary for the livelihood of society or that provide well-being (Daily, 1997). An environmental service is an action carried out by a group of people to benefit another group of people to conserve an ecosystem, which produces well-being for society (Karsenty and De Blas, 2014).

Thus, the operation of forest carbon projects in the voluntary carbon market consists in giving a price to the carbon credit, which represents one ton of carbon captured. Different actors interact in these projects: the credit seller, which can be a community or an individual who owns the forest where carbon is sequestrated; the organization that issue the carbon credit, and the buyer, which may be a company or an institution that wants to offset its emissions. There is then an exchange between supply (sale) and demand (purchase) of carbon credit. This aspect makes these projects more respectful with the definition of payment for environmental services by Wunder (2005) than the PSA-H program of the Mexican government.

IV. CARBON PROJECTS IN MEXICO: CHIAPAS AND OAXACA

Scolel'te Program, Chiapas

Started in 1997, the Scolel'te program is the oldest carbon sequestration credit commercialization project in Mexico and is coordinated by the AMBIO organization. Carbon credits are sold in the national and international voluntary market with "Plan Vivo" certification. In Mexico, *ejidos* are communities that own the lands that have been endowed to them. After the Mexican Revolution, the purpose of its creation was to obtain political control on the peasants and have a representative body to deal with the central state (Gordillo et al., 1998). The *ejidatarios* are men and women holders of *ejidal* rights (decision-making, access to common use areas, farm plots ownership). Currently, the program incorporates 1,200 forest producers located in 90 communities, mainly in the state of Chiapas and a part in the state of Oaxaca. The *ejidatarios* can participate jointly or individually so that the project area can be a plot of crop or forest distributed according to internal criteria of the community itself. The total surface of the application of the project is 9,000 ha in both tropical and temperate zones.

The participants are committed to remain in the project for 25 years. They can be integrated into the project under eight modalities of forestry activity for carbon sequestration: 1) avoided deforestation, which does not imply forest plantation or restoration (this is the least productive modality in terms of credits; the rest are more productive and induce agroforestry approaches); 2) improved *acahuales* of temperate climate; 3) improved *acahuales* from tropical climate; 4) living fences of temperate climate; 5) living fences of tropical climate; 6) taungya; 7) improved coffee plantation, and 8) forest restoration. Initially, a calculated baseline represents the estimated amount of carbon sequestrated in the forest without project application in the future, which is compared with estimations of sequestrated carbon in the project's forest system. This difference, representing the expected contribution in tons of carbon constitutes the basis for calculating the carbon credits generated and certified by "Plan Vivo".

The payment that AMBIO receives for the sale of carbon credits is ex-ante and is calculated based on the total estimated amount of credits that will be generated in the 25-year commitment of the project. The organization distributes the income from the sale to the producers in deferred payments. For projects started before 2015, AMBIO made the full payment in five partialities during the first eight years. Since 2015, seven partial payments spread over the first ten years of the project. As part of the procedure, monitoring is carried out in the plots before the corresponding payment. However, after the 10 years of validity, the monitoring decreases, mainly due to its high costs. This represents a risk of non-compliance with the project because, after the payment period, the forest producer could stop conserving the forest. There are also no sanctions for those who do not comply with the commitment made.

For monitoring, AMBIO trains producers to be community technicians, who are in charge of reporting the progress of the project in the area's plots under their charge. The distribution of the sales income is set: 30% goes to the AMBIO organization in the form of a technical commission, and 20% is directed to the payment of taxes. In comparison, the producer keeps 50% of the sales income. $617,683 of carbon credits were sold between 2001 and 2016. The buyers are private companies and public or governmental organizations such as the Presidency of the Republic.

Even though the extent of the project demonstrates its success, there are several weaknesses, among which the legal gaps stand out. Some producers are not *ejidatarios* with property titles, which makes their legal recognition difficult. To reinforce the previous agreement under international transparency requirements, recently (after 20 years of existence) it is proposed to establish a contract with legal value. The purpose of the contract is to identify commitments and protect both parts. It is a goodwill agreement; it is not an employment relationship. In this process, AMBIO receives the support of the Mexican Center for Environmental Law (CEMDA). The second weakness of the project is the monitoring and fulfillment of commitments by the producers. Due to the geographic dispersion of the project (1,200 small producers distributed in the state of Chiapas), it is complicated to maintain personal contact and follow-up with each one. Although there is an attempt to give attention to all through the community technicians, each year, collaborators are lost because contact is not maintained, or some producers decide not to continue with the project.

ICICO, A.C., Oaxaca

The Integrator of Indigenous and Peasant Communities of Oaxaca (ICICO) organization has been working on carbon sequestration and credit trading projects with communities in Oaxaca since 2008. It handles two types of certification. The first is with the CARBOIN project, which covers 3,251 ha spread over 11 communities, where forest or coffee plantation systems predominate (Table 5). The Mexican Accreditation Entity (EMA) certifies carbon credits under the ISO 14006 standard. Therefore, this initiative only sells credits in the national market. The second certification that ICICO works with is the Climate Action Reserve (CAR) certification. The organization has enforced a pilot project in San Juan Lachao, Oaxaca, since 2014.

Table 5. CARBOIN areas in 2015

Community	Ecosystem	Superficie (ha)
San Bartolomé Loxicha	Forest	550.98
	Coffee	208.38
Santa María Tlahuitoltepec	Forest	382.83
San Juan Metaltepec	Forest	116.13
	Coffee	279.80
San Miguel Maninaltepec	Forest	270.57
San Juan Yagila	Forest	208.96
	Coffee	56.61
Santiago Teotlaxco	Forest	45.82
	Coffee	50.93
Santa María Zoogochí	Coffee	187.51
Santiago Xiacuí	Forest	301.73
La Trinidad	Forest	126.12
Capulálpam de Méndez	Forest	294.19
Santa María Peñoles	Forest	170.50
Total area		**3,251.07**

Source: ICICO, 2015

The calculation of sequestrated carbon is made by comparing a baseline established at the beginning of the project (Figure 3). In this case, the amount of sequestrated carbon has gradually increased since 2008, reaching 107,179 tons in 2014 and 149,486 in 2015. Each sequestrated ton corresponds to a carbon credit generated and sold in the national market.

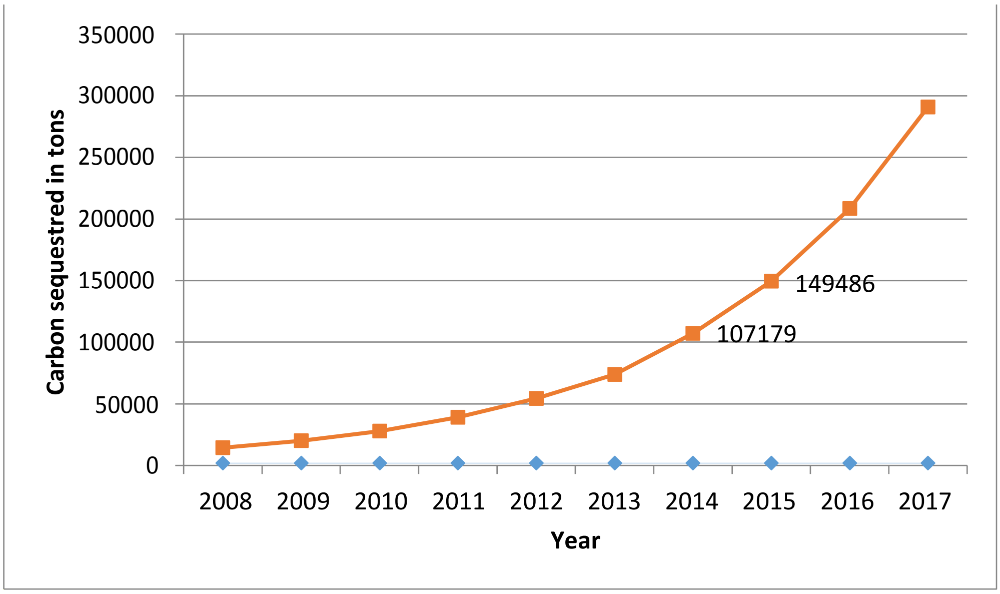

Figure 3. CO2e sequestred between 2008 and 2015 (forecasting for 2016 and 2017)

Source: ICICO, 2015

Each year the sequestrated amount is then calculated, and credits are issued for yearly sales. The main buyers are the Presidency of the Republic, the UN Conference of the Parts, Chinoin Pharmaceutical, Fundación Televisa, and Grupo Gamesa. From 2008 to 2017, 220,000 carbon credits were sold at MXN 19,500,000 (with an average price of MXN 89). For each transaction, a contract is generated between ICICO —to represent the communities that sell the credits— and the purchasing company or organization. ICICO then owns the credits before the sale. The negotiation for the income distribution income is trilateral between the communities, ICICO, and PRONATURA (broker). ICICO and PRONATURA each receive a 10% commission, and the remaining 80%, before taxes, is for the communities.

ICICO and San Juan Lachao have been working together since 2008, year in which the community entered the PSA-H payment for environmental services program. In 2014, this community renewed the program with financing from mixed funds (financial and technical support in conjunction with CONAFOR to extend PSA-H programs). In 2012, ICICO began supporting the community to carry out an environmental monitoring plan and a Sustainable Forest Management Plan (PMFS). Since then, the community has 5,000 hectares of pine-oak forests for sustainable management certification and planned for its use, which generates jobs and essential income for the community.

Around 150 temporary or permanent jobs have been created with forest harvesting and 22 jobs for the PSA-H project. These jobs still represent a minor employment source since the community has more than 1,100 households spread over ten villages and an area of 13,500 ha. The quality of forest management developed in San Juan Lachao with the support of ICICO was recognized with the SEMARNAT National Forestry Award in 2015.

In 2014, ICICO started the pilot project for the application of CAR carbon credit certification with the community on an area of 3,200 ha. This activity was complementary to the other forestry activities of the community. The first income from the carbon project arrived in 2018 since the monitoring, calculation, and certification process is very long. In California, United States, the city of Palo Alto is the only buyer of the 17,000 carbon credits generated between 2014 and 2017 and sold at USD 8, representing a net income of MXN 2,000,000 for the community. Likewise, the carbon project created six temporary jobs financed initially by the other forestry activities.

It is the first case of CAR certification in Mexico. Unlike the CARBOIN project, these carbon credits are sold in the international market, which allows trading at a higher price. Community members are generally delighted with the carbon project as it provides them with a complementary framework to the PMFS and other community environmental activities. Besides, it completes the valorization of the forest, as a producer of a new ecosystem service.

V. DISCUSSION

Forest carbon projects such as the case studies resulted from the evolution of the environmental policy at global scale. As presented earlier, carbon markets are political instruments acknowledged in the international agreements since the Kyoto Protocol. These agreements gathered all the stakeholders in the environmental governance discussion to improve its enforcement (Sanwal, 2007). The forest carbon project analyzed, are part of the “multi-level environmental governance paradigm” that seeks to democratize environmental conservation (Agrawal & Lemos, 2007).

Mexico has been a pioneer in developing forest carbon projects with AMBIO and the *Scolel’te* project in 1997. However, this was not a state policy but an autonomous initiative from the environmental organization. Nowadays, market-based instruments are a milestone in environmental policies. Article five and six of the Paris Agreement encourage enforcement of forest carbon projects to offset emissions at national and global scales and link them with emissions trading systems (United Nations, 2015).

In governance, to link local and global scales is usually complicated. Local initiatives can bring solutions for global issues such as climate change. Likewise, governance decisions at global scale can affect the efficiency of local initiatives (Sanwal, 2007). The national and local scale analysis in Mexico shows a governance network between environmental organizations, communities, standard organizations, brokers, and private companies. They are linked in the enforcement of forest carbon projects in the voluntary carbon market. This network links public and private stakeholders in a new governance scheme (Agrawal & Lemos, 2007). This governance scheme can be defined as a polycentric model because the different stakeholders are independent decision-making centers, and they coordinate their management capacities to provide marketable environmental services (Ostrom, 1999). Polycentric governance models have the advantage to be more adaptive by promoting learning from different knowledge sources more that centralized governance from the state (Sandström *et al*., 2020). In the forest carbon projects, the adaptation is observed in the interaction between the communities, the environmental organization, and the standard organization in the production of the carbon credits. Then, the valuation of the credits results from the market and the negotiation between the seller, the broker, and the buyers. Moreover, the projects can share experience and learn from each other. However, it has not been the case between ICICO and *Scolel'te* so far, may be because their functioning and context are very different.

We explained that market-based instruments are a compromise between conservationist policy and neoliberal approach. The market does not specifically induce free-market functioning neither waiting for solutions only from the private sector. In the voluntary carbon market, solutions come from the link between different stakeholders defining prices and quantities for carbon capture throughout individual contracts.

Figure 4 shows that the certification and trading steps are regulated even without state intervention. Understanding the links between the stakeholders has been made thanks to different interviews with the environmental organization and two brokers: MEXICO2 and PRONATURA. There are standard frameworks developed by specialized organizations (standard organizations) to certificate carbon credits production. Then, carbon credits production results from the cooperation and negotiation of different stakeholders (communities or individual producers, environmental organizations, and sometimes public agencies).

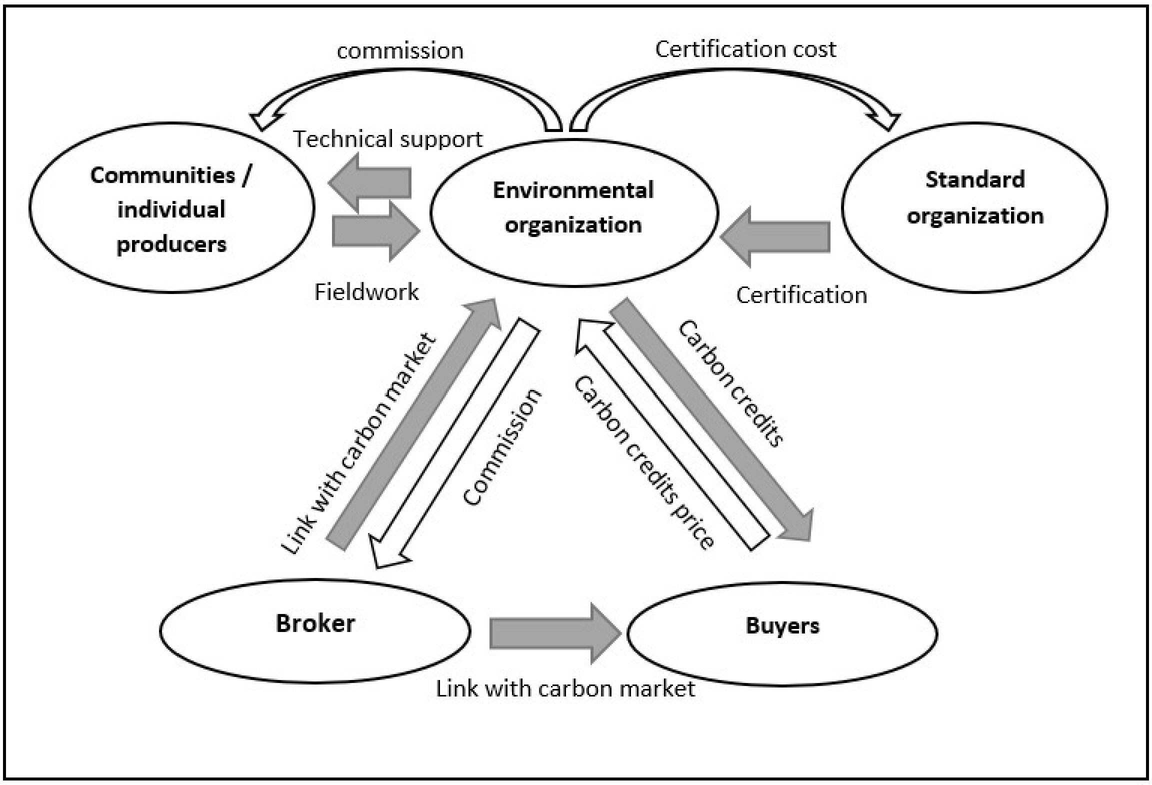

Figure 4. Structure of forest carbon projects

Source: Author

The presence of intermediary agents (brokers) to link buyers and sellers suggests that these actors do not have the same power of negotiation in the market. These brokers and the environmental organizations that manage the project are significant in the functioning of any forest carbon project. The producer (individual or community) needs funding and technical knowledge to create carbon credits. In the meantime, the buyer cannot pay before the certification. The intermediary actors' role is to compensate for the mismatch between the producer who needs time and money and the buyer who needs security about the carbon credits integrity (Lee *et al.*, 2016). Intermediary organizations in forest carbon projects in East Africa also support the coordination between sellers and buyers with technical knowledge and fundings. This kind of network also exists in the enforcement of REDD++ projects (Pesket *et al.,* 2011).

Even though the high number of producers in the *Scolel'te* project could induce more influence for the carbon credits sale, each producer individually signs the contract with AMBIO blocks many possibilities to manage the quantity and the price.

In the literature, the authors discuss what kind of land tenure is more efficient and sustainable for natural resources management. In his article, *The Tragedy of the Commons*, Garret Hardin (1968) exposes the negative impacts of free access on natural resources without property rights. This approach argues that the private sector with well-defined property rights is the optimal solution for resource management (Coase, 1960). The idea is that private management of natural resources presents an economic and technical efficiency that public administration cannot develop (Bakker, 2007).

However, in the 1980s, community-based natural resources management emerged as an alternative to public management based on command and control. In developing countries, the social organization has given more emphasis to the community than the individual. The integration of communities in natural resources management has been considered an essential aspect of economic and social development (Singh, 2008; Dill, 2009).

Community-based natural resources management is not always seen as an alternative to other kinds of management. This is a natural intuitive approach of society to consciously self-organize to face local problems (Bakker, 2007). Elinor Ostrom reported some of these cases in *Governing the Commons* (Ostrom, 1998). She explains that communities have the inherent capacity to self-organize for natural resources management.

Common participation includes decision-making and the enforcement of actions by the community to solve problems. This concept is linked to community empowerment and emancipation from other actors (Ferney, 2011). Indeed, the communities are not at the same stage regarding participation and common management. They do not automatically meet the conditions defined by Ostrom (1990). The cooperative capacity and the ability to produce collective actions are key factors for common management efficiency.

Besides the geographic and ecosystemic context, there are social, organizational contrasts between the two case studies. Most of the communities working with *Scolel'te*, in Chiapas include indigenous people (maya, tzetlal, chol). In these communities, forest areas are shared between the members into individual plots according to the internal agreement. Because of the informal aspect of this agreement in some cases, property rights are not very strong. This can be negative for resource management efficiency since well-defined property right is a crucial feature for land management (Rosa *et al.* 2004).

In the communities working with *Scolel'te*, there are internal rules that each member must respect otherwise, they are exposed to sanctions. However, each member has its own strategy for managing its plot. We can then notice ecosystemic disparity in the same area because community members do not have the same knowledge or interest. According to the member working on the project, it is a considerable challenge for AMBIO to deal with individuals instead of the whole community, which causes logistical difficulties for project enforcement and monitoring.

Thereon, some authors wrote about conflicts between community members with common areas due to the division of the land caused by market-based instruments (Büscher, 2012; Scheba & Rakotonarivo, 2016). Osborne (2015) detected conflicts between *Scolel'te* participants and non-participant community members about the access to logging activity allowed in the project. In Mexico, landowners must have a license from the SEMARNAT to carry out commercial logging activities. This license is costly and required a lengthy administrative process that makes it difficult to get. However, the *Scolel'te* participants can sell timber after the term of the contract with AMBIO without the SEMARNAT license.

In the case of ICICO and the communities of Oaxaca, the situation is different. The Forest area is totally under common use. Moreover, in San Juan Lachao, all the land is under common property rights. The carbon credits project is part of the whole forest management strategy assisted by ICICO. All community members are involved in the management with workshops, debates, fieldwork, and jobs. Because the area under the project is large, the quantity of credits produced is large, too; and because this land is owned by one body, they have more decision-making in the market to set the price and choose the buyer. The communities working with ICICO are deeply involved in the project administration, so the members developed knowledge and awareness about forest management.

It is important to balance the tradeoff between human capital and the size of the project. The community's project management could not be efficient without the technical and human support from the ICICO. This point confirms the interest multi-stakeholder's management. However, the same personalized treatment would be unaffordable for AMBIO and *Scolel'te*. Beyond the support from civil organizations, the public sector must take responsibility too, with monetary and technical support. Indeed, by conserving and restoring forest areas, the local landowners supply environmental services globally, which should be supported by the public agent (Costanza *et al.*, 1997).

VI. CONCLUSION

The forest carbon projects are marked by a multi-level governance structure with the integration of different stakeholders linked with contacts, as an alternative to state intervention. Although we cannot compare the ecological impacts with the current information, the benefits from the monetary incomes, job opportunities, and collective actions are real. In the case studies, the structural differences (land tenure rules, community structures, economic activities, and forestry background) and the distinct functioning can explain these impacts.

The voluntary carbon market and the forest carbon projects are the continuations of the evolutive trend in the environmental policy at global scale. These instruments are recognized in the international agreements and confirm the conceptual evolution of natural resources management to the direction of a multi-stakeholder's management that involves community participation. This polycentric governance scheme is positive for an adaptive environmental management. The literature shows the enforcement diversity of payments for environmental services. Therefore, it is crucial to rethink the definition and the application adaptively according to the context, even after the updated Wunder's work in 2015. In fact, the observed forest carbon projects seem to meet the definition of payment for environmental services more than the PSA program from CONAFOR because the contract is directly established between the seller and the buyer.

Although the forest carbon projects adopt an inclusive management mode with the communities, they derive from a neoliberal conception of environmental issues. The experience of *Scolel'te* proves the difficulty of balancing the tradeoff between economic efficiency, local sustainability, and environmental integrity. The land tenure and the landowners' cooperative capacity are key factors for the project efficiency and sustainability. In Mexico, the context can differ from these projects, so the functionings and impacts are heterogeneous.

The evolution of the environmental policy paradigm created a new form of governance such as these forest carbon projects that match ecosystem services and market efficiency. The governance structure can have different schemes but always based on the inclusion of several stakeholders. The cooperation capacity between them and the land tenure is determinant for the project impacts. It is necessary to develop governance schemes that consider these factors (land tenure and cooperation) to ensure sustainable environmental policy models.

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CHAPTER 4: POLITICAL CONSTRUCTION OF CARBON PRICING: EXPERIENCE FROM THE NZ ETS MODEL

I. INTRODUCTION

Carbon pricing is currently the most popular instrument to control and reduce greenhouse gas (GHG) emissions and could soon be the most common international political scheme to deal with climate change (ICAP, 2020). Carbon tax and emissions trading systems (ETS) are the main ways that governments enforce carbon pricing. Both instruments affect the behavior of GHG emitters, stimulate innovation, and provide public revenue (PMR & ICAP, 2016).

Carbon taxes set a price on emissions and let the market set the level of emissions, while under a cap-and-trade program, the level of emissions is set by the government, and the market determines the price. ETSs are considered to be the method that achieves the environmental target with the lowest social cost because companies will adapt their emissions by striking a balance between the cost of abatement and cost allowances. Setting an emissions cap instead of controlling emissions through a tax gives certainty about future emissions and compliance with international agreements (Pizer 2002). Daly (1992) recognizes that tradable permits ensure that a sustainable scale will be achieved, the initial allocation of grants can lead to a fair distribution and trading leads to an efficient reallocation.

The European Union launched the first ETS (EU ETS) to reduce GHG emissions in 2005. The system covered more than 11,000 industrial plants and power stations in 31 countries, representing 50% of total GHG emissions in the European Union (EU, 2015). This is also the ETS with the largest regional and emissions scale (Narassimhan *et al.*, 2018). In 2019, 20 emissions trading systems were in force in 27 jurisdictions covering 37% of the global gross domestic product (GDP), and 8% of global GHG emissions (ICAP, 2019). The trend is growing; six other ETSs are already scheduled, and 12 further jurisdictions are considering implementing them.

Improvement of existing ETSs around the world is planned for 2020. The EU ETS and the California Cap-and-Trade Program are entering the fourth phase of implementation with reforms and new rules. The government of New Zealand announced changes in the operation of the NZ ETS (New Zealand Government, 2019a). China will expand and combine all its regional ETSs into a single program (ICAP, 2020). A national ETS in Mexico and two local programs in New Jersey and Virginia (U.S.) will join the Regional Greenhouse Gas Initiative (RGGI) in 2020. With these new programs, ETSs will cover 14% of global emissions (ICAP, 2019).

The NZ ETS is the second oldest program after the EU ETS, and it includes the highest number of economic sectors (ICAP, 2019). After 12 years in operation, the program has recognized some weaknesses and seeks to improve its functioning. The current model is the result of a series of dynamic political discussions and has been subject to continuous evolution. In this period, when new ETSs are emerging around the world, it is necessary to learn from the experience of a model that has overcome difficulties and continued to improve. This chapter examines the functioning of the NZ ETS and the context of its development with a reflection about carbon policy construction to draw practical lessons. The purpose is to understand its implementation and functioning, focusing on its political construction rather than economic efficiency or impact on emissions. The method adopted is purely qualitative and includes reading official texts from the New Zealand government and Parliament (reports, consultations, bills, acts, and amendments), literature about other ETSs, and conversations in conferences and workshops with NZ ETS stakeholders.

II. NEW ZEALAND EMISSIONS TRADING SCHEME

a. Background

Carbon pricing and the choice between a carbon tax and ETS started to be considered officially in the early 1990s and discussed with scientists and experts (Kerr & Denne, 1995). In 2001 and 2002, the NZ government led consultations on policy instruments for climate change mitigation and compliance with emissions targets following the ratification of the Kyoto Protocol. The results showed preferences for a carbon tax because of apprehension about the complexity and efficiency of an ETS (Leining & Kerr, 2016).

In 2002, New Zealand implemented a political strategy to meet its international climate change commitment. The approach consisted of the Ministry of Finance and the greenhouse gas inventory system organizing market management, meaning holding and trading of AAUs (Assigned Amount Units, under the Kyoto Protocol) (Ministry for the Environment, 2019a). The Climate Change Policy Package included a $25 tax with exemptions for companies exposed to international competition and with a high level of emissions intensity, a deforestation cap with liability to surrender Kyoto units for forest landowners, and incentives for permanent sinks (Ministry for the Environment, n.d.). In 2005, the Ministry for the Environment forecast a deficit in the allowance allocated to New Zealand for the first Kyoto period (2008–2012) due to economic growth and a new forestry accounting system (Ministry for the Environment, 2005). Nevertheless, the carbon tax was abandoned because the incentive required to meet the Kyoto commitment was underestimated (Parker, 2005).

In the first phase of the ETS (2008–2013), forestry was the only sector involved from the start. Other areas would be included in the next steps. A first review (2008–2009) concluded that integration of agriculture should be postponed to 2015. However, a 2010–2012 change postponed the participation of agriculture indefinitely, although compulsory reporting by the sector was started in 2012 (Leining & Kerr, 2018). Industry, stationary energy, and transport joined the ETS in 2010; waste and synthetic gas in 2013. The NZ ETS was open to the international market and allowed international units from the Kyoto protocol to trade in the domestic market. However, international units sold at a low price because of excess supply decreasing the internal rate. Worried about the consequences of such a low cost, the government delinked the local market from international units in 2015 (LeinIng & Kerr, 2018).

In 2019, the government set further ambitious targets as a national commitment through the Climate Change Response (Zero-Carbon) Amendment Act 2019 (ZCA). The ZCA announced the creation of a Climate Change Commission that would bring independent experts together to advise about climate change mitigation and adaptation (New Zealand Government, 2019b). The act combines a target of achieving zero net emissions (including all GHG) for 2050 and reducing gross emissions of biogenic methane by 24–47% by 2050. These climate change commitments are feasible for New Zealand. Indeed, the country is projected to meet its 2020 emissions reduction target, and it completed the first commitment period of the Kyoto Protocol with a surplus of 123.7 million units (Ministry for the Environment, 2019c). The 2013–2020 objective would be achieved using 27.7 million of these units (Ministry for the Environment, 2019d).

b. NZ ETS functioning

In 2008, New Zealand aligned enforcement of the NZ ETS with the United Nations Framework Convention on Climate Change and the Kyoto Protocol. The ETS covers a broad range of GHG (CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs) and all economic sectors except agriculture. However, this sector is still obligated to report emissions. In 2018, 45% of emissions reported at the national scale were from agriculture, meaning that the ETS covered 55% of national emissions (Environmental Protection Authority, 2019). The same year, liquid fossil fuels produced 47%

of emissions included in the ETS, stationary energy 40%, IPPU 7.3%, waste 3.6%, and forestry (including carbon removal) 1.8%.

Integration of all these sectors into the ETS has been advancing progressively (Leining & Kerr, 2018). The NZ ETS is constructed with upstream points of obligation, meaning that actors required to surrender units are points in the supply chain before the emissions are generated (Leining *et al*., 2017). The advantage of this mode of functioning is that it ensures all targeted emissions are covered, and with fewer liable actors, monitoring is more convenient and less costly. Table 6 depicts these sectors, their year of integration into the NZ ETS, and their points of obligation.

Table 6. Sectors coverage and points of obligation in the NZ ETS

Sector	Year of integration	Points of obligation
Pre-1990 forest	2008	Forest landowners if there is deforestation
Post-1989 forest	2008	Voluntary registration (45% of participation). Earn or surrender units according to the balance of carbon sequestration
Liquid fossil fuel	2010	Owner of obligation fuel at the time the fuel is removed for home consumption or otherwise removed from a refinery
Sationary Energy	2010	Points of fuel production or import for coal and natural gas, points of use of geothermal fluid, points of emission for combustion of waste products, points of petroleum refining, and points of use of crude oil or other liquid hydrocarbons.
IPPU	2010	Industries where chemical process or products transformation produces GHG emissions
Waste	2013	Landfill operators

Source: Leining & Kerr, 2018

Financial penalties support the enforcement of liability. If a point of obligation does not meet with its responsibility to surrender by the due date, the entity must surrender and pay a penalty of NZD 30 per unit due. The government fines entities up to USD15,000 if their emissions reports contain failures or missing data. If the entity voluntarily hides or falsifies information, the sanction could be USD32,000 or five years imprisonment.

Allocation of units in New Zealand is based on the updated output. Emissions are estimated based on the quantity of products produced or processed by the obligation point, and liable entities must surrender the corresponding number of units each year. In order to limit the burden of the ETS, non-forestry sectors must give up one unit for two tonnes of emissions. This started to be phased out in 2017 to transition to one unit for one tonne in 2019 (Leining & Kerr, 2018). The NZ ETS did not set a limit on units generated each year (cap). Therefore, there is no supply limit of allowances in the market or from the government. The ways to receive contributions are purchasing from the government, purchasing in the secondary market, earning units for removal activities (post-1989 forest), or free allocation (Leining & Kerr, 2018).

The New Zealand Unit (NZU) is sold through a price ceiling mechanism. Liable entities can purchase NZUs from the government at a fixed price of NZD 25 per unit. This price ceiling mechanism replaces auctions, which are often used in other ETS. Liable entities can also purchase units in the secondary market. Currently, the secondary market only allows the purchase of domestic units since the NZ ETS was delinked from the international market in 2015. Only NZUs are accepted for surrender (Leining & Kerr, 2018). Figure 2 summarizes the actors involved in trading allowances in the NZ ETS and the flow of NZUs.

Removal activities are mostly in post-1989 forest (but marginally include the export of some industrial products). The government allocated NZUs for removal that can be sold in the secondary market (Figure 6) or banked by their owner to surrender future liability.

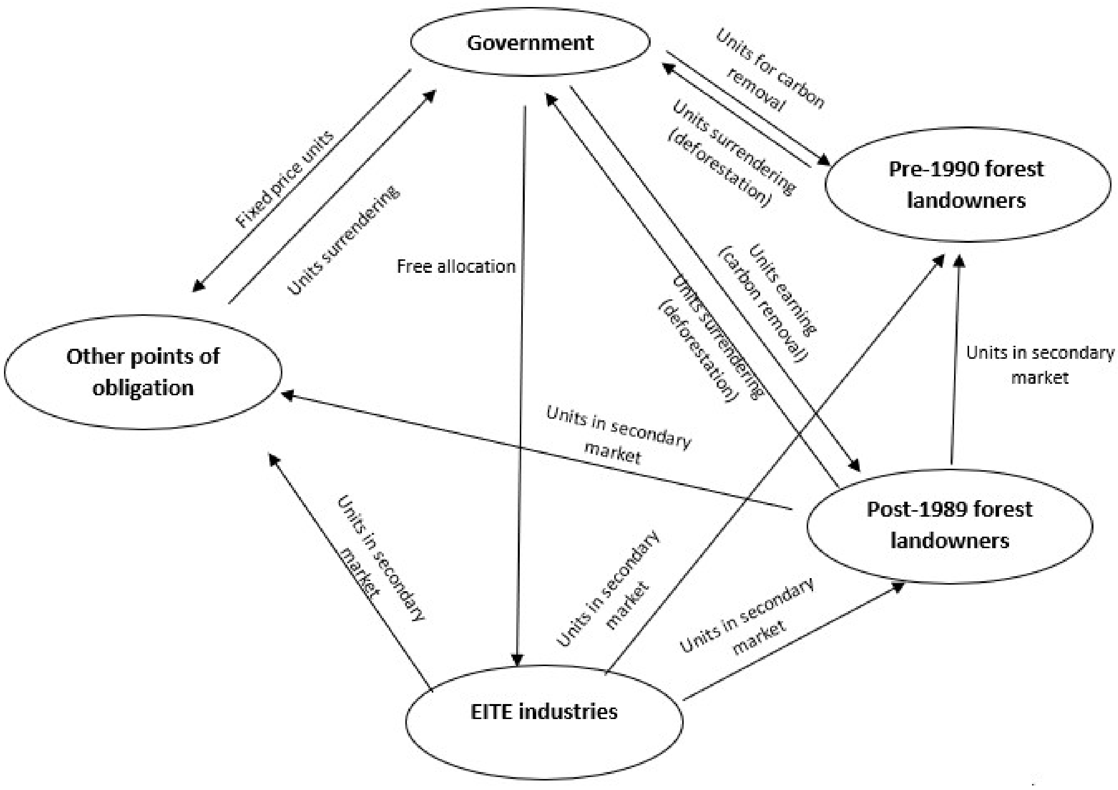

Figure 5. NZUs flows in the NZ ETS

Source: Authors

Free allocation of units is a compensatory instrument to enforce limits on the disruptive impact of carbon pricing for some sensitive sectors. The government provided pre-1990 forest landowners and fishing companies with free allocation of units from 2010 to 2013. Free distribution for industries seeks to compensate for the disruptive impact of carbon pricing. Carbon pricing causes a direct increase in production costs that can affect asset value (in the case of recent investment in emissions-intensive technology or processes), competitivity of a firm, and the community (PMR & ICAP, 2016). This increase in production cost can provoke carbon leakage.

The government distributes free allocations to emissions-intensive and trade-exposed industries (EITE) even if they are not a point of obligation (Figure 1). Indeed, a carbon price can be a burden to these companies if they surrender liability for energy consumption when suppliers pass on the price of units in energy cost. All companies, since they are not electricity generators, are considered as trade exposed. Highly emissions-intensive producers receive 90% of an allocative baseline,[3] and moderately emissions-intensive producers receive 60%.

c. Post-2020 NZ ETS

To date, the NZ ETS has not had a significant impact on domestic emissions. Indeed, New Zealand is going to meet its Kyoto protocol target thanks to international units with different environmental integrity than NZUs (Leining *et al.*, 2019). The low price of units, free allocation for EITEs, and the absence of a cap on allowances has constrained incentives for small emissions investment.

Acknowledging the need for improvement in the NZ ETS, the government introduced the Climate Change Response (Emissions Trading Reform), Amendment Bill, in 2019. This legislation includes modifications to improve the functioning of the NZ ETS. The main change in the reform is to establish a supply limit on emissions (cap) to support achievement of the emissions target (New Zealand Government, 2019a). However, no further information about the level of the cap or the rate of decrease has been announced yet.

The government proposes to shift from fixed price purchasing to an auctioning system in late 2020 or early 2021. Each auction is likely to have a reserve price and could also be governed by a price floor applying to all sales in the year. The market will be supported by a Cost

[3] The allocative baseline is the estimate of the average ETS cost per unit of output, including direct emissions and energy consumption.

Containment Reserve (CCR), which consists of saving some of the budgeted units, which can be injected into the market if the price increase is exceeded (New Zealand Government, 2019a). The free allocation system will start to be phased down in 2021, continuing to 2050. A 1% annual phase-down rate will apply from 2021 to 2030. This rate will increase to 2% annually from 2031 to 2040, and 3% from 2041 to 2050. However, depending on contextual economic factors in the EITE sectors, the government will have the option of increasing or decreasing this rate (New Zealand Government, 2019a). Several mechanisms will be implemented to strengthen monitoring, reporting, and verification (MRV) processes, including increased sanctions and penalties.

III. Comparing the NZ ETS to other models

Compared to the EU ETS, Swiss ETS, RGGI, California Cap-and-Trade Program, Quebec Cap-and-Trade System, and Korean ETS, the NZ ETS does not have the highest coverage rate, on average 51% of emissions, but has the broadest sectoral coverage (Narassimhan *et al.*, 2018; ICAP, 2019). However, the other half of emissions come only from the agricultural sector. The missing coverage in the NZ ETS is due to the decision to spare the agricultural sector from the disruptive impact of carbon pricing. Table 7 shows the ETS and its critical variables (emissions coverage, cap cut-rate, unit price, linkage, and public revenue[4]).

[4] We complemented the information with data fron the International Carbon Action Partnership (ICAP)

Table 7. Well-established ETSs along five key features

	Coverage	Cap cut rate	unit price (USD, 2018)	Linkage	Revenue (millions of USD)
NZ ETS	51%	None	$15.71	No linkage	n/a
EU ETS	45%	1.7%	$18.76	Clean Development Mechanism (limited), link with Swiss ETS	16,747
Swiss ETS	11%	1.7%	$6.73	Clean Development Mechanism, Joint Implementation (limited), link with EU ETS	n/a
RGGI	20%	2.5%	$4.87	International offsets from states having agreement with RGGI	239
California Cap-and-Trade Program	85%	3.0%	$14.91	Offsets from US, Canada Indonesia, Mexico and Brazil. Link with Quebec	3,018
Quebec Cap-and-Trade System	85%	3.0%	$14.91	Link with California	642
Korea ETS	68%	2.0%	$20.62	No linkage	n/a

Source : ICAP (2019), Narassimhan et al (2018)

The NZ ETS is the only ETS definitively enforced without any quantitative cap. All the other systems set their cap according to their target emissions (NDC at national scale). It is hard to imagine how the NZ ETS could control the level of emissions or encourage emissions to decrease without a cap. Moreover, a cap is necessary to guarantee the incentive level of the unit price.

Narassimhan *et al.* consider a low unit price to have high economic efficiency because it means that the marginal cost of abatement (reflected by the price of emissions) is lower in these jurisdictions. However, there is no point in respecting a unit price without other variables such as coverage or the type of allocation of allowances. The Swiss ETS and the RGGI have a low cost of abatement compared to other ETSs. Nevertheless, they have a meager coverage rate, which reflects economic efficiency at a minimal environmental impact.

Moreover, the RGGI does not give free allocation, which means that the industries involved carry the total cost of allowances to be surrendered while in the EU ETS, even if the price is higher than $18.76, 43% of the benefits have been given by free allocation between 2013 and 2020 (ICAP, 2019). In the NZ ETS, the government provides around 34% of free distribution and does so without a cap, which consequently limits the burden for ETS participants and the emissions incentives (ICAP, 2019).

New Zealand and South Korea have unique models that do not allow international units. However, the NZ ETS reform project includes a limited reintegration of international units into the domestic market (New Zealand Government, 2019b). As noted earlier, de-linkage with international markets has been a decision taken to protect the NZ ETS due to the volatility induced by the low price of international units and the lack of incentive effect. Empirical studies show that delinking the NZ ETS from the global market allowed it to take back its autonomy after being a price taker (Diaz-Rainey & Tulloch, 2018). The EU ETS and Swiss ETS seem to be the last models to accept Kyoto units while other ETSs work according to bilateral or unilateral agreements.

There is no doubt that the European Union is the jurisdiction that generates the highest level of revenue from its ETS, thanks to the large scale of the economic activity it covers (ICAP, 2019). No information is available about public revenue from the NZ ETS. However, we can assume that these revenues have been quite weak since the sale of fixed price units from the government started to become significant when the secondary market price passed NZD 25 in 2017.

IV. Insights and challenges from the NZ ETS

a. A dynamic democratic process

The implementation of the NZ ETS has been the result of a long and hard democratic exercise. The government had to consult the population, scientists, and stakeholders, make propositions to Parliament; face demonstrations and political opposition, and renunciations; and find alternatives (Driver *et al.*, 2018).

From the first considerations of carbon pricing to the current state of the NZ ETS, the government held nine consultations and NZ ETS reviews, and Parliament received and passed ten amendments and bills relating to the Climate Change Response Act (Table 8). Before enforcement of the NZ ETS, the government held several public consultations about the direction to take on climate change policy and the Kyoto Protocol commitment. In 2005, public consultation on a carbon tax was the primary determinant of the government's renunciation (Inland Revenue Department, 2005). In 2006 and 2007, the consultation on measures to reduce post-2012 GHG emissions supported the implementation of an ETS after 2012 (MacGregor, 2006). However, the government finally decided to enforce it sooner and held regular NZ ETS reviews, which involved public consultation.

Table 8. Government and parliament exercise in the NZ ETS implementation

Year	Consultation / Government review	Legislature (Amendment)
1996	First consultation on emission pricing	
1999	Second consultation on emission pricing	
2005	Consultation on carbon tax	
2006-2007	Consultation on measure to reduce GHG emissions post-2012	
2008	First NZ ETS review	Passage of the Climate Change Response (Emissions Trading) Amendment Act 2008
2009		Passage of the Climate Change Response (Emissions Trading Forestry Sector) Amendment Act 2009 Passage of the Climate Change Response (Moderated Emissions Trading) Amendment Act 2009
2010	Second NZ ETS review	
2011		Passage of the Climate Change Response Amendment Act 2011
2012		Passage of the Climate Change Response (Emissions Trading and Other Matters) Amendment Act
2014		Climate Change Response (Unit Restriction) Amendment Act 2014 Climate Change (Unit Register) Amendment Regulations 2014
2015	Third NZ ETS review	
2016		Passage of the Climate Change Response (Removal of Transitional Measure) Amendment Act 2016
2018	Public consultation on the Zero Carbon Bill Public consultation the NZ ETS reform	
2019		Passage of the Climate Change Response (Zero Carbon) Amendment Act 2019 Passage of the Climate Change Response (Emissions Trading Reform) Amendment Bill 2019

Source: authors

The democratic process does not only involve the state and the Parliament but should also consider the various stakeholders. Each economic sector defended its interests and argued to limit the economic impact of the ETS. This democratic process is part of the political construction that shaped the current functioning of the NZ ETS.

The agriculture sector is the best example of this process. Farmers have opposed emissions pricing since they were first proposed. Agriculture, mostly dairy and intensive crop agriculture, is the highest source of GHG emissions (45%). However, the sector is a leading contributor to the national economy and produces 35% of export revenue (ICCC, 2019a). New Zealand developed around this activity, and the sector's political relations with the government have always been exceptional. Agriculture is the motor of the nation to a certain extent; the country would fear to disrupt it, and the politicians feel responsible for defending its interests (Driver et al. 2018). Farmers achieved the repeal of the Climate Change Package in 2005 and then were declared eligible for 95% of free allocation in the first version of the NZ ETS before delaying its integration until it was suspended indefinitely (Leining & Kerr, 2018).

Forest landowners also argued for optimization of the impact of the NZ ETS. At first, the only integration of foresters into the NZ ETS was the liability for carbon removal in pre-1990 forest. However, post-1989 forest landowners complained that the government would benefit from their removal activity with Kyoto units without their receiving any payment. They then argued that they should have the ability to earn units according to their removal activity. Landowners of pre-1990 forests were impacted by land value decreases resulting from liability for carbon release (deforestation) and claimed compensation that took the form of a one-time free allocation. Fishery companies, also impacted through the price of fuel, lobbied for and received the same kind of compensation.

Although many stakeholders took part in shaping the NZ ETS, citizens, and consumers as such, have not been involved. Invitations for public consultation are mostly directed to experts and scientists. Driver *et al*. (2018) denounced the construction of the NZ ETS as technocrat policymaking contradictory to a real democratic decision-making process. The population's acceptance of emissions pricing can vary from one country to another. New Zealand has a robust neoliberal background and is different from countries such as France, where the population does not accept taking on the burden of climate change mitigation on behalf of the producers (Douenne & Fabre, 2020).

b. Managing the transition

An ETS, like any carbon pricing scheme, aims to create an incentive for producers and consumers to choose lower-emission alternatives while enabling innovators to compete. This means switching the economic model into lower consumption of fossil fuels, the use of renewable energy, and better resource efficiency in the production process. However, this transition must be managed carefully. Otherwise, economic disruption could affect businesses and society. To achieve this transition gradually, the NZ ETS has been shaped with two instruments: one-for-two unit obligation and free allocation for industries.

The one-for-two unit obligation was introduced to limit the economic impact of the NZ ETS for mandatory participants except for the forestry sector (Leining & Kerr, 2016). The point is that entities were obliged to surrender one unit for two tonnes of CO_2-e. This measure cut the cost of surrendered units in half so that the valid fixed price of NZUs sold by the government was NZD 12.50. The government adopted the phase-out of the partial unit obligation in 2016 (Climate Change Response (Removal of Transitional Measure) Amendment Act 2016) with a progressive introduction of the one-for-one unit obligation between 2017 and 2019 (Leining & Kerr, 2018).

In the NZ ETS, support can be provided to an industrial entity regardless of whether it is a point of obligation or not. For firms producing emissions-intensive outputs, emissions pricing causes a direct increase in production costs that can affect asset values, market share, and workers, with flow-on effects for the local and national economy (PMR & ICAP, 2016). While these changes may be a valuable and necessary part of the low-emission transition, their impacts – and the ability of firms, workers, and communities to adapt to these impacts – may be unevenly distributed. Free allocation is an asset that can be used to alter the distribution of emissions pricing effects. Given the value of units in the trading market, providing free allocation is analogous to a public subsidy.

Emissions-intensive producers exposed to import, or export trade competition are particularly vulnerable. Whereas other types of producers have the option to pass the cost of emissions on to their customers, emissions-intensive and trade-exposed (EITE) producers may not be able to do so and remain competitive (Sense Partners, 2018). If they cannot switch to less emissions-intensive production or absorb the rising cost of emissions, they may be forced to reduce output, which, for a given level of demand, is then displaced to other jurisdictions. As well as causing local economic and employment effects, this displacement of production has the potential to increase global emissions, thereby contradicting the core purpose of the mitigation policy. This outcome is known as "carbon leakage" (Sense Partners, 2018).

Avoiding carbon leakage is the rationale for free allocation in the NZ ETS. The government supports EITE industrial activities even if the businesses are not obliged to surrender units, since the ETS impacts them through energy costs. Economic activities are quantitatively assessed to estimate whether they are EITE and eligible for free allocation. Only stationary energy production is not considered trade-exposed; eligibility for other sectors is based on their emissions intensity. In New Zealand, 85 entities among 26 economic activities receive free allocation (EPA, 2019).

Other ETSs use free allocation to manage the carbon leakage risk. The NZ ETS is not the most generous scheme in free distribution, with an average of 34% of total allowances provided by the government. The EU ETS has an average of 43%, and the California Cap-and-Trade Program, 85% (ICAP, 2019). However, carbon leakage has not been empirically observed. In the EU ETS, overuse of free allocation in the first and second phases slowed low-carbon transition. The phase-out triggered in 2013 would potentially have an impact on innovation and small carbon production (Teixidó et al., 2019). New Zealand delayed the decision to start the removal of free allocation until 2020.

Government support for low-carbon transition is necessary to guarantee ETS efficiency. The New Zealand government developed and is planning to implement programs to incentivize reduced energy consumption in industry and transport and promote low-carbon products (Ministry for the Environment, 2019d). However, there is no information about the amount and use of public revenue from the NZ ETS. The amount would still be limited since the government started selling fixed price units after the price of the secondary market reached NZD 25 following the delinking from the international market (Leining & Kerr, 2018).

Recycling public revenue from the ETS is necessary for support of the low-carbon transition and social acceptance of carbon pricing. The EU ETS supports companies with subsidies for R&D and the adoption of clean technologies in industry, while the California Cap-and-Trade Program and the RGGI help consumers through subsidies for low/zero-emission vehicles and energy-efficient housing (Raymond, 2019)

c. The gap with theory

In the actual programs, observations are far from the theory, and this gap is significant in the NZ ETS. Indeed, the NZ ETS could take the form of other economic instruments than cap-and-trade. For the case of the NZ ETS, this gap is about the cap on emissions, price management, the liability scheme, and voluntary participation by post-1989 forest landowners.

The cap should correspond to the emissions target and determine the environmental efficiency of the instrument. Then, in the context of the Paris agreement, the current ETSs should set a cap based on the target of keeping global warming by 2100 below 2 °C. The members enforcing an ETS should establish a cap according to the NDC. However, it is not enough to guarantee that emissions keep below the NDC emission target since the programs only involve a part of the emissions according to the sectorial coverage. Even the NDCs are not sufficiently ambitious to achieve the Paris agreement target, and 70 countries have already declared they will announce new NDCs in 2020 (UNEP, 2019). The NZ ETS is the only program without a cap (Narassimhan et al., 2018). This results in complete uncertainty about the emissions impact of the ETS and impacts the environmental efficiency of this instrument.

An ETS will see the emission price rising until it reaches the marginal cost of abatement that corresponds to the level of emissions set in the cap. In the NZ ETS, the government sells units at a fixed price (NZD 25), which works like a price ceiling. Control of prices is used to avoid a substantial economic impact on businesses, but a high price is necessary to have a significant effect on emissions. Globally, unit prices in the ETSs are lower than the estimated social cost of GHG emissions (UNEP, 2019). In New Zealand, emissions prices are still too weak to have a significant incentive impact, even considering future predictions. Indeed, reaching a carbon price of USD40 would decrease emissions by 5,173 kt CO2-e (MPE, 2019d).

The system of assigning upstream liability also places the functioning of the NZ ETS far from the theory. This scheme is preferred for its simplicity in allocating allowances and monitoring a few points of obligation. Liable companies can pass on the cost of benefits to their clients as with any production cost if it does not impact their competitiveness. Most of the firms affected by emissions pricing are energy consumers (electricity or fuel) and must pay for their indirect emissions at a price established by their suppliers. For them, it resembles a tax, since it is directly included in their energy consumption cost, and they do not have the opportunity to participate in the secondary market to negotiate the price or sell extra allowances.

The participation of post-1989 forest landowners in carbon removal works like any voluntary carbon market regardless of their liability for deforestation and corresponds to the definition of payment for environmental services (Wunder, 2005; Wunder, 2015). Including forestry in the voluntary carbon market is like making payments for environmental services (Rontard *et al.*, 2020). Transactions are voluntary and bilateral between environmental service sellers and service buyers and are under conditional and agreed rules of forest management through the allocation of NZU from the government. Indeed, this observation does not imply any reconsideration about the efficiency of the NZ ETS to promote carbon storage and is valid for any voluntary carbon market.

V. DISCUSSION: IMPLICATIONS FOR NEW ETSs

It is not possible to determine whether the NZ ETS is a better or worse model than the others. However, the political dynamic and changes in functioning make it an excellent example that can be learned from. The country set ambitious targets to be carbon neutral and to produce 100% of renewable energy by 2050 (ICCC, 2019b; Ministry for the Environment, 2019b). In 2020, new ETSs are starting, and others are under consideration. The launch of Mexico's ETS is probably the most notable step this year.

Mexico implemented the first ETS in Latin America in 2020. The Mexican ETS covers direct emissions from entities in the energy and industry sectors emitting at least 100,000 tCO_2 per year. It represents around 37% of the country's emissions (ICAP, 2020). For the first three years, the ETS is being implemented as a pilot program with no economic consequences for the participants. Allowances are therefore, fully distributed with free allocation based on grandfathering (SEMARNAT, 2019). Mandatory GHG reporting has already been in place since 2014 (MEXICO2 et al., 2018). The government is still developing the auction platform and the methodology for offsetting (ICAP, 2020).

In parallel, Colombia, Ukraine, the State of Pennsylvania, and China (at the national scale) will establish their own ETSs. Other countries in Latin America and Asia are also considering this policy (ICAP, 2020).

According to the analyses of the NZ ETS, we expect these countries will take a long time before their ETSs reach stable functioning. Even the existing schemes are still improving their processes, and several reforms are being implemented in 2020 (ICAP, 2020). The development of an ETS requires discussion and consultation with the democratic institutions of the country (governments, assemblies), economic stakeholders, and the population. In Mexico, the ETS was already under consideration ten years ago, and its implementation was announced in the General Law on Climate Change in 2012 (SEMARNAT, 2017). The government organized discussions with the private sector, academics, and civil society (MEXICO2, 2019; SEMARNAT, 2020). Ukraine's national ETS is under development, and public consultation will take place in 2020. In Quebec, the ETS is already in force. The government launched a public consultation about offsetting modalities and held consultations with industry to set the free allocation scheme for 2024–2030. The Transportation and Climate Initiative (TCI) in the northeastern states of the USA started after consultation with an expert and the public in 2019. The United Kingdom held a public consultation on carbon pricing in the post-Brexit situation, and other countries such as Brazil and Chile, where ETS is under consideration, will also hold public consultations (ICAP, 2020).

These steps are necessary for democracy and helpful in the establishment of public policy. It is crucial to maintain openness for discussion in policy enforcement. However, stability for investors and producers is also essential. The NZ ETS has been reformed and changed, resulting in an atmosphere of political uncertainty, to a certain extent, that is harmful to low emissions investment. These changes have been abrupt and unrelated instead of reflecting a consistent set of policies.

Political alternation in New Zealand with the election of new governments induced changes in the orientation of climate change policy and the implementation of carbon pricing (Driver *et al.*, 2018). Australia had the same experience at a more robust level. In 2012, the Labor government launched its carbon pricing mechanism (that inspired the functioning of the NZ ETS). Nevertheless, the 2013 elections placed the conservative party in power, and the new government set out to repeal carbon pricing (Crowley, 2017).

In contrast, the EU retained a stable political orientation in its structures of governance, and the EU ETS followed a consistent trend in its implementation (Bouillaud & Persico, 2019). In Mexico, even after a radical change in the policy framework with the election of socialist president Andrés Manuel López Obrador, implementation of the ETS was kept on the political agenda. It had never been reconsidered (ICAP, 2019). However, regarding the experience of the ETSs implemented at a national scale, we can expect instability in the development of the new schemes and the schemes under consideration.

Climate change is a very long-term issue, and it is crucial to maintain a consistent political orientation to tackle the problem. In 2017, the United Nations was already warning about the necessity of setting more ambitious NDCs to respect the Paris Agreement target and that emissions trends were very distant from reaching the objectives (UNEP, 2017). Considering that most of the NDCs are set to the year 2030, we can assume that current policies are not sufficient to meet them and that the new implementations of ETSs will not be enough. It will be necessary to strengthen the rules of current and forthcoming ETSs and combine them with a complimentary program to accelerate the transition, such as public subsidies for low-carbon technologies and products and to overcome the economic disruption with public investment.

The fear of economic disruption is a real factor in the enforcement of carbon pricing. The government of New Zealand debated with the agriculture sector and traditional industries to manage the transition to a low-carbon economy. To mitigate the economic impacts of carbon pricing, the NZ ETS integrated various instruments, such as free allocation and partial surrendering of obligations. The new schemes will have to make the same tradeoff between the transition and conservation of the main economic sectors. To manage the problem of economic disruption, they will have to consider international competitiveness, carbon pricing policies in the neighboring countries, and the links with other ETSs. The question is, what kind of transition will countries aim for?

A country can focus on reducing the intensity of emissions in the existing economic sectors or substitute carbon-intensive industries by low-carbon activities (these options are complimentary). In New Zealand, the scheme is oriented to reducing intensity, with strong support for industry. We did not observe radical changes in the industrial structure of the countries with ETS, and we can assume that forthcoming schemes will be oriented to carbon intensity reduction.

We observe a gap between the theoretical functioning of cap-and-trade programs and the NZ ETS. The theoretical benefits of these instruments were already highlighted in the 1990s (Daly, 1992). However, it is hard to establish the same functioning in reality. In the field, countries mostly focus on the economic efficiency of the instrument instead of on achieving the environmental target that the emissions cap is supposed to guarantee. The NZ ETS did not set any cap at all, and flexibility mechanisms and weak price incentives in the EU ETS have helped companies avoid the quantitative limitation of the original cap.

Rules of enforcement are political choices mainly oriented by the tradeoff between economic development and environmental targets, even if ETSs are popular because of the potential for achieving the transition to a low-carbon economy with less economic disruption (PMR & ICAP, 2016).

The countries where ETSs are being implemented will make decisions about the rules of operation according to their political orientation, including complimentary instruments to support the transition in order to achieve the emissions target. Complementary instruments can take the form of public subsidies to support innovation, environmental standards, or building codes. Quebec and California already considered these by supporting the production of electricity from renewable sources (ICAP, 2020). In New Zealand, the government combines forestry's participation in the NZ ETS with other subsidy programs (Ministry for Primary Industries, 2018). In the post-2020 period, the country will support the transition to a cleaner transportation model and sustainable agriculture (Ministry for the Environment, 2019f). However, these policies came late and are still too weak to support the necessary transition that countries must develop to achieve climate change targets. The new ETSs would produce a significant advantage by already considering reliable complementary instruments to show faster emissions results.

VI. CONCLUSION

After 12 years of operation, the NZ ETS is still under construction and seems to be experiencing difficulties in finding a politically consistent orientation. Its operation seems to be unusual and covers the highest number of economic sectors, including forestry. However, it does not include the sector that is responsible for almost half of gross emissions, namely, agriculture. The decision to not set a cap on emissions and the upstream scheme for liability are also features that make the NZ ETS unique. The linkage structure was the most open at the beginning with the option to surrender any number of international units without limit but switched to the most restrictive with absolutely no linkage after 2015 while other ETSs made at least bilateral agreements.

Three lessons can be learned from New Zealand. ETS construction is a prolonged and sensitive democratic exercise. The process induces lengthy consultations between the government and economic stakeholders and parliament debates. The way to deal with the transition to a low-carbon economy is a vital issue in ETS enforcement and is a tradeoff that the country must make between low-carbon transition and protection against economic disruption. New Zealand made a choice to adopt a slow transition process. The third issue is the gap between theory and reality in ETS functioning. The example of the NZ ETS exposes this gap. The absence of a cap is the most visible aspect, but the way of managing emissions prices is also far from the theory. The weak price signal, the generous system of allocation and liability, and the lack of a cap on allowances have meant that the NZ ETS has avoided making a real impact on gross emissions in New Zealand up to now. We assume, however, that the reform adopted in 2019 will have effects on emissions.

Each context is different, and we cannot expect the same impact from ETS implementation everywhere. Lessons about political construction and the source of negative impacts can be beneficial for harmonizing future ETSs and integrating them with existing programs in order to have a consistent international scheme in the future.

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CHAPTER 5: EMISSION TRADING SYSTEM AND FOREST: LEARNING FROM THE EXPERIENCE OF NEW ZEALAND

I. INTRODUCTION

Deforestation and forest degradation have caused 30% of the anthropogenic CO_2 accumulated in the atmosphere. However, forests are an essential component of achieving climate change targets since they capture one-third of current anthropogenic CO_2 emissions (Frederici et al. 2017). The United Nations has denounced the lack of commitment regarding forestry. Many countries have undertaken to achieve net-zero deforestation targets for the next decades, but very few of them have presented measures for doing so (United Nations Environment Programme 2019).

Article Five of the Paris Agreement presents the necessity to preserve and improve existing carbon sinks and support the development of a new source of carbon sequestration. Article Six highlights the importance of international cooperation in the development of mitigation schemes. Both articles are the successors of the treatment of Land Use, Land Use Change, and Forestry (LULUCF) in the Kyoto Protocol. The text established the conditions for generating and trading Certified Emissions Reductions (CERs) or Emissions Reduction Units (ERUs) under Clean Development Mechanism (CDM) or Joint Implementation (JI) projects (UNFCCC 2009). Globally, units from forest activities only represent 0.5% of the total traded in carbon markets, and they are mostly from voluntary activities (Gren and Aklilu 2016).

The concept of Emissions Trading Systems (ETS) or carbon markets is to commodify an ecosystem service or avoidance of environmental damage (GHG emissions). However, integrating carbon units from emissions permits and units for carbon sequestered into the same market assumes that they are similar products. This is reasonable because when buyers purchase carbon units in the secondary market, they correspond to emissions avoided somewhere else or carbon sequestered, which results in less carbon in the atmosphere.

ETSs are the most popular response by governments to meeting their climate change targets. In 2020, there are 21 ETSs in force and nine in the process of implementation (ICAP 2020). Some of them allow emissions to be offsett with units from forest carbon projects or forestry CDM projects. The European Emissions Trading System (EU-ETS), currently the largest ETS, excludes the international units from forest carbon activities (European Commission 2020).

The EU-ETS omitted emissions and storage from LULUCF, but the Kyoto Protocol set the rules for net emissions accounting (Delbeke and Klaassen 2016). Under the Paris Agreement, the EU included LULUCF in the 2030 target. This target represents the third pillar of European climate policy after the EU-ETS and the Effort Sharing Regulation. The measures to support carbon sinks and limit emissions were integrated into the Common Agricultural Policy and seek to improve agricultural productivity and ecosystem services provision (Runge-Metzger and Wehrheim 2019). The New Zealand Emissions Trading Scheme (NZ-ETS) is the only ETS that includes the forestry sector (ICAP 2020). NZ-ETS covers 52% of national emissions. The scheme includes the energy sector, industry, domestic aviation, transport, buildings, waste, and forestry.

In the NZ ETS, the different sectors do not respond to the price signal in the same way. Emissions from transport do not respond to carbon pricing as strongly as the other sectors do (Chris Livesey, personal communication 2020). The price sensitivity is not the same in emitters sector as in forestry. In forestry, price incentive is efficient up to 19 USD to encourage carbon storage (which is close to the current price). However, it is not efficient enough to be an incentive for emissions abatement in industry and energy consumption. 60 USD is the estimated threshold where we could expect to observe a significant emissions reduction (Ollie Bolton, personal communication 2020). This gap in the price incentive demonstrates that units from carbon captured, and units from emissions avoided are different economic products, and the relevancy of integrating them into the same scheme is limited.

In 2015, Mexico signed the Paris Agreement and presented its Nationally Determined Contribution (NDC) to the global target (United Nations 2015). Mexico set the target to reduce its greenhouse gas (GHG) emission by 25% by the year 2030 compared to the business-as-usual scenario (Gobierno de la Republica 2015). Nevertheless, the Mexican ETS (Sistema de Comercio de Emisiones, SCE) does not integrate forestry as a liable sector. However, the scheme allows entities to offset up to 10% of their surrendering obligations with units from mitigation projects, which can include forest carbon projects (SEMARNAT 2019).

Mexico has plenty of forest resources, and reduction of emissions from LULUCF is essential to achieve the international commitment. Nevertheless, the current political measures to increase the national carbon sink are fragile (Ranero 2018). The experience from other countries where ETS and policies to support carbon sequestration have been enforced represents an essential source of learning. Mexico is supported by international organizations in the implementation of the SCE and takes inspiration from other experienced ETSs. Given the potential of forest resources and the recent launching of the SCE, observing the functioning of NZ-ETS, and learning from it is an important step.

This chapter analyzes the potential for Mexico to establish an SCE with the inclusion of forestry and the likely impacts, using the experience of New Zealand. The first part describes the forestry sector in New Zealand and the functioning of the NZ-ETS. The second part presents the forest resources in Mexico and the current political strategy in this sector. The third part tackles

Mexico's strengths and weaknesses for the inclusion of forestry in the SCE and the potential impacts.

The quantitative information was available on public data bases or shared by Motu Economic and Public Policy Research. We made unstructured and semi-structured interviews with researchers, a forestry consultant, the president of the Forest Owners Association, and a Ministry for Primary Industries agent. A semi-structured interview was prepared for all of them, but the discussion and the information shared were not consistent with the questions. Then, some of these interviews took an unstructured form. The transcriptions of these interviews are in Appendix 3.

II. FORESTRY AND THE NZ ETS

a. Forestry in New Zealand

The forest industry has been an essential factor for economic development in New Zealand. In consequence, native forests were impacted by European settlement. In the middle of the past century, the country started to massively plant exotic species, mostly *Pinus radiata*, to avoid deforestation of native species and to provide for domestic consumption and exportation of forest products (Ministry for Primary Industries 2020a). *Pinus radiata* is the most common exotic tree in New Zealand, covering 90% of forest plantations (New Zealand Forest Owners Association 2019).

Forest covered 80% of the country before Europeans started to arrive. At present, 38% of the land (10.1 million hectares) is covered by forest (8 million of native forest, and 2.1 million of exotic species). The government owns 75% of the native forest and the rest is under private ownership. The private land occupied by exotic species (1.7 million hectares) is available for production (Ministry for Primary Industries 2020a). In 2018, forestry activities produced

USD4.7 billion (1.6% of the national gross domestic product). The sector employs 35,000 people and is the third-largest exporting industry in the country after dairy and meat (Ministry for Primary Industries 2020b).

The Forest Act (1949) and the Resource Management Act (1991) set out the forestry rules. The government is not allowed to conduct any productive activity in the forest. Productive forestry plantation and logging activities are carried out on private property. New Zealand forestry is market-oriented and responds to price variation. In the mid-1990s, with a significant increase in the price of timber products, 300,000 hectares of new forest area had been planted (Carver et al. 2017). Private forest landowners are mostly individuals who have a small holding. More than 2,000 smallholders are registered with the Farm Forestry Association (FFA), and some 10,000 are not affiliated. The Forest Owners Association (FOA) also includes more than 200 owners of large forest holdings (David Rhodes, personal communication 2020).

The FFA and the FOA represent 70% of harvest volume. The large landowners can be individuals, investors, forestry corporation, or Maori communities (Iwi). Two types of contracts (forest lease and forest right) allow forest landowners to transfer the rights for forest operation. A forestry lease is a leasing contract on a land title. This contract allows the beneficiary to occupy and take resources on the land. The owner of a forestry right has a property right on the trees but not on the land. Generally, this contract is preferred due to its simplicity of enforcement.

The Maori people have a spiritual and intergenerational relationship with the forest. While the occidental approach to forest heritage is on capital bequeath, they consider it a responsibility to past and future generations to preserve what the parents gave and to allow a future generation to live in the same world as the current one (Kingi 2008). Maori forest is held under individual private ownership, but for commercial activities, they join their lands through forestry trusts or corporations that can be either self-organized or under agreement with a forest company. Since land use and forest management is treated by means of a long-term approach in their culture, decision making is a prolonged process.

b. NZ ETS and forest

The NZ ETS was launched in 2008 after the enforcement of the Climate Change Response (Emissions Trading) Amendment Act. Agriculture is the only sector not covered by the program. However, this sector is the principal source of emissions. In 2018, 45% of emissions reported at the national scale were from agriculture, meaning that the ETS covered 55% of national emissions (Environmental Protection Authority 2019a). The NZ ETS works with upstream points of obligation, meaning that the upper part of the supply chain of the source of emissions is liable to surrender allowances to the government. Forest landowners are points of obligation since deforestation is a direct source of emissions.

Forestry was the first sector in the NZ ETS. Integration of forestry into the NZ ETS seeks to promote carbon sequestration and storage by discouraging deforestation of pre-1990 forest and by encouraging plantating of the new post-1989 forest, replantating of the existing post-1989 forest, and increasing carbon density with longer harvest rotations. The government decided to distinguish pre-1990 and post-1989 forest because of the Kyoto protocol scheme setting 1990 as the baseline year. For the program, the definition of forest land is an area with at least 30% covered by forest species with at least 30 m of diameter on average (Ministry for Primary Industries 2020c). In 2018, there were 1,412,323 hectares of exotic pre-1990 forest and 682,439 hectares of post-1989 forest (Environmental Protection Authority 2019b).

Owners of land registered as forest area before 1990 are liable to surrender units for the quantity of carbon released when they deforest more than two hectares in five years. Indigenous forests are excluded from the NZ ETS since they are already protected by the Resource Management

Act and the Forest Act (Karpas and Kerr 2011). The obligation is to notify the Ministry for Primary Industries for any deforestation, calculate the emissions and surrender units. They can pay units directly to the government at a fixed price or buy them on the secondary market. It is also possible to offset deforestation by establishing an equivalent forest elsewhere (Ministry for Primary Industries 2017a).

Participation is voluntary for post-1989 forest owners. They can register their land to the NZ ETS and earn units during each obligation period (between one and five years) according to the net quantity of carbon captured. Until 2013, new participants could claim units according to the level of carbon captured from 2008. Since then, new participants receive units starting from their entrance into the NZ ETS (Carver et al. 2017). According to the evolution of the stock, the participant can earn or surrender units. In the case of total deforestation or if the owner wants to leave the NZ ETS, the participant must repay all units received.

Figure 7 illustrates the evolution of carbon storage for a single-age, single-species forest planted in 2008 or later. It assumes harvest followed by replanting for the first rotation with a partial liability to surrender units, and harvest followed by land-use change for the second rotation with a total liability to surrender units.

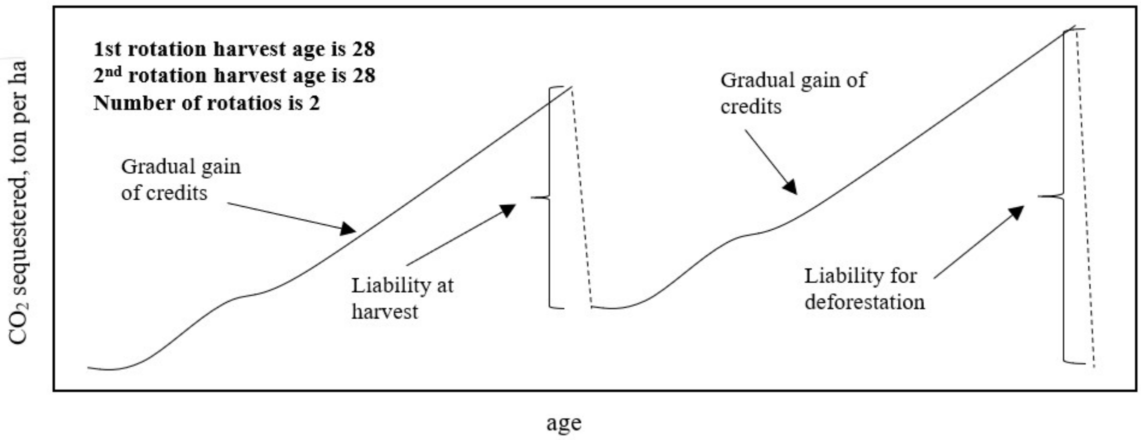

Figure 6. Credits and liabilities over two forestry rotations

Source: Karpas and Kerr, 2011

The NZ ETS reform (2019) introduced a new accounting methodology based on averaging. Instead of gradually gaining credits until harvesting, participants will gradually gain credits until the average age and then receive a constant level of credits corresponding to the average level of carbon sequestered without liability at harvesting. The average age is the age at which the forest achieves the average level of carbon sequestered. This accounting seeks to simplify and reduce the cost of participation in the NZ ETS. Forest areas registered from January 2021 will apply this methodology, participants with forest registered in 2019 and 2020 will have the option to use it and forest registered before 2019 will continue with the previous methodology of stock change accounting (Ministry for Primary Industries 2020c).

The program uses tools provided by the Ministry for Primary for self-reporting. For pre-1990 deforestation reporting and post-1989 participants below 100 hectares, the level of carbon stored is estimated by a look-up table (Ministry for Primary Industries 2017b) used to calculate the carbon released by deforestation and the evolution of the carbon stock by comparing with previous years. The calculation is based on information provided by participants (area, species, age, region). For post-1989 forest larger than 100 hectares, the participants must use the Field Measurement Approach (FMA) (Ministry for Primary Industries 2018a). This instrument requires GPS data and detailed analysis on a sample plot, gathering data on tree diameters and heights, species, shrub types, crown cover, past and planned silvicultural activities, and adverse events (disease, fire, storm). The Ministry validates reporting processes for primary industries and may carry out audits and monitoring in the field or by remote sensing. Penalties for omitting information or cheating range from a monetary fine to a term of imprisonment up to five years according to the severity of the offense (Ministry for Primary Industries 2015a).

The scheme represented a high cost for pre-1990 forest owners if they planned to carry out land-use change or sell their land. As compensation for the loss of asset value, the government decided to give them a one-off free allocation, which is a fixed number of allowances (Leining and Kerr 2018). The forest owners can use these units to meet their liability when they decide to deforest or sell them on the secondary market to receive a monetary payment.

Two complementary programs have been implemented by the government to substitute for participation in the NZ ETS: The Permanent Forest Sink Initiative (PFSI) and the Afforestation Grant Scheme (AGS). The PFSI seeks to improve conservation of post-1989 forest. Landowners who enter in the program sign a covenant with the government to definitively conserve their forest (with the possibility of withdrawing after 50 years). Limited harvesting is possible, but a minimum canopy cover must be maintained. Even if the landowner sells the land, the covenant stays in force (Ministry for Primary Industries 2015b). The landowner receives units according to the quantity of carbon stored, using the same reporting instrument. In 2021, the government will enforce the Climate Change Response (Emissions Trading Reform), which includes the end of the PFSI and transfers the participants to the NZ ETS in order to simplify the administrative process (New Zealand Government 2019).

The AGS was a grant distributed by the government to small and medium landowners for planting between five and 300 hectares. The landowner receives USD 800 per hectare, and the government continues to receive the carbon units for the first ten years. After that, the forest enters into the NZ ETS (Carver et al. 2017). In 2019, the One Billion Trees Program replaced the AGS. This program operates with the same objective to promote new forest planting and native regeneration. Depending on the type of forest (native or exotic species), the landowner can receive between USD 320 and 2,500 per hectare. Landowners can participate in the NZ ETS except if they grow *Pinus radiata*, in which case the landowner can apply after six years (Ministry for Primary Industries 2018b).

c. Participation and Impacts

In 2018, 39 pre-1990 forest landowners were liable to surrender units corresponding to 74,363 tCO2e released (0,1% of total emissions covered by the NZ ETS). The same year, 2,106 post-1989 forest participants had registered 324,819 hectares (48% of the total). 94% of post-1989 forest participants are owners, 6% are forestry rightholders, and 1% are forestry leaseholders (Environmental Protection Authority 2019b). Most of the post-1989 forest landowners participating in the NZ ETS were already carrying out commercial logging activities, which gave them the possibility of having the capital to finance carbon farming.

Forestry rightholders or leaseholders are investors (individuals or companies) that have a contract with the forest landowners to share profit from carbon units or to pay a fixed rent. They represent a small portion of the number of participants but potentially cover a large part of the registered land. Since most of the forest landowners in New Zealand are smallholders, most NZ ETS participants are registered in small areas. Among the 2,206 participants in 2015, 1,439 listed between one and 49 hectares covering only 9% of the total, while 45 participants registered more than 1,000 hectares, which covered 58% of the total (Table 9).

Table 9. Distribution of pre-1989 forest participants by size class of forest

Size class of forest	Number of participants	Percentage of participants	Total area registered (ha)	Percentage of land registered
1–49 ha	1,439	65%	26,000	9%
50–99 ha	353	16%	22,000	7%
100–499 ha	343	16%	66,000	22%
500–999 ha	24	1%	14,000	4%
1,000+ ha	45	2%	177,000	58%
Total	2,206	100%	304,000	100%

Source: Carver et al., 2017

The price increase in timber products prompted forest landowners to massively plant new forest areas between 1993 and 1996. In consequence, even if most of the new pre-1989 forest areas (planted after 2008) are registered in the NZ ETS, the most significant part of this area is forest planted before 2004 (Carver et al. 2017). It is hard to determine wether the NZ ETS had a material impact on pre-1990 deforestation and post-1989 afforestation. Previous empirical observations have shown that carbon pricing had a minimal impact on afforestation (Manley 2016). However, the carbon price is strongly affected by the volatility of the international market. In 2014, the price decreased by USD 3 but in 2015 the price of national units increased and has remained stable between USD 12 and 15 since 2018 (Leining and Kerr 2018).

At first, timber producers’ participation in the NZ ETS was driven by a business-as-usual strategy. The recent evolution of the national carbon price encouraged registration of new forest areas (David Rhodes, personal communication 2020). Figure 8 shows the evolution of units surrendered for deforestation, harvesting, or deregistration of post-1989 areas and units earned by post -1989 forestry. The effect of the carbon price on deforestation and harvesting is strong. However, the effect on removing activities is not immediate, probably due to the phenological stage of registered forest.

Nevertheless, there is an increase in post-1989 forest areas registered from 277,212 hectares in 2014 to 324,819 hectares in 2018 (Environmental Protection Authority 2015, Environmental Protection Authority 2019). Planting of forests in New Zealand is not regular. The average new forest area planted was 100,000 hectares per year as of 1990. At present, it is around 15,000 hectares (Steven Cox, personal communication 2020). Experts are expecting a wave of harvesting in 2020, followed by a considerable increase in planting.

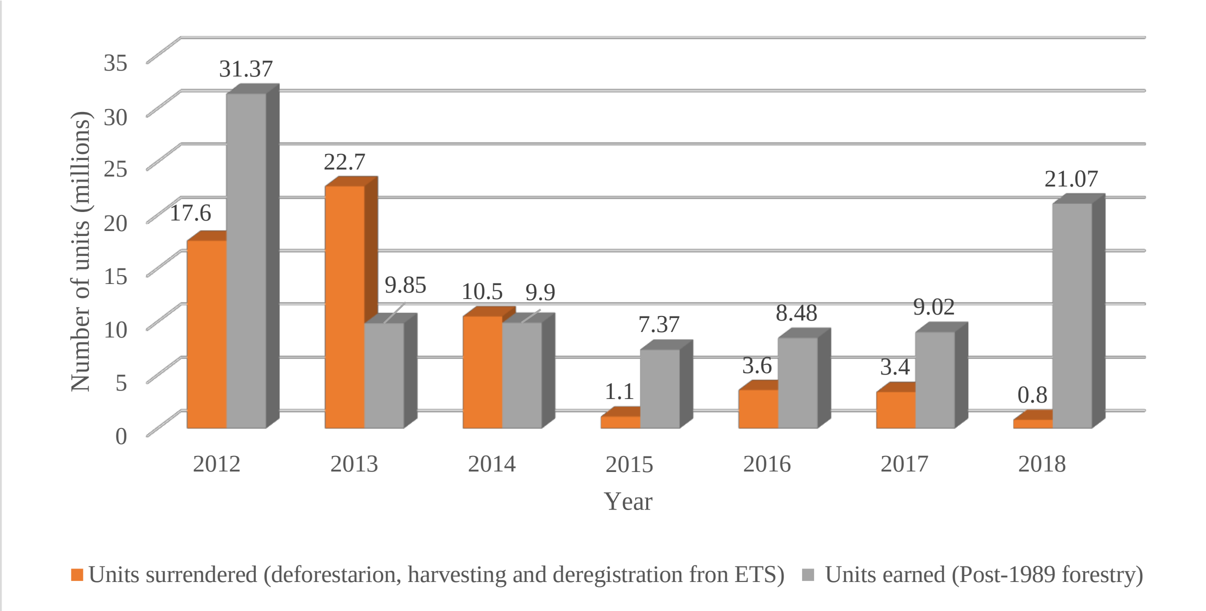

Figure 7. Units earned and surrendered from forestry (millions)

Source: Environmental Protection Authority, 2019b

III. FOREST AND CLIMATE CHANGE POLICY IN MEXICO

a. Forest in Mexico

Forest area covers 70% of the country (137.9 million hectares), but most of this area is dry forest. Current wooded forest areas in Mexico cover 65.7 million hectares, consisting of 52% of temperate forest, 45.7% tropical rainforest, and 1.4% mangrove (CONAFOR 2019). Deforestation in Mexico has been irregular. In the most recent decades, the deforestation rate decreased from 0.52% (1990-2000) to 0.10% (2010-2015) (Camara de Diputados and CEDRSSA 2019). The target under the Paris Agreement (Nationally Determined Contribution) is to reach a rate of 0% by the year 2030 (Gobierno de la Republica 2015). Deforestation varies from one type of forest to another. Most of the deforestation occurs in rainforest areas and is caused by land-use change for pastures, while dry forest areas have tended to increase in the most recent decades (Bonilla-Moheno and Aide 2020). At the national scale, land-use cover/change, and forestry (LULUCF) is the source of 4,9% of total GHG emissions (Ranero and Covaleda 2018).

Common property is dominant in the country (51% of Mexican territory) and is the result of numerous agrarian reforms in the twentieth century, which impacted forestry management (Bray et al. 2006). However, most of the forest areas are under private ownership (50%), while 45% are under communal ownership and 5% state-owned (Reyes et al. 2012). Timber production is mostly carried out in common properties. 4.4 million hectares of forest with logging activity is under communal ownership and 1.1 million hectares under private ownership (CONAFOR 2019). The National Forest Commission also supports 220,000 hectares of commercial planting in the country.

At the national scale, forestry is a weak activity (0.23% of the gross domestic product in 2016), and imports of timber products are five times higher than exports. However, forestry has an essential social value in the country since the sector produces 166,664 jobs (CONAFOR 2019). Forest areas are an essential resource mainly for a large part of the population who depend on non-timber forest products for their livelihood.

Mexico had a purely productive vision of its forest until 1980 when it started to convert its national forest strategy into a sustainable logging and ecosystem conservation plan. In 2001, the country started a centralized plan for restoration and conservation of forests, support of timber and non-timber products for commercial purposes and livelihood through the creation of the National Forest Commission (CONAFOR 2001). Forest landowners (individuals and communities) can receive training, technical support, and subsidies from CONAFOR either for productive activities or conservation and restoration.

The iconic program is the payment for environmental services (PSA) program. This program was launched in 2003 with the goal of preserving hydrological services from forest funded with a fiscal instrument controlling water consumption, and payments are based on the opportunity cost of land (Muñoz-Piña et al. 2008). The payment can vary according to the region and the type of forest. Currently, the maximum amount is around USD50 per hectare per year. The payment must fund technical support, which is compulsory in any CONAFOR program and restoration, reforestation, or conservation. The community can use the rest of the money for collective projects or investments (CONAFOR 2020). The PSA program supported 13,200 participants between 2003 and 2019, with total payments of USD 725 million (CONAFOR 2019). However, one of the limitations is budget availability. Figure 9 shows that the budget allocated decreased from USD 242 million in 2016 to USD 101 million in 2019.

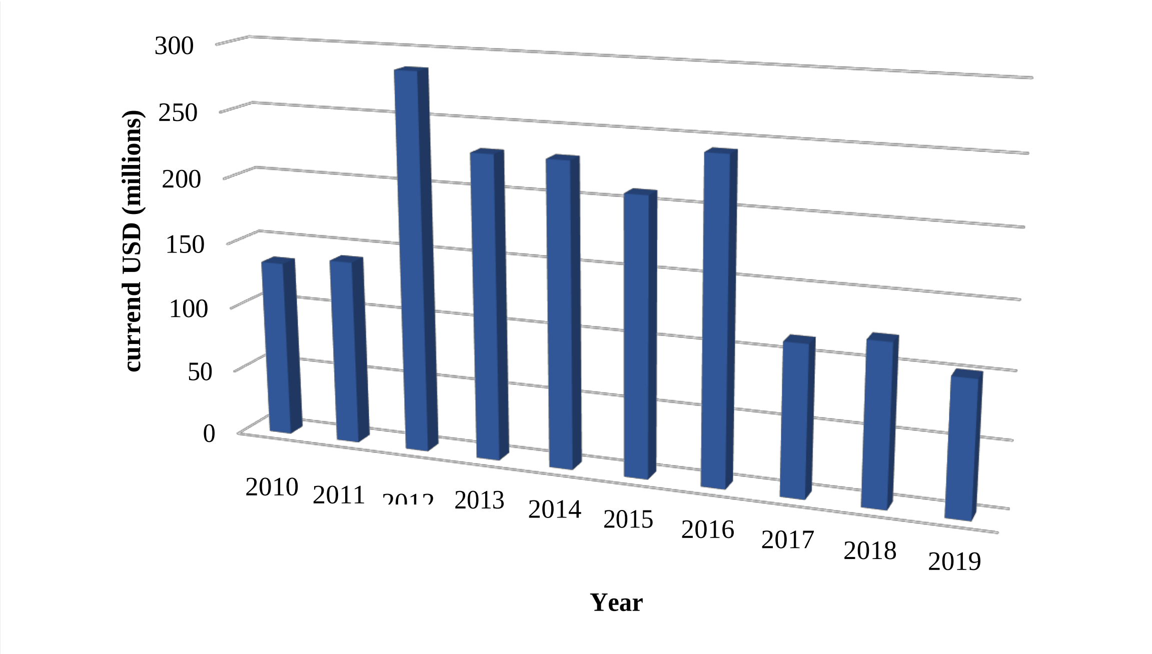

Figure 8. Budget allocated to PSA program from 2010 to 2019 (current US dollars)

Source: CONAFOR, 2020

b. Forest carbon policy in Mexico

Mexico began hosting forest carbon projects soon after the Kyoto Protocol through the voluntary carbon market and REDD+ program (Reducing Emissions from Deforestation and forest Degradation). Although Mexico is the second greatest recipient for Clean Development

Mechanism (CDM) projects in Latin America and the fifth in the world, the country never hosted any forest carbon project under this scheme (MEXICO2 et al. 2018, Ranero and Covaleda 2018). The limitation in the EU-ETS to accept CDM offsetting only from Least Developed Countries (LDC) and the collapse of the price of Kyoto units after 2012 limited the opportunity for new CDM. Afforestation and reforestation (A/R) projects had not been successful under the CDM scheme because of methodological limits to unit accounting, the long-term process to generate units, and the compliance conditions to preserve carbon storage. While forest carbon projects are almost absent in the CDM, they covered up to 35% of the credits offset in the voluntary carbon market between 2009 and 2016 (Ranero and Covaleda 2018). In Mexico, there have been forest carbon projects for the voluntary carbon market. Environmental organizations work with local communities and sell carbon units to private companies that want to offset their emissions certified under international standards (Rontard et al. 2020). Table 2 shows the projects in Mexico currently in force.

The Scolel’te project implemented in 1997 in the southern state of Chiapas involves 1,200 participants from 90 communities throughout the state covering 7,660 hectares. The Cooperativa Ambio organization launched the project and worked directly with the forest landowners. Participants are individuals, members of the communities, even if the forest area is officially communal property. They can harvest trees for logging activities without authorization from the Ministry of Environment (SEMARNAT), which provides them additional income if they respect the 25 years of commitment with Scolel’te.

The organization ICICO A.C. has been very active in setting up forest carbon projects in the last decade. Today, they manage four projects in three different states, and they are the first to develop a forest carbon project with the Climate Action Reserve standard (CAR). Unlike Cooperativa Ambio, they work with communities as a whole.

The government supports actions to encourage carbon storage in the forest through the ENAREDD+ political framework. Since 2010, the Mexican government has been working on the strategy to develop a REDD+ program across the country (Comisión Intersecretarial de Cambio Climático 2017). ENAREDD+ seems to be the principal instrument used to meet Mexico's climate change targets in the forest sector. In REDD+ programs, national governments are recipients of payments from other countries. The conditions to be met before starting the program are very strong. After ten years of national strategy design, Mexico has not launched and is still working on the funding scheme.

IV. INTEGRATION OF FORESTRY INTO THE MEXICAN ETS

The government has not made plans to include the forest sector in the Mexican ETS to date. However, integration of the forest sector has the potential to contribute to climate change targets and support rural communities. Mexico has favorable points to develop a policy scheme like the NZ ETS. In this part, we present the strengths and weaknesses in the Mexican context to integrate forestry in the SCE and the potential impacts (positive and negative) that it would induce.

a. Strengths in the Mexican scheme

The NZ ETS has done consistent regulatory work in the Climate Change Response (Emissions Trading) Amendment Act and has efficient public organizations such as the Ministry for Primary Industries, Ministry for the Environment, and Environmental Protection Authority. Mexico has gained experience in forest and ecosystem services policy. This experience through the years has enabled institutions and governmental organizations to develop their abilities to develop cross-sectoral policy on the national scale, such as the SCE.

Mexico was the first of the developing countries to have a regulatory framework to achieve climate change targets through the General Climate Change Act (SEMARNAT 2019). This law launched the creation of the National Emissions Registry (RENE) in 2013. Entities in the energy, industry, transport, agriculture, waste, commerce, or services sector who emit more than 25,000 tCO_2e per year are required to report their emissions in the RENE (Ramirez Bautista et al. 2016). The registry is based on self-reporting from entities following guidelines issued by SEMARNAT. Even if forestry is not included in the RENE, the institution would be able to establish a similar reporting instrument in this sector.

Since its creation in 2001, CONAFOR has showed its ability to manage forestry and ecosystem services. The 17 years of PSA and other forestry programs have strengthened CONAFOR functioning. Therefore, this institution should be able to manage the participation of forest landowners in the SCE as Ministry for Primary Industries does in the NZ ETS. Reporting process failures in New Zealand have been detected due to lack of knowledge about the methodology and liabilities. These failures are mostly due to landowners' mistakes and induce monetary sanctions more expensive than the cost of hiring a forestry consultant (David Rhodes, personal communication 2020).

Many landowners work without any technical support because the state limits interactions with landowners to avoid any influence in their decisions (Ollie Bolton, personal communication 2020). The Ministry for Primary Industries must deal with cases of non-compliance caused by lack of knowledge about the reporting process. The landowners also need support to understand market functioning to avoid losing money in the sale of carbon units. In Mexico, participants in CONAFOR programs must hire a forest technician to support landowners (CONAFOR 2020). The institution could teach landowners about program functioning. CONAFOR knowhow and ability to train forest landowners could be a definite advantage in the integration of forestry into the SCE.

The experience from the forest carbon project in the voluntary carbon market must be considered too. Indeed, although these projects were developed without the participation of government institutions, they showed the ability of Mexican forest landowners to participate in carbon sequestration. These experiences also demonstrate the socioeconomic impact of carbon forestry on local communities. These internationally certified projects have robust technical requirements. The Mexican government could take these standards as a point of reference in implementing a methodology for accounting and monitoring the participation of the forest sector in the SCE. Data from these projects could give an estimate of the level of carbon sequestration and support the development of a national protocol (Ranero and Covaleda 2018).

Large forest areas in many communities are an advantage of Mexican land tenure. Fifteen thousand five hundred eighty-four communities in Mexico have more than 200 hectares each. It means an opportunity to avoid the problem that smallholders face in the NZ ETS. When landowners register a small area, it is likely to contain the one unique stand of trees of the same age. Then, at harvesting time, they must surrender units for the totality of their registered area (Fig. 1). For them, the balance between harvest and growth is healthy. Large landowners have a different class and age of trees and compensate the surrendered units by units earned in another part of the land where it has not been harvested. In New Zealand, most of the participants with small areas are strongly exposed to this income volatility. Because of this, the government implemented averaging accountability. In Mexico, most of the communities with large forest areas can manage income stability.

b. Weakness in the Mexican scheme

In the NZ ETS most of the forest landowners are farmers who also do commercial logging, even on a small scale. However, in Mexico, commercial logging is not that common, and only a small portion of the communities with forest area have experience in forest management. Although the CONAFOR provides capacity building and technical support in its programs, the lack of experience in forest management could cause two problems: failures in forest management and difficulty in investing in the first step of participation.

In the NZ ETS, participants have capital when they register their land because they already carry out farming and logging activities. The first income from carbon farming can take time because the land must pass the first report period, and the participant must sell the distributed carbon units in the secondary market. It could be difficult for Mexican rural communities to finance the first investment and wait for the first income without any financial support.

Asymmetric information between stakeholders in the contracts is a problem of trust and uncertainty with commitment and price variation. Mexico is quite vulnerable to this issue, which limits the incentive to trade carbon credits from the forest (Van Kooten 2016). Illegal deforestation would represent a severe difficulty in the enforcement of unit surrendering. In Mexico, the Office for Environmental Protection (PROFEPA) identified 108 areas of illegal forest activity (SEMARNAT 2020). Illegal deforestation and forest degradation are mainly due to land-use change without authorization, illegal commercial logging commonly linked to organized crime, and extraction of non-timber products for livelihood or local commerce. It would be a challenging task to achieve compliance of unit surrendering in these zones where people have carried out extraction activities for a long time, and the law has not been enforced. The NZ ETS experienced ups and downs in the incentive impact of carbon pricing in forest participation according to the variation of the unit price. The incentive impact depends on the cost of carbon farming activity and the potential income from alternative activities. In Mexico, the SCE will start with a total free allocation. The 300 participants will be allocated allowances based on historical emissions, and 5% of the total available units may be sold by auction (MEXICO2 2019). Moreover, no economic sanctions will be enforced in the pilot phase (2020-2022). With this high level of free units and without sanctions for non-compliance, we can assume that the price of carbon units at auctions and in the secondary market will be quite low. A low price would be insufficient to avoid deforestation and to support afforestation and reforestation at the same time. In current carbon pricing mechanisms, the prices are already low. In the voluntary carbon market, units from forest carbon projects are sold at around USD 10 (Leticia Espinosa, personal communication 2017), and the carbon tax for fossil fuel has a rate of USD 2.4/tCO_2e In the NZ ETS, the limit from which the price of carbon units can have a potent incentive effect for forest landowners is at around USD 19 (Ollie Bolton, personal communication 2020).

There are also some political and macroeconomic limits on the integration of forestry into the SCE. In New Zealand, including forestry in the ETS and the international market was an opportunity to support an important sector of the national economy and resulted from political pressure from the forestry sector. In Mexico, forestry has always been an important economic sector, and forest areas were an opportunity to meet the Kyoto Protocol target because it was a positive carbon sink. In international negotiations, Mexico said it would include forestry in the international market. Under the Kyoto Protocol, the forest units were given to the government. However, the forest landowners pressured the government to receive these units. The forestry sector, through the FOA, put intense lobbying pressure on the government to include them in the NZ ETS (David Rhodes, personal communication 2020). In Mexico, the situation is different, and there is no political or economic interest in including forestry in the SCE. The forestry sector does not have any strong political influence in the country because it is not an important economic sector. The share of forest products in the GDP is shallow (0.23% in 2016), and the level of imports in the forestry sector is five times the level of exports (CONAFOR 2019).

c. Potential impacts

Environmental impacts

The motivation to integrate forestry into the ETS is obviously to improve the level of carbon storage at the national scale. This would support achievement of the forestry target in Mexico's climate change commitment. Moreover, the potential increase in forest area would support mitigation of Mexico's emissions and meet the country's NDC. There is severe environmental additionality in the distribution of carbon units for carbon sequestration in new forest areas. In New Zealand, most of the post-1989 forest participants were already carrying out logging activity, which was their incentive to make new plantations. Participation in the NZ ETS is a new source of income, but these forest areas could probably have been planted without it. In Mexico, besides CONAFOR programs, there is no incentive to reforest or plant new forest. Participation in the SCE by bringing income for new forest areas could be a net influence in the tradeoff between forest and other land uses.

However, the environmental impact of carbon farming can also be harmful. Landowners participating in this activity are motivated to plant species with a high level of carbon sequestration. In New Zealand, *Pinus radiata* was the most commonly planted species because it is fast-growing and cheap to establish and to log. In addition, it achieves a high level of carbon storage in a short time compared to native species. Today, 75% of the forest areas registered in the NZ ETS are planted with this specie (Carver and Kerr 2017). However, native forests are essential because they are adapted to the local environment. These forests can provide more ecosystem services than carbon sequestration.

Native forests are composed of a high diversity of species and represent an essential habitat for other animal and plant species. Non-timber products from the native forest are also an essential resource for the livelihood of local populations in Mexico (Delgado et al. 2016). Moreover, the biodiversity of native species is vital for soil stability and water quality. Native forests have social and cultural value. For the local population, there is recreational interest in their conservation, and these forests can have spiritual value for indigenous people. The risk of encouraging planting for carbon sequestration is the substitution of native forests by more productive species.

Economic impact

One of the first motivations for deforestation in Mexico is land-use change because communities do not earn income from their forests. Payment in the PSA program has been set according to the opportunity cost of forest areas (Muñoz-Piña et al. 2008). With time, livelihood support became more of a target than a positive externality of PES programs, and the marginalized population has been more likely to participate (Liu and Kontoleon 2018). The PSA has a small impact on poverty alleviation (Sims and Alix-Garcia 2017) because the payment is quite low, and forest conservation or planting has a high cost. There is also a limited number of recipients. The public budget limits the program, and available funds have been decreasing sharply.

In forest carbon projects, the income from the sale of carbon units would be enough to fund the projects and remunerate people working on them. However, it is still not enough to generate a sustainable income for the whole participating communities. The advantage of the integration of forestry into the SCE is that the income would not depend on the public budget. As long as the unit sellers find buyers in the market, they will receive an income. In a way, it is a mechanism to collect private funding to support forest conservation and reforestation. In this scheme, the landowners must meet conditions to participate, but there is no limitation in the number of participants or forest area.

The income that participants will receive from the secondary market is exposed to price volatility. In the NZ ETS, unit price was quite unstable before 2015 because of variation in the price of international units (Leining and Kerr 2018). This volatility has been reflected in the participation of post-1989 forest and the deforestation of pre-1990 forest (Carver et al. 2017). The government tackled this problem by delinking domestic ETS from the international carbon market. In Mexico, it would be necessary to have amechanism to ensure income stability for forestry participants.

In the operation of the ETS, the government receives income when selling units through auctions, so distributing units to forest landowners for carbon sequestration can also have an impact on public revenue. The level of income from auction is proportional to the demand for carbon units. This income also depends on the proportion of free allocation, but this portion is decided by the government. If we assume the integration of forestry with more units distributed for carbon sequestration than units surrendered for carbon released, it will induce a larger supply of units in the secondary market, which will reduce the price and consequently the public revenue from auctions.

Conflicts

Carbon farming is an alternative economic activity and land use. Focusing on this activity means another activity is foregone. In New Zealand, a conflict grew between forestry and farmers. Farming is the largest economic activity in the country, and it also has a strong political lobby. The farmers' organization, 50 Shades of Green, has been struggling against the impact of the NZ ETS on land use change. Farmers criticized investors buying farmland to convert into intensive forest plantations (Chalmers 2019). Foresters claim they have the right to plant forests to participate in climate change mitigation. However, the farmers highlight the economic loss to agriculture and the ecological impact of intensive forest plantation. The government must find a compromis between the first and third economic sectors.

In the Mexican voluntary carbon market, the forest carbon project created internal conflicts among the participant communities. In the Scolel'té program, conflicts rose between participants and non-participants because of the difference in land-use practices and the benefit they could obtain. In fact, the participants can legally harvest their forest for commercial use after the commitment period (25 years). This practice generally requires harvesting authorization. Non-participants felt it unfair that other members in the same community could have more access to natural resources (Osborne 2015). However, this is specific to this program, where participants are individuals instead of whole communities. In communities with collective decision making about land use and participation in forest carbon projects, this kind of conflict has not been detected (Rontard et al. 2020).

V. CONCLUSION

The NZ-ETS model is unique because of the importance of the forestry sector in the economy of New Zealand. Nevertheless, the scheme is still far from perfect and needs further improvement. Mexico has the potential of its forest resources, the experience of existing institutions in forest management, and emissions registration, meaning that the country could be ready for the integration of forestry into the SCE. The forest carbon projects developed under the voluntary carbon market can be considered as a laboratory for their extension to the national scale. However, Mexican forest landowners are mostly communities with fragile technical knowledge about forest management.

The forestry sector does not have the same political influence in the two countries. Unlike New Zealand, forestry is not an essential economic sector in Mexico. New Zealand has developed a standardized system to account for carbon storage. Mexico has not achieved this step yet. This can explain why Mexico did not consider the inclusion of forestry in the SCE yet. The environmental effect will be helpful if the negative impacts of intensive carbon forestry are controlled. In the economic aspect, there is high interest in the communities benefitting from a new source of income, even if this resource would be exposed to market price volatility. Integrating forestry into the SCE induces that emissions avoided, and carbon sequestered are comparable and that units from allowances to the industry and units from carbon forestry are similar economic products. This is arguable regarding the difference in price incentives between forestry and other sectors in the NZ-ETS. Integrating emissions avoided and carbon sequestered into the same market is a political choice, as is the use of an economic instrument to control environmental impacts.

Mexico has the potential to successfully enforce the integration of forestry into the SCE. Nevertheless, this task will need strong technical support from CONAFOR to forest landowners, and significant investment for monitoring and verification. Finally, the integration of forestry in the NZ-ETS is the result of sociopolitical discussion among the government, farmers, and forest landowners. In Mexico, it would be essential to establish a democratic process with the forestry sector and discuss its integration into the SCE with forest landowners and forestry organizations in the country.

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CHAPTER 6: FREE ALLOCATION AND TRANSITION

I. INTRODUCTION

Mexico finally launched the ETS pilot after years of discussion and preliminary phases. Before starting the pilot program in 2020, SEMARNAT conducted a public consultation and presented in October 2019 the functioning rules, which include the scope, existence, and use of reserves, allocation process, MRV process, compliance cycle, and the existence of flexibility instruments (offsets and early action credits). The Consultative Committee has been created in 2020 to reflect the stakeholder engagement process initiated between SEMARNAT and the private sector to develop the ETS pilot rules. The pilot program is planned for two years, and after a transition year, the ETS should start its regular functioning in 2023.

The type of allocation of carbon units is a critical feature in the efficiency of an ETS. Indeed, this will determine the burden for industries and the impact on emission reduction. It is essential to balance these two points to achieve the environmental target without disrupting the national industry.

For firms producing emissions-intensive outputs, emissions pricing causes an immediate increase in production costs that can affect asset values, profitability, market share, and workers, with flow-on effects for the local and national economy (PMR & ICAP, 2016). While these changes may be a constructive and necessary part of the low-emission transition, their impacts – and firms, workers, and communities' ability to adapt to those impacts – may be unevenly distributed. Free allocation is an asset that can be used to alter the distribution of the impacts of emissions pricing. Given the value of units in the trading market, providing free allocation is analogous to handing cash to participants.

How free allocation should be designed and where it should be targeted depending on the core rationale(s) for providing free allocation, such as:

1. Preventing carbon leakage
2. Safeguarding economic competitiveness
3. Avoiding stranded assets
4. Enabling a smooth low-emission transition for businesses and communities.

Additional policy considerations when designing free allocation include managing fiscal implications of freely allocating versus auctioning units, preserving incentives for producers and consumers to reduce emissions in line with targets, appropriately recognizing early action to reduce emissions, and deciding who receives free allocation and on what basis (PMR & ICAP, 2016; SEMARNAT & GIZ, 2018).

The issue of preserving incentives for mitigation is particularly important. Producers with unit obligations who receive free allocation still have an incentive to reduce emissions because they face an opportunity cost from using the units for compliance rather than reducing their emissions and selling the surplus units in the market. Whether producers bear a direct cost or opportunity cost from surrendering units to meet an ETS obligation, they have an incentive to reduce that cost where possible, improving their competitiveness, and pass that cost to their customers where possible, incentivizing demand-side emission reductions. Producers without unit obligations who receive free allocation as a form of compensation still have an incentive to reduce the consumption of emissions-intensive goods and services carrying an embodied emissions price and invest the revenue from selling units.

The methods for distributing free allocation can affect both the average and marginal costs imposed on producers by an ETS, with flow-on effects for decisions on output and investment. Importantly, while free allocation does not remove the incentive for producers and consumers to reduce emissions in relation to a particular product or service, for example by increasing production efficiency, it can distort incentives to substitute toward low-emission alternatives that face the full price of emissions (Acworth et al., 2020).The outcomes sought by providing free allocation can also be achieved in other ways, such as government decisions on the ambition of ETS unit supply and price management settings, the strategic application of ETS auction revenue, border carbon adjustments and consumption charges, and complementary economic, labour, and social policies that support firms, workers, and communities.

II. CARBON LEAKAGE

Issues relating to safeguarding competitiveness, avoiding stranded assets, and enabling a smooth transition could arise with any form of environmental, economic, or social regulation affecting New Zealand producers (e.g. addressing worker health and safety, child labor, toxic discharges to the environment, consumer protection, etc.). In contrast, the issue of carbon leakage is a consideration unique to climate change mitigation policy.

One group of ETS market participants potentially subject to disproportionate impacts from emissions pricing consists of emissions-intensive producers exposed to import or export trade competition from jurisdictions with weaker emissions pricing or regulation. Whereas other types of producers have the option to pass on the cost of emissions to their customers, emissions-intensive and trade-exposed (EITE) producers may not be able to do so and remain competitive. If they cannot transition to less emissions-intensive production or absorb the rising cost of emissions, they may be forced to reduce or cease production which, for a given level of demand, is then displaced to other jurisdictions with weaker emissions pricing or regulation. As well as causing local economic and employment effects, this displacement of production has the potential to shift emissions to other jurisdictions. This outcome is referred to as "carbon leakage."

For a given level of output, if the emissions intensity of production in the recipient jurisdiction is higher than in the regulated jurisdiction, shifting production will increase global emissions. If the emissions intensity is the same in both jurisdictions, global emissions will not change. If the emissions intensity in the recipient jurisdiction is relatively lower, there will be a global emissions benefit from shifting production.

However, a further consideration is whether the recipient jurisdiction is bound to compensate for any emissions increase under an emissions reduction target or cap. For example, if cement production and emissions shift to a jurisdiction with weaker emission pricing or regulation for cement, but that jurisdiction has an economy-wide target which compels it to reduce emissions elsewhere in the economy, then global emissions will not increase as a result of production leakage.

The boundaries for assessing carbon leakage impacts can extend beyond the product itself. For example, carbon leakage can also result from increased international transportation required to meet domestic demand for products that are no longer produced locally. Further climate change impacts can be generated from decommissioning plant and infrastructure and losing the value of their embodied emissions. Reduced fossil fuel demand in jurisdictions with more stringent targets can lower fossil fuel prices and lead to higher consumption of fossil fuels elsewhere (Acworth et al., 2020)

There can also be broader environmental and social impacts from production leakage if the recipient jurisdiction's standards are below the domestic standards. Industrial production can impact on ecosystem services (e.g., soil and water quality, landscape, and biodiversity). If relocating production implied increasing capacity of production in other jurisdictions, and the ecosystem impacts of production capacity in the regulated jurisdiction were irreversible, then the relocation would induce a net impact on ecosystem services at a global scale.

Given the number of factors that contribute to production outcomes, it can be challenging empirically to assess potential and actual carbon leakage. In ex ante studies, carbon leakage has been estimated with general equilibrium or partial equilibrium modelling approaches. To date, several ex ante studies have focused on the EU ETS and showed potential risk for carbon leakage (Acworth et al., 2020; PMR, 2015). For example, (Fowlie et al., 2016) estimated the impact of emission pricing on carbon leakage by modelling the responsiveness of trade flow to energy price in California from empirical data. The results show potential leakage risk, mostly for industries classified under high leakage risk in the California Cap-and-Trade Program. Empirical ex post studies on the topic have mostly focused on the EU ETS and concluded that there is no evidence to date of carbon leakage (PMR, 2015). However, the empirical data used covered the early years of the EU ETS when free allocation was at 100 per cent for entities. Recent studies in China show the absence of evidence of carbon leakage risk (Fan et al., 2019). However, most of Chinese ETS pilots provide 100 per cent free allocation of units. International literature reviews of ex post analysis to date suggest that existing emissions pricing models have reduced the level of emissions without impacting the economic performance of business (Acworth et al., 2020; Ministry for the Environment, 2018). Given data limitations as well as the relatively low levels of emissions prices and short operational periods for emissions trading systems to date, these conclusions may not be definitive – or indicative of a future with higher emissions prices and lower levels of free allocation (Acworth et al., 2020).

Another interesting consideration is the potential for investment leakage as a result of emissions pricing. In one example, Koch and Basse Mama (2019) estimated the impact of the EU ETS on investment leakageforeign direct investment to non-EU ETS countries between 2005 and 2013 within German firms. The study indicated that emissions pricing generally had not resulted incaused significant investment leakageimpact among the total sample. They found evidence of investment leakage involving firms infor less capital-intensive industries for which it is easier to relocate productionof the impact of emissions pricing on foreign direct investment. But these firms neither operate in the targeted energy-intensive sectors, nor are they emission-intensive (Koch and Basse Mama, 2019).

III. METHODOLOGIES FOR FREE ALLOCATION

Free allocation typically involves a choice among three different methodologies: grandparenting, an output-based approach with infrequent updating, and an output-based approach with frequent updating. Under grandparenting, the regulator distributes units to eligible entities on the basis of historical emissions (generally a percentage of the average absolute emissions over a specified period). Output-based approaches use a benchmark factor to estimate the emissions intensity of the outputs produced by the firms. The benchmark is typically derived from recent historical performance or best practice. Units are allocated according to this emissions intensity and the level of output. In the case of infrequent updating, the regulator allocates units on the basis of a fixed level of output in a prior year or average over a prior period. In the case of frequent updating, the allocation is based on the actual level of output in the current year. Generally, under an updating model, the firms receive a provisional allocation according to the level of output in the previous year, and this is adjusted as needed when actual annual output has been reported.

Table 10 compares auctioning with the three free allocation methodologies according to the impact on potential policy objectives whose relative priorities may vary across jurisdictions. Some key points of comparison are:

- Under grandparenting, producers receive a fixed amount of free allocation and face a full emission price on marginal increases in production, whereas under output-based approaches the amount of free allocation increases as output increases and producers face a fraction of the emissions price at the margin. Output-based approaches with frequent updating operate like an output subsidy which incentivises improvements in emissions intensity but not reductions in absolute emissions. For this reason, they are generally considered the most effective option for preventing carbon leakage.

- Grandparenting can offer relatively greater predictability about the volume of free allocation than output-based approaches. While this can help with managing target compliance, it can also be counterproductive for targets if firms that significantly reduce or cease production continue to receive free allocation at historical levels. This can be managed through closure rules. Under output-based approaches with frequent updating, the volume of free allocation fluctuates with actual production. To support targets, some systems have applied cap adjustment factors to constrain output-based free allocation in line with declining emissions trajectories.
- In the case of both grandparenting and output-based approaches with fixed output or historically based benchmarks, producers that have taken early action to reduce emissions or output may be disadvantaged relative to those that have not. This can be addressed by using methodologies applying industry-average or best-practice benchmarks. For output-based approaches, frequent updating of benchmarks based on recent industry performance can disincentivise efficiency improvements by producers.

Table 10. Strengths and weaknesses of different allocation methods

	Auctioning	**Free allocation**		
		Grandparenting	Output-based approach with infrequent updating of output	Output-based approach with frequent updating of output
Managing transition	--	+	+	+
Avoiding carbon leakage	--	+	+	++
Optimizing public revenue	++	--	--	--
Achieving emissions targets	++	+	+	-
Rewarding early actions	++	--	+	++
Minimizing political inputs	++	-	--	--

Source: Adapted from (PMT &ICAP, 2016; SEMARNAT & GIZ, 2018).

In Mexican ETS pilot phase, every participating entity will receive free allowances with grandparenting method. The reference year is the year the entity first achieved 100,000 tCO_2. There is an ex-post mechanism of adjustment for entities that emitted more than the corresponding free allowances received. This mechanism will use a reserve corresponding to 5% of the total cap that will be assigned by auctions. However, there is no indication for the case where exceeding emissions surpass this reserve (ICAP, 2020).

IV. INTERNATIONAL EXPERIENCE WITH FREE ALLOCATION

a. European Union Emissions Trade System (EU ETS)

The EU ETS started in 2005 with around 11,000 installations in the energy and industrial sectors and covered 45% of the EU's total greenhouse gas emissions (European Commission, 2019a). The program is now in its third phase (2013-2020) and operates with a cap reduction rate of

1.74% per year. The EU ETS works with two kinds of unit allocation: auctioning and free allocation (European Commission, 2015). Only direct emissions by entities with obligations to surrender allowances are eligible for free allocation.

Each year, all obligated entities receive a percentage of free allocation and must purchase the other part by auction, with the exception of electricity producers which have to purchase the totality of their allowances at auction.[5] For non-EITE participants, 80% of units were freely allocated in 2013 with a phase-down to 30% in 2020 (Table 11). EITE participants receive 100 percent free allocation plus financial compensation for the increase in electricity prices induced by the EU ETS. The EU ETS maintains a New Entrant Reserve in each phase, making units available for free allocation to installations that are new or significantly increase their capacity.

Table 11. Assistance factor for non-EITE industrial sectors

Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
AF for non-EITE sectors	80%	72.9%	65.7%	58.6%	51.4%	44.2%	37.1%	30%

Source:(European Commission, 2015)

All entities receive their free allocation based on the following equation (European Commission, 2015):

FA = O x Bm x AF x CSCF

Where:

O = Quantity of output for one fixed year (2005-2008 median or 2009-2010 median)

Bm = Benchmark factor

AF = Assistance factor (80% in 2013 decreasing each year to 30 per cent in 2020 for non-EITE participants / 100 per cent for EITE participants/ 0 per cent for electricity generators)

[5] In Phase III, an exception has applied for eligible Member States which have received transitional free allocation to assist with modernisation of their electricity sector (European Commission, 2015).

CSCF = Cross-sectoral correction factor

The output basis for allocation in the EU ETS is not updated and is set according to output in 2005-2008 or 2009-2010 (historical output). To link the current output with the output basis, four categories of allocation are used (PMR & ICAP, 2016):

Table 12. Output basis adjustment in the EU ETS

Current output compared to the historical output	Output basis compared to the historical output
Less than 10%	0% (no free allocation)
Between 10% and 25%	25%
Between 25% and 50%	50%
More than 50%	100%

Source:(PMR & ICAP, 2016)

Benchmark factors are calculated from the average direct emissions per unit of output of the 10 per cent most efficient entities of each sector. Regulators have developed 52 specific product-based benchmarks (European Commission, 2019b). For the products without specific product-based benchmarks, free allocation is based on an energy-based benchmark estimated from heat production or fuel consumption. Unlike the allocative baseline in the NZ ETS, benchmark factors in the EU ETS only cover direct emissions since indirect emissions are not eligible for free allocation.

The CSCF is a coefficient that ensures that the amount of free allowances for industrial entities does not exceed the limit set for Phase III. It is calculated by comparing the sum of the preliminary total annual amount of free allocation submitted by Member States to the limit. For electricity generators, a linear reduction factor (LRF) is used that exactly corresponds to the decreasing cap rate of 1.74 per cent for Phase III (Table 12).

Table 13. Cross-sectoral correction factor and linear reduction factor for Phase III of the EU ETS

Year	2013	2014	2015	2016	2017	2018	2019	2020
LRF	1	0.9826	0.9652	0.9478	0.9304	0.913	0.8956	0.8782
CSCF	0.9427	0.9263	0.9098	0.893	0.8761	0.859	0.8417	0.8244

Source: European Commission, 2015)

The assistance factor reflects carbon leakage risk in a sector of production and is estimated by assessing trade exposure (the non-EU trade intensity) and the change in production cost due to the EU ETS (accounting for direct and indirect costs as a per centage of total Gross Value Added).

Trade exposure is calculated using the following equation (European Commission, 2015):

TE= (Extra-EU ETS exports + Extra-EU ETS imports) /

(EU ETS production + Extra-EU ETS imports)

The change in production cost due to the ETS is calculated using the following equation (European Commission, 2015):

ETS cost = (Direct emissions x auctioning factor + indirect emissions) x CO_2eq price /

GVA

Where:

Direct emissions = emissions of the sector in 2012

Auctioning factor = 80 per cent in 2013 decreasing to 30 per cent in 2020

Indirect emissions = electricity consumption x emission factor (EF = 0.465tCO_2-e/MWh)

CO_2 price= estimated at €30 as an average for the 2013-2019 period

GVA= Gross Value Added

From these two variables, a quantitative assessment is used to determine carbon leakage risk for the sector. Any of the three criteria can be used to confirm carbon leakage risk as follows:

- The ETS cost is at least 5 per cent of the GVA and the sector's non-EU trade intensity is above 10 per cent.
- The ETS cost is at least 30 per cent of the GVA.
- The sector's non-EU trade intensity is above 30 per cent.

A qualitative assessment is conducted if a sector is close to the quantitative threshold but does not reach it. The European Commission applies three criteria:

- The extent to which it is possible for installations in the sector to reduce their GHG emissions or electricity consumption through additional investment
- The current and projected market characteristics of the sector, such as the market concentration, homogeneity of the product, competitive position relative to non-EU producers and bargaining power of the sector in the value chain
- Profit margins of the sector as an indicator of the ability to absorb costs and long-run investment or relocation decisions.

A first list of sectors and subsectors at significant risk of carbon leakage (referred to as the "carbon leakage list") was determined for the years 2013 and 2014 and a second for the rest of Phase III (2015-2020). The carbon leakage list for Phase IV (2021-2030) was adopted in February 2019 (European Commission, 2019c).

The EU ETS also includes an assistance scheme for industries facing a cost increase due to electricity price (indirect emissions cost). This monetary assistance is provided directly through Member State aid. Whereas each member state is free to decide about giving this assistance and its level, the European Commission sets the eligibility criteria and the equation for aid allocation. A sector is eligible to financial compensation if the indirect emissions cost is at least 5 per cent of the GVA and the sector's non-EU trade intensity is above 10 per cent, or if it meets all of the following criteria:

- The indirect emissions cost is at least 2.5 per cent of the GVA
- The sector's non-EU trade intensity is at least 25 per cent and there is evidence the sector cannot pass on the cost of indirect emissions
- Benchmarking showed fuel and electricity substitutability for at least part of the sector.

The European Commission published guidelines with the 15 eligible sectors for financial assistance (which also are eligible for free allocation) and the methodology for aid allocation. The maximum level of financial assistance a Member State can provide is set by the following equation (European Commission, 2012):

$$\mathbf{Amax_t = Ai_t \times C_t \times P_{t-1} \times E \times BO}$$

Where:

$\mathbf{Ai_t}$ = The maximum aid intensity allowed by the EU ETS for the current year[6]

$\mathbf{C_t}$ = The electricity emission factor specific to different areas reflecting the local energy mix at the current year

P = The allowance price in the previous year

E = The product-specific electricity consumption efficiency benchmark

BO = Baseline output

As is the case for free allocation, the output basis for monetary assistance is not updated.

[6] Its level has decreased during Phase III of the EU-ETS from 85 per cent between 2013 and 2015 to 80 per cent between 2016 and 2018 and 75 per cent in 2019 and 2020.

Phase IV (2021-2030) of the EU-ETS will introduce some changes to free allocation but keep the same measures to avoid carbon leakage (European Commission, 2019d). The annual cap reduction rate will increase to 2.2 per cent. The auctioning factor will continue to be phased down and reach 0 per cent in 2026. Sectors at risk of carbon leakage will continue to receive 100 per cent free allocation and financial compensation for the cost of indirect emissions. The list of eligible sectors (published in 2019 as noted above) will be updated during the decade. Two updates are also scheduled for benchmark values. Finally, the free allocation system will be based on annually updated output values instead of the fixed values previously used. The EU ETS is budgeting 6 billion units of free allocation for the ten years coved by Phase IV compared to 6.5 billion units for the eight years covered by Phase III (European Commission, 2019d).

b. California Cap-and-Trade Program

The California Air Resources Board (CARB) began compliance obligations under the Cap-and-Trade Program in 2013. The program is in its third phase (2018-2020) and covers around 80 per cent of California's GHG emissions (ICAP, 2019). More than 500 entities are liable to surrender allowances. The system covers large industrial processes, electricity generation, electricity imports, other stationary combustion, natural gas suppliers and other liquid fuels suppliers. During Phase III, the cap is decreasing by 3.3 per cent each year and allowances are allocated through a mix of auctioning and free allocation.

There are two kinds of free allocation. First, industrial facilities receive free allocation as support to prevent carbon leakage. Second, electricity distributors and natural gas suppliers receive free allocation on behalf of ratepayers. These installations must sell their freely allocated allowances in the auctioning platform and use this income to benefit the ratepayers.

The industrial free allocation scheme is based on a carbon leakage risk assessment using the following equation (California Air Resources Board, 2019):

$$\mathbf{FA_t = O_{t-2} \times Bm \times AF \times C_t}$$

Where:

$\mathbf{O_{t-2}}$ = Quantity of output in the year t-2 (the quantity of free allowances is adjusted when the actual quantity of output is known)

Bm = Benchmark factor

AF = Assistance factor

$\mathbf{C_t}$ = Cap adjustment factor

The benchmark factor is a sector-specific benchmark. The program applies 32 product-based benchmarks (California Air Resources Board, 2019). When a product eligible for free allocation does not correspond to a specific product-based benchmark, an energy-based benchmark applies. This factor corresponds to 90 per cent of the average emissions by the sector. However, if 90 per cent of the sector average is more stringent than any facility in the sector, the benchmark factor is set according to the “best-in-class” value (the emission intensity of the most efficient facility). Like the allocative baseline in the NZ ETS free allocation equation, the benchmark factor accounts for both direct and indirect emissions. Standard emission factors apply for heat consumption (0.0663tCO_2/MMBtu) and electricity consumption (0.431 tCO_2/MWh) (California Air Resources Board, 2011).

The cap adjustment factor is a coefficient that reflects the cap reduction rate (Table 13). The value is higher for nitrogenous fertilizer manufacturing, cement manufacturing and lime manufacturing, which are activities with over 50 per cent of total emissions from process emissions, a high emissions intensity, and a high leakage risk classification.

Table 14.Cap adjustment factor between 2013 and 2020 in the California Cap-and-Trade Program

Category of activity / Year	2013	2014	2015	2016	2017	2018	2019	2020
Standard activities	0.981	0.963	0.944	0.925	0.907	0.888	0.869	0.851
Highly intensive	0.991	0.981	0.972	0.963	0.953	0.944	0.935	0.925

Source: California Air Resources Board, 2019

Carbon leakage risk is assessed based on trade exposure and emissions intensity. Trade exposure is calculated with the following equation (California Air Resources Board, 2013):

TE= (Exports + Imports) / (Shipments + Imports)

CARB applies three categories of trade exposure:

- **High**: up to 19 per-cent
- **Medium**: between 19 per cent and 10 per cent
- **Low**: under 10 per-cent

Emissions intensity is calculated with the same method as in the NZ ETS:

EI = Metric tonnes CO_2eq / $million value added

CARB established four categories of emissions intensity:

- **High**: up to 5,000 tCO_2eq/$m value added
- **Medium**: between 4,999 and 1,000 tCO_2eq/$m value added
- **Low**: between 999 and 100 tCO_2eq/$m value added
- **Very Low**: under 100 tCO_2eq/$m value added

From these two variables, CARB initially proposed to establish a variable assistance factor (AF) according to carbon leakage risk (Table 14). Ultimately, the legislation applied the same assistance factor (100 per cent) for all categories. The list of sectors at risk of carbon leakage is published in the Regulation for the California Cap on Greenhouse Gas Emissions and Market-

Based Compliance Mechanisms for the current phase (2018-2020) and the forthcoming phase (2021-2030). For the post-2020 period, the Cap-and-Trade Program will continue with 100 per cent free allocation for eligible activities and there is no proposal to update benchmark factors. The most relevant change to come in the next phase is increasing the cap reduction rate to 4.1 per cent per year.

Table 15. Carbon leakage risk categories from the California Resources Board

Leakage Risk	Emission Intensity	Trade Exposure
High	High	High Medium Low
	Medium	High
Medium	Medium	Medium Low
	Low	High Medium
Low	Low	Low
	Very Low	High Medium Low

Source: California Air Resources Board, 2013

c. New Zealand Emission Trading Scheme (NZ ETS)

In the NZ ETS, free allocation is provided to eligible EITE industrial producers to help them manage the cost impacts of the NZ ETS regardless of whether they also hold obligations to surrender units. Most of the free allocation recipients do not have surrender obligations. This reflects a key design feature of the system: for energy-sector emissions, the obligation to surrender units typically applies upstream at the level of fossil fuel suppliers or importers.

However, large fuel users can opt into a direct unit obligation with a corresponding adjustment to the upstream unit obligation. This approach provides comprehensive coverage of emissions while minimizing the administrative burden for both regulators and participants. Under this framework, no free allocation is provided to fossil fuel producers, which can pass on emissions costs. For industrial-process emissions, the unit obligation typically applies directly to emitters, some of which also qualify for free allocation.

Industrial free allocation is awarded in respect of specific eligible activities, rather than firms. Eligibility involves two determinations: trade exposure and emissions intensity. In New Zealand, electricity generation is the only industrial activity considered as not trade-exposed (TE) because generators do not have any foreign competition and can pass on the cost of the ETS in the price of electricity. Emissions intensity (EI) assessment is based on: (a) the direct emissions from non-energy industrial processes and fossil fuel consumption for stationary energy, and (b) indirect emissions from electricity consumption. Free allocation is not awarded in respect of transport emissions.

The determination of indirect electricity emissions is complicated in the NZ ETS. Different methods are used for assessing initial eligibility for free allocation versus calculating the actual amount of free allocation. In the New Zealand electricity market, which currently operates with over 80 per cent renewable generation through an integrated national grid, the electricity price is set by the marginal generator, which commonly uses fossil fuels when demand exceeds renewable supply.

In order to compensate ETS participants for increased electricity prices as a result of emissions pricing, the government applies a marginal – rather than average – grid emission factor based on a modelled projection for fossil generation. For context, in 2018, the average emission intensity for electricity generation across the grid was 0.1 tCO2eq/MWh (MBIE, 2020).

For the purpose of calculating actual free allocation, the Electricity Allocation Factor (EAF) applied to most participants was 0.52 tCO2eq/MWh over 2010-2012 and 0.537 tCO2eq/MWh over 2013-2020. As a result, the number of NZUs issued regarding electricity consumption by free allocation recipients has exceeded the number of NZUs received by the government for the corresponding amount of electricity production. The EAF influences a significant component of the government's unit liability under the NZ ETS; in 2018, electricity use accounted for about one-third of industrial free allocation excluding aluminium smelting (Ministry for the Environment, 2019a).

In contrast, the test to assess eligibility to receive free allocation applies an electricity emission factor of 1 tCO2eq/MWh. For reasons of trans-Tasman competitiveness as discussed above, this value was taken from the industrial free allocation methodology applied in the Australian emissions trading system under development at the time (Australian Department of Climate Change, 2008). This high value reflected the dominance of coal-fired generation in Australia, which was and remains inconsistent with the New Zealand context.

The emissions intensity variable for eligibility to receive free allocation is expressed in tonnes of CO2eq emissions per million dollars of revenue from output sales. The emissions intensity variable is calculated for each industrial activity based on the historical average across the whole industry over a specified period (2006/2007 to 2008/2009 for most firms) and accounts for both direct and indirect emissions. Two eligibility thresholds apply: moderately intensive sectors have an emissions intensity of at least 800 and less than 1,600 tCO2eq/million NZD revenue, and highly intensive sectors have an emissions intensity of at least 1,600 tCO2eq/million NZD revenue. These thresholds were derived from those initially proposed for Australia's CPRS with adjustment for exchange rates but not for the relative emissions intensity of electricity generation in New Zealand (Ministry for the Environment, 2009).

Once eligibility has been determined, the actual amount of free allocation (FA) distributed to a company each year depends on three variables: the quantity of output (O), the allocative baseline (AB), and the assistance factor (AF).

FA = O x AB x AF

Free allocation recipients receive a provisional quantity of units based on the output during the previous year. This amount is adjusted in the subsequent year when the actual production level has been reported. The assistance factor is initially set at 60 per cent for moderately intensive activities and 90 per cent for highly intensive activities. As with assessing eligibility, the emissions intensity variable for providing free allocation is calculated for each industrial activity based on the historical average across the whole industry over a specified period (2006/2007 to 2008/2009 for most firms) and accounts for direct emissions and indirect emissions from purchasing electricity. There are 44 allocative baselines corresponding to the same number of eligible products.

V. CONCLUSION

While informed by technical, economic, and fiscal considerations, decisions about the provision of industrial free allocation are ultimately about political choices in managing the transition to a low-emissions economy. In existing ETSs, the primary rationales for providing industrial free allocation have been to mitigate the risk of carbon leakage and to avoid economic regrets from losing domestic production. As long as there is no harmonization about carbon pricing and climate change policy at an international scale, the countries adopting ETS will need to protect their industry, avoiding economic disruption.

Balancing between emission targets and economic development is a political decision based on ideological orientation and democratic discussion. Level of free allocation is clearly presented as the result of technical parameters such as the benchmark and the methodology of output calculation. However, it is based on arbitrary decisions according to the political targets. This instrument allows the countries to hide the political decision to slow the transition to a less emission-intensive economy due to the fear of economic regret. Adopting carbon pricing is a laudable initiative because it corresponds to a climate change mitigation policy. However, the countries adopt a double discourse between climate change commitment and protection of domestic industry. They claim that these two objectives are not necessarily averse. Nevertheless, this argument is not demonstrated and reflects an ideological position. The level and methodology of free allocation are a way to adapt carbon pricing policy to the industrial context. However, the climate emergency is real, and a policy to adapt the industrial model to the climate change target is necessary.

Mexico adopted EU ETS model of phase I. During the pilot phase, all participants receive 100% of free allowances calculated with the grandparenting methodology. There is no indication about the free allocation policy for the next years, neither about the categorization of EITE sectors. In Mexico, carbon leakage is a real issue because the country is attractive for its low production cost without carbon pricing. When the ETS will be at the regular phase of functioning, meaning with allowance auctions, the production cost will grow, and the industry will lose competitiveness. The carbon leakage threat could come from other Latin American countries or border US states with no carbon pricing in the region. Mexico will have to make a political choice to optimize its technical methodology of free allocation. This choice will determine the transition rate to a low emission industry and the economic impact of the ETS.

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CHAPTER 7: GENERAL CONCLUSION

Implementing the ETS in Mexico is a positive signal for the climate crisis in a neoliberal world. The country can enforce an efficient functioning model like other developed countries and take leadership into transition countries. However, this instrument did not demonstrate significant impacts regarding the climate change target, and other solutions must be considered.

Mexico has a challenging commitment to the fight against climate change. Before the Paris Agreement, the country already announced a political strategy in this area with the General Law of Climate Change in 2012. After that, with the announcement of a forthcoming ETS. Today, the ETS is in force at a pilot phase and should be the main instrument in the political scheme.

MBIs result from the influence of neoliberalism on environmental policy and Mexico presents four representative cases of this political orientation: the PSA program, the carbon projects in the voluntary market, the carbon tax, and the ETS. Mexico followed the trend of the other industrialized countries about environmental policies since market functioning is deeply implemented in the environmental policy. Most of the observations made in the literature about MBIs in the world are confirmed for Mexico. These instruments induce tradeoff between economic efficiency, poverty goals, and environmental targets even if they are supposed to achieve all these targets with the best cost-efficiency.

Hybrid aspect of the PSA program between market functioning and state intervention is observed. The forest carbon projects in the voluntary market does not have the name but operates like payment for environmental services.

The NZ ETS model is an excellent example of the gap between the theoretical functioning and the ETS real enforcement. The most obvious point in New Zealand is the absence of an emission cap. This model is attractive because it is the second oldest after the EU ETS, and it is the only one where forest landowners are participants. Learnings about the political construction of an

ETS can help to develop the Mexican scheme. This political enforcement requires a long democratic process, as well as political and technical adjustments. The government must deal with the interest of different actors and economic sectors. Managing the transition is the main topic in the ETS enforcement because the instrument disrupts the current productive function. Free allocation is an instrument to control the disruptive impact of carbon pricing on the economy. The governments deploy technical methods to determine the level of allowances that the entities can freely receive. However, free allocation is an instrument based on a political decision to manage the transition to a low economy carbon while minimizing the economic impact. All these technical assessments reflect that governments put the protection of their current industry in priority rather than the transition to a low emission economy.

The Mexican ETS is ending its first year of the pilot phase. It is too soon to estimate the efficiency of the scheme and the forthcoming months will determine the gap between real emissions and the amount of initial free allocation. This is a crucial step because this gap will define if the cap set by the government can be met and reasonably phased down in the next years. Mexico is taking a severe leadership of carbon pricing policy in the continent with the first national ETS. This is an opportunity to support the implementation of such policies in other countries with similar functioning to facilitate linking in the future. According to the experience of other jurisdictions about free allocation, the Mexican government must already consider political decision about the phase-out of the free allocation and the benchmarking improvement to ensure that these allocations reflect the real level of emissions.

SEMARNAT has received support from international organizations (GIZ, ICAP) to establish the ETS structure and the current enforcement. The model is drawn from the EU ETS. Even if existing models showed weaknesses, it is a correct orientation to learn from them and avoid the mistakes observed in these schemes. The oldest ETSs are starting the fourth phase of implementation with many changes in the functioning because it is part of the political strategy to gradually achieve a stable model (to avoid economic disruption and adapt the model according to the first observable effect) but also to correct failures.

The implementation of the ETS in Mexico has been slow since the first declaration but not more than in other jurisdictions. Besides the emergency of the climate change issue, the industrial transition to a low emission economy must be well planned to avoid failures in the first years. The implemention of an ETS is a long process. It is a top-down policy enforcement approach since the target (emissions cap) is set at a national scale. Each sector and territories get used to the unit allocation and the secondary market. However, each industrial sector reacts in a different way to carbon pricing. It is important to open the dialogue with the economic sectors to receive feedback and consider the difficulties they face to adjust the ETS functioning. This bottom-up process drives the implementation of carbon pricing to an adaptive policy making.

Representative forest carbon projects reveal a new form of environmental governance that integrates different stakeholders autonomous from state intervention in a polycentric model that promotes adaptive process in environmental management. Indeed, in these projects, multilateral experience sharing between the stakeholders and the different projects is an opportunity to keep improving their functioning, economic efficiency, and environmental integrity. *Scolel'te* and the forest carbon project of San Juan Lachao have different functioning and context. These differences show the influence of land tenure and the importance of technical support. The case of San Juan Lachao also demonstrates that including a carbon project in a whole forest management plan is a crucial feature for its efficiency. The experience of *Scolel'te* proves the difficulty of balancing the tradeoff between economic efficiency, local sustainability, and environmental integrity. The land tenure and the landowners' cooperative capacity are key factors for the project efficiency and sustainability.

NZ ETS participation of forestry scheme could be considered for Mexico because of the potential of its forest resources. The country has the strengths to reproduce a comparable model thanks to its legal and institutional framework. The experience with forest policy is relevant regarding the CONAFOR programs and the forest carbon projects. These programs always include technical support, which is a systematic condition to participate. This an opportunity for Mexico to overcome difficulties faced in New Zealand.

However, some threats can harm the integration of forestry. Illegal logging and other forbidden activities in Mexico reflect the weakness of the country to enforce the rules. Mexico does not have the same economic interest in including forestry such as New Zealand, where forestry is a main economic activity. Finally, the access to capital to launch carbon farming is limited for forest landowners in Mexico. The environmental impact of this model is hard to anticipate and is balanced between the support for emissions targets and the effect of carbon farming on biodiversity. The economic impacts should be positive for the country if it develops commercial logging, and for the the landowners as long as market stability is ensured. Potential conflicts must be considered between participants and non-participants and between agriculture and forest being two opposite land uses. New Zealand is a neoliberal country with an individualistic culture and self decision-making on the base of available information where the state has a minimum intervention. In Mexico, the state is very present, mostly in land-use decision-making. However, its power is weakened by illegal activities in the territories and corruption, limiting its governance capacity.

The current model of the Mexican ETS only considers forestry through the implementation of offset credits from existing mitigation projects. However, offsetting was already considered in the carbon tax, but there was no impact on creating new forest carbon projects. Of course, this can be explained by the low cost of the carbon tax, which does not incentivize offset credits.

New Zealand is the only country where forestry participates in the ETS, and Mexico could have another opportunity to stand out from the crowd and take more political leadership by reproducing this model. This will be a very tough challenge to ensure the enforcement of the rules regarding the Mexican context but the implementation of an ETS on the Mexican industry was also hard to imagine ten years ago. Some conditions must be met in Mexico to implement forestry integration in the ETS. The necessary institutions exist, but they need to be strengthened with more human capital, funds, and transparency. Another condition is to develop registration and monitoring tools for the participants. The government failed to implement a national standard to emit offsetting credits from forestry in 2017. However, RENE succeeds in the emissions registration from industrial sectors. SEMARNAT and CONAFOR must work on the development of a registration tool by taking learnings from the Look-up table in New Zealand and the experience of the forest carbon projects in Mexico. To compensate for the lack of access to capital in the country, the government must also support forest landowners to launch forest carbon activity with initial funding programs. Carbon farming is a productive vision of forestry, and even New Zealand cannot avoid the negative impact of this activity on landscapes and biodiversity. Therefore, integrating forestry in the ETS must be linked with complementary programs to incentive permanency and species diversity.

While a part of the scientific and intellectual community claims that free market and capitalism are the origin of the climate change issue, the ETS policy argues that the market economy is the solution to this problem. Carbon pricing implementation demonstrates that market-based policy is now the political paradigm to manage the transition to a low emission economy and meet climate change targets. This governance scheme includes an adaptative approach observed in ETS functioning. Government selects the ETS option because it is the most flexible and cost-efficient instrument. ETS and, generally, tradable permits are based on the neoclassical theory of the optimum allocation of free market. However, ETS also includes state intervention with the establishment of the cap and the management of allowances assignation. In that sense, there is no opposition between state intervention and free market but a symbiosis where market mechanisms highlight sectorial needs and feedback them to the government to adapt the ETS functioning. This adaptative process is a democratic issue. The government needs learnings from the bottom, and economic sectors and civil society must participate in the establishment of the rules. Governments use to show authority in crisis period to enforce emergency measures and this is not a good option. However, for the climate crisis, ETS enforcement is an adaptative approach. Democracy and transparency are essential to ensure the efficiency of the adaptive process.

Carbon pricing and especially ETS enforcement is a good signal in a neoliberal economy but certainly not sufficient. ETS is a cross-sectorial instrument, but each economic sector has its own production function and reacts in a different way to carbon pricing. Even with an adaptive approach, one political instrument is not sufficient. The market functioning in the ETS will not drive the economy to a low emission model without state intervention to support the transition with complementary programs, budget policies, and new legislation.

In a post-neoliberal world, market-based policy is probably not adapted. Governments must recognize that the climate change issue results from a structural model of production in the industrial countries that must be reformed. A simple political instrument such as the ETS will not be efficient without structural changes. The issue is to transfer the capital concentrated in polluting activities into low emissions industries and environmental services provision. Monetary language is probably not the best solution for that. Neoliberalism is a model where agents can freely accumulate capital, and price signal is not sufficient to make low emission sectors attractive if the capital is already deeply concentrated in high emission sectors.

Enforcing production rules without price signal is a political choice and can also result from an adaptive approach if democracy and discussion are ensured.

APPENDIX 1: Interviews about the Mexican forest carbon projects

I. Mariana Ayala Calva y Luis Fernando Gutiérrez Champion (MEXICO2) – September 2017

Entrevista semi-estructurada

Sistema de comercio de emisiones

1. ¿Quien propuso la elaboración de este Sistema y cuando?

   En 2016 por la SEMARNAT en concertación con MEXICO2 para alcanzar el Nationaly Determined Contribution (NDC, -22% 2030).

2. ¿Qué es el estado actual de su implementación?

   ***Inicio del ejercicio en octubre** para 9 meses con 100 empresas voluntarias (Pemex, Unilevel) que representan 60% de las emisiones del país. ➔ Solo dejar permitir las empresas adaptarse al proceso. Simulacro con inteligencia artificial*
   3 fases de 10 semanas, 4 subastas por semana. Inclusión de offsets limitados a 8% por empresa.
   ***Piloto en 2018** con las empresas obligadas a participar, pero no va a ser real aún. Hasta 2020.*
   Distribución de derechos en función de las emisiones anteriores en el sector (Grandparenting).
   Monitoreo a través del RENE. Reducción de créditos (Cap) de – 3% cada año.
   2020 mercado real

3. ¿Qué base o referencia? ¿Reciben apoyo técnico de otro país?

   Mercado europeo un poco. Apoyo del mercado de California (posibilidad de juntarse a ellos en el futuro), GIZ, embajada británica, Mercado de Ontario y Quebec.

4. ¿Quién va a participar y que será el papel de MEXICO2?

   100 empresas que emiten mas de 25 000 t / año, Mexico2 maneja el intercambio de créditos como plataforma, coopera con SEMARNAT para la evaluación y aplicación del ejercicio y piloto.

5. ¿Se plantea solo ser entre emisiones nacionales? ¿Se abre a compras de créditos de proyectos de reducción o mitigación?

   Se va a abrir a offsets nacionales (8% por empresa por año). Mercado Nacional

6. ¿Qué frenos o dificultades encuentran actualmente?

Necesidad de transparencia para obtener confianza de las empresas ante el gobierno y entre ellas.

Mercado Voluntario

1. ¿Quien propuso la elaboración de este mercado y cuando?

   Se hizo "solo" con la implementación de proyectos de mitigación o compensación de emisiones. Existe desde 10 años, lo considero la LGCC en 2012 y nació Mexico2 cuando Europa dejo de aceptar offsets de paises industrializados. Este último punto fue una crisis para el mercado internacional ya que bajo mucho la demanda de offsets entonces los precios bajaron.

2. ¿Relación con el mercado internacional?

   Solo depende del comprador y del registro de proyectos.

3. ¿Papel de Mexico2?

   Revendedor de créditos. Intermediar entre proyectos y compradores. Buscan compradores y se financian con comisiones sobre transacciones.

4. ¿Cuántos créditos por captura de carbono se generan cada año? ¿Quien compra quien vende?

   No da el dato. Y aun no quieren compartir la base (por el momento). Todo tipo de mitigación o compensación carbono.

   2 proyectos de carbono forestal.
   Scolelte - AMBIO en Chiapas con certificación Plan Vivo
   Otro en Nayarit – Jalisco – Tabasco con certificación VCS

   El precio varía con el proyecto y lo vendedor lo propone según los costos. Proyectos de rellenos sanitarios ➔ 2.5$ - 3$

   Reforestación es una actividad más costosa ➔ 6$ - 7$

   Beneficio de puro marketing para las empresas ➔ comunicación, certificación, a veces requisito de clientes

5. ¿Cuáles estándares de certificación?

5 estandares: CDM, Plan Vivo, VCS, CAR, Gold Standard

Los promotores de proyecto son Asociaciones Civiles o pueden ser empresas también. Proteak (aprovechamiento forestal) es promotor del proyecto VCS

6. ¿Qué frenos o dificultades encuentran?

Difícil de encontrar compradores ya que el interés para ellos es puro marketing así que el sistema de comercio de emisiones con los creditos de compensación representa una oportunidad para estos proyectos.

II. Leticia Espinosa (PRONATURA) – Septiembre 2017

Entrevista no estructurada, Leticia presento su trabajo y los proyectos de manera abierta.

El proyecto de San Juan Lachao aún no comercializa. Inicio en 2014 el proceso. Comprador Ciudad de Palo Alto, California. Es una piloto para la aplicación de CAR a escala más grande.

Proyecto manejado por ICICO A.C. Tienen otro proyecto que incluye, CarboIn 11 otras comunidades desde 9 años con certificación ISO 14006 (Asociación Nacional de Normalización).

Comercializa también los créditos de Sierra Gorda desde 10 años. Venta a empresas locales con certificación VCS. Pequeños propietarios, ninguna comunidad.

ICICO, Oaxaca:

11 comunidades iniciales con más de 3000 ha + San Juan de Lachao mas de 3000 ha

Restauración y cultivos agroforestales sobre todo

ICICO es propietario del crédito generado➔ negociación trilateral (comunidades, ICICO, Pronatura) en la repartición del ingreso de venta➔ comunidades 80%, ICICO 10%, Pronatura 10%.

El precio varía mucho según la tasa de cambio con USD y cantidad de compra

Menos de 1500 toneladas = USD 10

Entre 1500 y 5000 toneladas = USD 10 con posibilidad de descuento por fidelidad (5%)

Más de 5000 toneladas = USD 11 con 15% descuento y posibilidad de descuento por fidelidad (5%).

Transacción en peso mexicano.

Entre las 11 comunidades la repartición se hace según la participación en la creación de créditos

3% que se quitan de los 80% para las comunidades van para el tramite del año siguiente. Lo demás, el uso se decide por asamblea ejidal para ir en obras en el bosque, jornadas de trabajo, inversión colectiva en la comunidad. Los trabajos de conservación se manejan aveces por faenas (Tequio).

¿Dificultades encontradas?

Encontrar comunidades y organizaciones locales que aceptan hacer tal compromiso de largo plazo (25 30 años minimo).

Necesidad de mas educación ambiental a través de talleres. ICICO maneja talleres para compartir experiencias.

La mesa ejidal cambia cada 3 años. Idea de juntar las mesas ejidales para compartir experiencias a nuevas generaciones de ejidatarios y nuevos presidentes ejidales para seguir con el proyecto.

En Guerrero tuvieron un proyecto que cancelaron por decisión de la nueva mesa ejidal, inseguridad y cambio de gobierno estatal.

III. Helena Barona y Ruben Trujillo (Cooperativa AMBIO) – Agosto 2017

Entrevista semi-estructurada

1. ¿Que relación entre AMBIO y Plan Vivo?

El Programa Scolel'te, manejado por AMBIO, es certificado bajo el estándar internacional Plan Vivo. El Sistema Plan Vivo se distingue especialmente por el acompañamiento y apoyo a pequeños(as) propietarios(as) de bosques y selvas, quienes frecuentemente se encuentran limitados para participar en programas o estrategias nacionales e internacionales, debido a condicionantes relacionadas con la tenencia y extensión de sus tierras. Además, es un estándar para bonos de carbono exclusivo para proyectos ubicados en países en vías de desarrollo.

2. ¿AMBIO tiene otros proyectos de comercialización de carbono en el país?

No, es el único

3. ¿Cúando inició el proyecto y con qué frecuencia de ventas?

Desde 1998 y se venden bonos a lo largo del año.

4. ¿Cómo se define el precio de venta? ¿Es una negociación directa con el comprador o no tienen ningún contacto con él?

Se define de acuerdo con el mercado, al costo de los trabajos de reforestación y capacitaciones, así como pagos dentro del Programa.
Se tiene contacto directo con el comprador cuando se acerca de manera directa con AMBIO o a través de revendedores (Mexico2) de los bonos del Programa.
Precio actual 11USD /tonelada, estable, créditos ex post, el primer pago viene después del primer año.

5. ¿Quién financia los costos del proyecto? (administrativos, certificación, etc.)

Se financia por medio de la venta de los bonos de carbono y proyectos complementarios enfocados al fortalecimiento de actividades del Programa. La administración de recursos y gastos se realiza a través de la figura de la Cooperativa AMBIO.

6. ¿Quién trabaja en el campo para las obras de conservación / reforestación?

Los(as) productores(as) participantes en el Programa, técnicos comunitarios y regionales, con los coordinadores de AMBIO.

7. ¿Quién es "propietario" del crédito de carbono antes de venderlo?

El Programa Scolel´te a través de la Cooperativa AMBIO

8. ¿Cómo se reparten los ingresos de ventas? (remuneración y costos)

70% para pagos de productores y el 30% para gastos administrativos, así como operativos de AMBIO

9. ¿Cuáles son las principales dificultades que encuentran en todo el proceso? (obras, certificación, mercado, relación con las comunidades…) ¿Que se podría hacer para mejorar el proceso?

La organización con las comunidades, como asegurar la permanencia de las plantaciones; para minimizar el no complimiento, se han desarrollado procesos paralelos y complementarios a la venta de carbono que incrementen el interés de los productores en la venta de bonos de carbono ligados a mejoramientos productivos.
El mercado es otro de los puntos críticos, debido al poco desarrollo de este y a los precios que son poco atractivos. Se busca identificar los intereses de los compradores y se negocian los precios, de modo que sean lo más justos posibles.

10. ¿Porque este tipo de proyecto no se repite más en el país?

Es el proyecto más longevo dentro del Sistema Plan Vivo y uno de los pioneros a nivel mundial con el manejo del esquema de Pagos por Servicios Ambientales. El proyecto cuenta con experiencia de 20 años de trabajo y con la fortaleza de capital humano formado dentro del programa, así como la continuidad de los productores dentro del mismo.

IV. Ruben Trujillo (Cooperativa Ambio) – Febrero 2018

Entrevista no estructurada

Inicio de Scolel'te en el 1997, hoy 1200 productores en 90 comunidades de Chiapas. Alrededor de 10000 ha.

El pago es ex-ante según una línea base

4 modalidades: Deforestación evitada, agroforestería, cercas vivas

Compromiso de 25 años con calendario de pago establecido al inicio: 5 pagos los 8 primeros años desde 2015 7 pagos los 10 primeros años.

Monitoreo a cada pago

Capacitación de técnicos comunitarios.

Hasta hoy se propone establecer un contrato con valor jurídico. El contrato especifica que no se permite dedicar la parcela a otro proyecto de carbono. Problema jurídico con el contrato: unos productores no son ejidatarios con título. El contrato es para reforzar el convenio precedente frente a los requisitos internacionales de transparencia. El objetivo es de identificar los compromisos y proteger ambas partes. Es un acuerdo de buena voluntad, no es una relación laboral. Trabajan con el apoyo de la CEMDA (Centro Mexicano de Derecho Ambiental).

Muchas dificultades en campo para el monitoreo por la falta de personal técnico y la disparidad geográfica de las parcelas. Se perdió el contacto con varios productores.

El proyecto no se finanza solo con los 30% de comisión sino también con otros proyectos de Ambio, donación CONAFOR, viveros comunitarios. Costo personal, material, siembras, juntas y eventos de capacitación.

Ambio se financia donativo de GEF, asesoría técnica a PSAH, sus proyectos. Al principio CONANP fue un buen vinculo entre Ambio y las comunidades.

V. Expresidentes ejidales de 3 comunidades con participación al programa Scolel'té – Febrero 2018

Entrevistas semi-estructuradas, pero no se pudo seguir toda la estructura del cuestionario (Apendix 2)

AGUA AZUL

POBLACION Y USO DE SUELO

84 ejidatarios (7 mujeres) 400 pobladores

20 menos de 30 años y 40 con mas de 60 años

Varios pobladores y ejidatarios van a trabajar de manera temporal a Cancún, Playa del Carmen, Jalisco, Sonora, Chihuahua, USA, ya que Ococingo esta saturado

Superficie de 1110 hectáreas, todo parcelado con acuerdo sin titulo, 80 ha de cultivos y 400 ha de pastizales, lo demás puro bosque.

Cultivo comercial de palma y café, autoconsumo de maíz y platano

Programa de siembra CONAFOR alrededor de potreros

BONOS DE CARBONO

En el proyecto desde 2008, conocimiento del sistema de comercialización. 11 hectáreas entre 11 productores, 5 pagos sobre los 8 primeros años. Los que entregaron después de 2015➔ 7 pagos sobre los 10 primeros años.

4 productores abandonaron, al principio esta difícil de mantener los árboles. Luego, los 11 que quedaron están muy satisfechos del programa.

OTRO PROGRAMAS

700 ha con PSAH segundo contrato: Distribución de los ingresos entre las parcelas. Trabajo con brigada.

CONANP

PROGAN

PROSPERA

COMCAFE 800 ha,

ORGANIZACIÓN DEL EJIDO

Reglamento desde un poco mas 20 años. Reunión una vez al mes, más reuniónes excepcionales. Todos participan y votan, hasta los pobladores. Multa por no asistir a la asamblea, cooperación individual para los gastos comunes, de luz de agua…

Programas ambientales representa 100% del presupuesto comunales, fuera de la cooperación individual. Financiaron infraestructuras de agua, de luz, y la escuela últimamente.

Partidos políticos presentes en la comunidad, Asociación de productores de café ➔ casi toda la comunidad con otras comunidades.

Importancia de las actividades para subsistencia e ingresos: 1- Ganado 2- Bosque 3- Agricultura

PRESEPECTIVAS FUTURO

No hay programa que se destaca. Los bonos de carbono ayudaron. Motivan a cuidar el bosque y apoya económicamente.

Ninguna opinión negativa. En el futuro ve un aumento de superficie de bosque tanto por compromiso personal asi como con los programas de apoyo.

OBSERVACIÓN

Modelo económico del proyecto de carbono presentado:

Fase 1 ➔ árbol chiquito, se gasta para trabajar el árbol y se dedica mucho tiempo

Fase 2 ➔ el arbolo esta más autónomo, el productor se puede dedicar a otra actividad, mas espacio porque menos arboles y se puede mezclar con otra actividad como ganado o cultivo.

Don Manuel hizo una analogía entre criar árboles y criar un hijo.

ALANKANTAJAL

Alankantajal es una localidad del ejido San Sebastian Bachajon.

POBLACION Y USO DE SUELO

43 comuneros hombres, 15 posesionarios

15 con menos de 30 años, 18 entre 31 y 60 años, 10 con mas de 60

10 se van a trabajar de manera temporal a Cancún

100 ha. 10 de uso común y 90 parcelada sin titulo

10 ha de bosque, agricultura 80 ha (maíz y café), pastizales: 10 ha

BONOS DE CARBONO

Entraron 15 productores en 1997 ahora son 24. Todos ya pagados y respetan el convenio de 25 años

Bien enterados del proceso

Opinión positiva de la comunidad, no hay nada mejor en la comunidad, propuesto en grupo. Reunión cada semestre con técnicos, comisariados y Ambio.

OTRO PROGRAMAS

No hay otro programa ambiental. Prospera, PROCAMPO, PESA SAGARPA, SAGARPA para café orgánico.

ORGANIZACIÓN DEL EJIDO

Reglamento interno reciente, se junta cada mes la asamblea incluyendo los posesionarios, multa de 100 pesos por faltar. Todos siempre participan. Los programas ambientales no pesan en el presupuesto común. Ningún presupuesto / inversión colectiva.

Ambio es la única organización civil con quien trabajan.

A nivel económico y de subsistencia son el bosque y la agricultura las actividades mas importantes.

Problemas con la empresa COYOTE que compra el café de la mayoría de los productores de café en Chiapas. Poco poder de decisión sobre ventas y precio.

PRESEPECTIVAS FUTURO

PROSPERA es el programa que ayuda más. Lo reciben todas las mujeres.

El programa Scolel'te no aportó muchos cambios en la comunidad.

En el futuro habrá más bosque.

VILLA DE LAS ROSAS

POBLACION Y USO DE SUELO

46 ejidatarios, 41 hombres 5 mujeres. 64 posesionarios.

8 con menos de 30 años y 25 con mas de 60 años.

40 se van a trabajar en el país de manera temporal

4 en USA temporalmente

1458 ha 384 de uso común, lo demás parcelado con acuerdo alrededor de 20 ha por ejidatario

500 ha de bosque, 500 ha de agricultura, 15 ha de solares, mas de 400 ha de pastizales.

BONOS DE CARBONO

Entraron en Scolelt'te en 2008 con 14 productores, hoy son 96. Buen conocimiento del proceso.

Buena opinión: doble servicio➔ Apoyo técnico para producir recursos forestales + Recursos económicos para conservar el bosque

OTRO PROGRAMAS

PSAH

PET CONANP

Prospera, 65 y mas

PROCAMPO, COMCAFE

ORGANIZACIÓN DEL EJIDO

Reglamento interno des 2010, reglas internas sobre el uso de los recursos forestales

Reunión cada mes mas reuniones excepcionales. Los posesionarios votan también. Alrededor de la mitad viene.

No hay presupuesto ni inversión colectiva.

Organización Ambio, organización de productores: Espocel y Apicultura, UMA (ambiental)

El bosque es muy importante para la subsistencia y los ingresos, agricultura también

Ganado y turismo muy poco. Solo 10 personas tienen ganado.

PRESEPECTIVAS FUTURO

Scolel'te es el programa que ayuda más. Apoyo ecológico y financiero. Ayuda mucho la comunidad. Fertilidad del suelo, calidad y cantidad de agua. Mala opinión de programa CONABIO porque no dieron seguimiento. Desean más apoyo técnico.

En el futuro habrá mas bosque, suelos mas fértiles.

VI. Carlos Perez (ICICO) – Febrero 2018

Entrevista no estructurada sobre le funcionamiento del proyecto en San Juan Lachao y el proyecto CARBOIN

SAN JUAN LACHAO

Programa de Manejo Forestal Sustentable con 5000 ha de Pino-encino. Certificados con premio nacional de Silvicultura de SEMARNAT

Proyecto de carbono sobre 3200 ha

Buen acompañamiento de ICICO con monitoreo y talleres regulares.

Seguimiento y autoevaluación, recorridos en campo a detectar rodales y organizar el plan de aprovechamiento.

Retrosintesis con mapa de trabajos por anualidad desde 2012.

Reglamento de aprovechamiento escrito con ICICO desde 2012.

Programas en la comunidad:

Carbono, Programa de Agua, PMFS, UMA, PSAH, Biodiversidad, ecoturismo, ACC

Proponen una responsabilidad del bosque independiente de la mesa ejidal.

CARBOIN

Proyecto con 11 comunidades

Reventas con Pronatura desde 2012

Funcionamiento similar a San Juan Lachao con certificación nacional.

Principales compradores: Presidencia de la Republica, COP, Farmaceutica Chinoin, Fundacion Televisa, Grupo Gamesa.

Cada año se hace un contrato entre el comprador y el vendedor ICICO

ICICO es propietario del crédito generado➔ negociación trilateral (comunidades, ICICO, Pronatura) en la repartición del ingreso de venta➔ comunidades 80% (70%), ICICO 10%(15%), Pronatura 10%(15%).

VII. Presidente ejidal de San Juan Lachao, el tesorero, y un miembro de la brigada foresltal – Febrero 2018

POBLACION Y USO DE SUELO

Bienes comunales desde 1968.

666 ejidatarios, 20% de mujeres, mas de 400 posesionarios no reconocidos, alrededor de 100 avecindados

15 ejidatarios con menos de 18 años, más de la mitad con más de 60 años

150 trabajadores temporales en Oaxaca, Monterrey, CDMX,   250 en Canadá o USA

13 000 ha todo uso común

7000 de bosque, 4500 agricultura, 2 localidades grandes, 10 pequeñas

BONOS DE CARBONO

Proyecto piloto para aplicación CAR a mercado internacional, inicio en 2013, primeras ventas a finales de 2017 a la ciudad de Palo Alto en California. Buen conocimiento del funcionamiento.

Se cuentan 17 000 toneladas para la primera venta a 8 USD = 2 500 000 MXN mas o menos

Saben que hay gastos administrativos, comisión ICICO (10% transparente) Impuestos.

Buena aceptación global del proyecto, oportunidad de marco para la organización forestal, ayuda en el PMFS, va de la mano. Complementariedad. Unas parcelas reciben tanto PSA como crédito carbono. El PMFS permitió amortiguar los primeros gastos del proyecto de captura de carbono. Al principio hubo preocupaciones, pero ahora estan convencidos.

Primer pargo llego en 2018, les llega alrededor de 2 000 000 neto. Queda de definir el uso.

Pagan personal: "Ambientales" 22 personas: 200 MXN por jornada

PMFS mas de 60 persona 180 MXN

Carbono 6 personas

Tecnicos remunerados de tiempo completo: 200 MXN

Es poco aún para ser autónomo con esta actividad, pero tienen otras actividades como cultivo de maíz y cafe

OTRO PROGRAMAS

Desde 2008 PSAH CONAFOR 2014 fondo concurrente.

Prospera / 65 y mas

PROGAN PROCAMPO

PIMAF

CAFÉ SAGARPA

ORGANIZACIÓN DEL EJIDO

Reglamento interno desde 2011 a nivel municipal y ejidal ya que San Juan Lachao es los dos

Se reúnen cada 3 meses. Con participación total de todos.

75% de participación en promedio. Programas ambientales muy importante ya que emplean entre 60 y 70 personas.

Principales fuentes de financiamiento son el PMFS y el ecoturismo.

Organizaciones: UNECAFE (500 miembros), Michtza (organización productiva 20 miembros), Club de futbol con liga municipal varonil y feminil, ICICO

Bosque y agricultura muy importantes para la subistancia, bosque muy importante para los ingresos, unos ganaderos (100)

PRESEPECTIVAS FUTURO

Todos los programas ambientales ayudaron mucho. Apoyo en la organización, acción colectiva.

Los programas deben ser aplicados estrictamente con sanciones sino no se cumplen.

Van bien con los bonos de carbono muy felices de ver el primer pago.

En el futuro se va a crecer la conciencia ambiental, mejorar el bosque, mas empleos forestales y turísticos. Estan discutiendo como y donde forestar mas.

APPENDIX 2: Questionnaire for the communities.

Cuestionario proyectos de carbono

Nombre del ejido:____

Contacto

Nombre:____

Tel:______________________________

Historia y población

1) ¿Cuál es la composición del ejido/ bienes comunales?

Población del ejido/bienes comunales	N° hogares	Ejidatarios / comuneros		Posesionarios	Avecindados
		H	M		

2) ¿Cuántos ejidatarios/comuneros pertenecen a los siguientes grupos de edad? Especificar **% o #**

18- 30	**30-60**	**Más de 60**

3) ¿Cuántas personas del ejido/bienes comunales trabajan fuera del ejido? # de personas

Forma / Lugar	**México (País)**	**Estados Unidos y otros países**
Temporal		
Permanente		

Uso de suelo

4) ¿Cuál es la tenencia de la tierra en el ejido/bienes comunales? (Ha)

Total	Uso común	Parcelada con PROCEDE	Parcelada por acuerdo (sin título)

5) Uso del suelo adentro del ejido/bienes comunales (Ha)

Tipo	Ha por tipo
Bosque	**Total:________________Ha**
Agricultura	**Total:________________Ha**
Pastizales	**Total:________________Ha** Dentro del parque: ________
Urbanizado	**Total:________________Ha**
Otro(s)________________________	**Total:________________Ha**
TOTAL	

Bonos de carbono

- ¿Desde que año entraron el proyecto de captura de carbono? _
- ¿Conoce el sistema de comercialización de los bonos de carbono? _

- ¿Que monto recibieron cada año / promedio?

- ¿Sabe que porcentaje de los ingresos de venta regresan a la comunidad para un crédito vendido? ____

- ¿Cómo se decidio esta repartición? _______________________________

- ¿Qué es la opinión global de la comunidad al respecto?__

- Uso del dinero

Año	Técnico	Vigilancia		Mantenimiento			Reforestación / plantación		Inversión colectiva		Otros ________________	
	%	%	Quién	%	Otra actividad**	Quién*	%	Quién***	%	Tipo***	%	Quién*

- ¿Quienes trabajan en áreas de proyecto de carbono?

- ¿Como los pagan? (Jornada, cuantitad de trabajo, porcentaje de venta de crédito…)

- ¿Cuánto reciben en promedio?

- ¿Es suficiente para vivir?

- ¿Cómo complementan sus ingresos?

<u>Otros programas (agrícolas y sociales) a nivel de hogar.</u>

6) En los últimos diez años ¿qué programas recibieron (si es un programa anual último año solamente)

Organización del ejido

7) **¿Existe un reglamento interno específico para el ejido?** (**0.No 1.Sí**) _ ¿Desde cuándo?_

8) **¿Cuántas veces se reunió la asamblea el año pasado?** _

9) **¿Quién puede participar en la asamblea?**

Quién	Presencia	Toma de palabra	Votar
Posesionarios			
Avecindados			
Otros:			

10) **En las últimas 3 veces (reuniones) ¿en promedio, cuántos ejidatarios/comuneros participaron en cada asamblea?** _

11) **¿Qué importancia tienen los programas ambientales en el presupuesto del ejido / bienes comunales?** %

12) **¿Financió el ejido/bienes comunales infraestructura estos 10 últimos años (excepto con el dinero de los programas ambientales)?** (**0. No 1.Sí**) _ _

Si sí ¿para qué?_

1. Iglesia 2. Escuela 3.Maquinaria agrícola colectiva 4. Infraestructura de agua 5. Biblioteca 6. Centro de salud 7. Edificio colectivo 8. Otras:_

Principales fuentes de financiamiento: _

1. Aprovechamiento forestal 2. Minas 3. Otros del ejido_ 4. Externo (ONG, gobierno)

13) Enlista las organizaciones que existen en el ejido:

Tipo*	Nombre de la organización	# de pers. del ejido

*** 1. Organización de productores (asociación o cooperativa) 2. Grupo de actividad social (mujeres, jóvenes, deportiva, cultural) 3. Organización ambiental 4. Otra(s):_**

14) Importancia de los recursos para los hogares del ejido/bienes comunales:

Tipo de recurso	Importancia para la subsistencia*	Importancia en los ingresos*	Cuántas personas implicadas
Bosque			
Ganado			
Agricultura			
Turismo (truchas, cabañas, guía…)			
Minas			
Otra fuente de ingreso:			

*<u>**Importancia**</u>**:** 1.Baja 2.Media 3.Alta

Perspectivas a futuro

15) ¿Cuál es el programa que más los ayudó? ______ ¿Por qué? ______

____

16) ¿Cree usted que los programas de bonos de carbono en el ejido/bienes comunales? ______

1. No han cambiado nada 2. Han sido de ayuda 3. Han traído problemas

17) ¿De qué manera? ______

____

____

____

____

18) ¿Hay un programa del que tiene una opinión negativa? ______

____

¿Por qué? ______

____

19) ¿Qué desearía cambiar de los programas de bonos de carbono? ______

____

20) ¿Cómo ve la evolución del uso de la tierra en el ejido/bienes comunales en los próximos 5 años?

____

____

APPENDIX 3: Interviews about the NZ ETS (January-February 2020)

<u>Suzie Greenhalgh (Manaaki Whenua - Landcare Research) – Unstructured interview</u>

<u>Voluntary carbon market and offsetting:</u>

She works with Toitu: carbon certification, offsetting, voluntary market. Different from ETS. It is not for compliance but for market incentives (demand for green product).

<u>Agriculture</u>

Farmers fear more uncertainty than carbon pricing. Moreover, the first scheme is not very binding (95% free allocation). Farmer's awareness about climate change. Lobby/industry/sector pressure to conserve statu quo.

<u>Forest landowners</u>

Very price oriented. Planting post 1989: strong decrease of carbon and logging price incentivizes cutting before it get worst. Price today is incentive enough. Very bad prepared, lack of knowledge.

<u>Leo Mercer (Victoria University) - Unstructured interview</u>

<u>Forest management</u>

Maori land managed with trusts and corporations. Trust is more like and association / corporation is more business oriented.

<u>Maori approach</u>

Maoris have intergenerational consideration of forest. Responsibility to past and future generation to preserve what the parents gave and to allow future generation to live in the same world. While occidental heritage approach is on capital bequeath.

<u>ETS</u>

Participation in ETS has brought a lot of money. Because large plantation areas. They often are experienced with forest management in commercial logging. Can work with brokers or sometimes buyer companies directly contact them. However, in carbon market, MPI information is unclear and hard to access.

Environmental integrity of units is important for some buyers (ask for native forest units).

<u>Decisions making</u>

They can be self-organized or work with forest a company. Decision making about land use and forest management is very slow. Infrequent assembly (each year), land considerations are long term approach.

<u>Ollie Bolton (Carbon Forest Services) – Semi structured interview</u>

FOREST LANDOWNERS

a. General forest landowner profile?

Landowners are farmers, Iwi (small number but big areas of pre 1990), investors, corporate forestry.

b. Participation to ETS (Post- 1989)? Profile, motivations?

45 % - 50 % of post 1989 forest in the ETS (300 000 ha)

At first, mostly business as usual timber strategy, then price increased and encouraged land use change.

c. Environmental Protection Agency ETS report gives three categories (owning forest land, holding forestry right, holding forestry lease). Can you explain? Is it a business for some companies to invest in contracts?

Forestry right is a property right on trees (Forestry right Act) distinct from the land property right. It is easy to process, cheap, no need to make an accurate surface survey. Forestry lease is a leasing contract on forest area, on the land title. Lease to occupy and take resources.

d. Economic model for individual, small landowners, is it a viable income?

Most of ETS participant had already capital to finance carbon farming or the activities already were in their business plan. As farmers they can have access to bank funding

Support programs: AGS, one billion trees

Contract: leasing, forestry rights. Investors (can be a person, a company), profit sharing or rent paying (carbon rent).

ETS MODEL

a. Offsetting exists? If yes, what the difference?

Offsetting is only in voluntary market. You cannot used offset credits for compliance. Offsetting is for greenwashing (he did not use this term).

Point of obligation can use 100% of secondary market allowances but no offset.

b. Is the MRV functionning efficient?

Self-reporting does not work, the ETS encourages self-management but lack of knowledge about the functioning and non-compliance happens a lot of penalties.

New Zealand culture based on "do it yourself" attitude. Free market society: The system has been weak to deal with the problem because of NZ ideology about free-market and self-functioning. Let people manage compliance and apply penalties.

Minimum technical support needed, more education about the rules

EXAMPLE: landowners send storage declaration with mistakes, the MPI gives validation, and the landowners think that it is all good. But MPI makes verification after payment and send penalties.

MPI administration is saturated of non-compliance case studies. Cases from years are still waiting to be solved.

c. Why this model only exists in NZ?

Because of the history: NZ claimed for accounting forestry in Kyoto compliance and made a strong negotiation. 1) Because forestry is a positive sink and a huge export activity 2) a lot of post 1989 forest.

Political reason: Forestry lobby is very strong in NZ. Foresters protested and accused government to steal forest credits. Because forestry generated AAUs (Kyoto market units) but foresters did not received them.

IMPACT OF THE NZ ETS ON FORESTRY

a. Forest covering: some ex-ante studies but ex-post? (Deforestation avoided? / Afforestation?)

Deforestation survey (match with MPI data)

"$29 is enough for forest ETS, but should be very much higher for industry, mostly fossil fuels"

b. Ecological impact: exotic species, ecosystem services (biodiversity, soil, wate), landscape.

ETS causes monoculture, push to Radiata pin because of price driving. Lack of incentives to keep forest (PFSI must be strengthened). Tradeoff between fast carbon storage and fast income / long term ecological target (restore native forest cover)

c. About conflict with farmers

Carbon farmers are claiming for farmers to be included in ETS

d. ETS reform in the good direction?

Bill will increase penalties. It is bad because already high and it is not the problem. It will be do it worse. It is high cost for small landowners. Averaging it is good, encourage participation because *will quite liability for harvesting. Good because encourage for timber harvesting with carbon species instead of native forest (avoid native forest deforestation in NZ and other countries).*

Steven Cox (Ministry for Primary Industries) – Unstructured interview

General forest information about Forestry

1900' Radiata pine plantation to supply timber exportation and stop native forest cutting.

80' market based focused.

90' price of timber products increased ➔ 300 000 ha afforestation

Forest area = 8 million of hectares native forest / 6 million of hectares owned by the crown/ 2 million of hectares privately owned.

2.1 million of hectares planted for production / 1.4 pre-1990 / 0.7 post 1989 (10% is native species).

Carbon and forestry are under Resource management Act (other ecosystem services under other laws).

MPI focused on commercial timber and carbon forestry. ETS purely carbon.

MPI vision: minimum standard of impacts, individual decisions making.

Landowners

Different types of contract (forestry right / carbon rights/ lease/ joint venture…)

Contracts are mostly with large area owners.

Lack of knowledge about ETS (administration of liability and MRV/ market functioning how to read it and do not lose money [price]).

The most misunderstood part is about unit balance (surrendering after harvesting).

ETS registration enters in land title

Technical support is necessary, but we cannot force it. MPI must give access to necessary information and work with other actors of the market but not say to the landowners what to do. Free decision making.

ETS model

After Kyoto commitment, 1989/1990 reference remains

Paris agreement brought averaging (new accounting)

The scheme is very complex. Mostly when different species and replanting year. One plot = specie/year.

Age band= give gap for harvesting.

NZ: low subsidies in forest and agriculture. Incentive based policies.

REFORM: Averaging, Permanent forest post 89 (PFSI with ETS) it is individual contract, one billion trees (out of ETS but complementary). Make the scheme easier to understand and participate. Developing ITs

Impact of averaging: 5 years period of accounting in the ETS forest, zero sum game because of surrendering when registering with existing forest.

<u>David Rhodes (Forest Owner Association) – Unstructured interview</u>

FAO= 200 members (corporates or large landholders)

Farm Forestry Association = 2000 smallholders

FAO + FFA = 70% harvest volume

Around 10 000 owners not affiliated

FAO is an organization for communication, representation, programs (technical support, training)

<u>Landowner's business problem:</u>

Smallholders balance between harvest/grow is strong and problematic (income volatility with one unique class of age).

Cooperation can be complicated between smallholders with different strategies and context (they are not plenty dedicated to forestry, they mostly are farmers).

Corporates or large areas owners can manage income without different classes of age.

With the ETS:

Saw-tooth is manageable and interesting for large areas and holding, but not for smallholders.

Averaging interesting for smallholders.

Syndicate are common: investing organization to purchase land and plant trees.

Forestry right holding offers the possibility to separate wood and carbon right in such a way that different agents can manage timber and carbon. Need to cooperate.

Sometime agreement with industries for carbon right holding.

<u>NZ ETS scheme</u>

In NZ almost all the commercial forestry is private ownership while in other ETS countries it is public.

Forest units under Kyoto was given to the government➔ forest owners did not agree and claim to receive these units, strong lobby from FOA against the government (2007-2008), strong political battle. Forest were going to be first liable participant to ETS, foresters claimed for earning units as well.

Forest should not be the solution to tackle climate change. Industrial and agriculture emissions have the responsibility.

<u>Land use decision</u>

Carbon units has been a very strong economic signal. Efficient since $10-$15 to influence decision making.

The tradeoff is between forestry and sheep-beef farming.

Even without ETS, today is more interesting that livestock but cash flow starts after 25- 30 years. With ETS cash flow since the beginning then even better.

Problem: Planting in NZ is by waves, not progressive. According to prices, big waves of planting. But induces big wave of harvesting after 25-30 years. Saw tooth of carbon sink for commercial areas then.

Current average of new planting= 15 000 ha/year   in the 90' = 100 000 ha/year

Permanent forest sink: interesting for land without use. No possible for farming and livestock (steep land). Regular income easy to manage.

Hard for the big to buy the small: For most of smallholders, forest is a secondary activity because they are farmers and want to keep farming. With corporates and syndicates who want to buy land it is hard because farmers agree to sale only forest land and keep farmland. However, corporates and syndicates need to gather their land for the work and machines.

<u>ETS functioning</u>

Most of owners (smallholders) are not experienced.

Need for simple system ➔ look up table

But need to talk with consultant: The cost is lower than the money they lose with mistakes and bad decisions.