THE POWER OF NATURE: ACCELERATING CARBON PRICING POLICIES AND LEGAL FRAMEWORK FOR ECUADOR

COLUMBIA | SIPA
School of International and Public Affairs

THE EARTH INSTITUTE
COLUMBIA UNIVERSITY

SPRING 2021

SPRING 2021

CAPSTONE WORKSHOP FINAL REPORT

PROGRAM DESCRIPTION

This research and analysis was conducted as part of the Capstone Workshop in Applied Earth Systems Management in partial fulfillment of the requirements for Columbia University's Master of Public Administration in Environmental Science and Policy. This workshop pairs student groups with clients in the non-profit or government sector to conduct in-depth research, policy analysis and present policy recommendations. Our workshop team was honored to conduct research and analysis of carbon pricing mechanisms and nature-based solutions to fund conservation initiatives on behalf of Conservation International.

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ACKNOWLEDGEMENTS

We would like to thank our client contacts, Carolina Rosero, Director of the Amazon Program, and Montserrat Alban, Environmental Services Manager, of Conservation International for this opportunity to contribute research and analysis to a critical conservation problem for the Ecuadorian government.

With special thanks to our faculty advisor, Sara Tjossem, Senior Lecturer in International and Public Affairs, for her boundless support and guidance throughout this process.

REPORT CITATION

Corrêa, K.K., Kenny, J., Kuhner, R., Levy, A., Macchione, G., McGinnis, C., Smith, G., Tolomiczenko, S., Wilson, E. The Power of Nature: Accelerating Carbon Pricing Policies and Legal Framework for Ecuador. April 2021. Columbia University, Capstone Workshop.

Cover page image source: WallpaperCave. 2021

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ACRONYMS & ABBREVIATIONS

AFOLU	Agriculture, Forestry, and other Land Use
˚C	Degrees Celsius
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFUG	Community Forest User Groups
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CONENIA	Confederation of Indigenous Nationalities of the Ecuadorian Amazon
ETS	Emissions Trading System
GCF	Global Conservation Fund
GHG	Greenhouse gas
Gt	Gigaton
LULUCF	Land Use, Land Use Change, and Forestry (emissions)
NBS	Nature Based Solutions
NDC	Nationally Determined Contribution
RBCF	Results Based Climate Financing
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDD+	Extends REDD by including sustainable forest management, conservation of forests, and enhancement of carbon sinks
SDG	Sustainable Development Goal
tCO_2e	Metric ton carbon dioxide equivalent
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Market
VER	Verified Emissions Reduction

Pinas, Ecuador.
Photo Credit: Jamie Serrano.

Photo credit: WallpaperCave. 2021

EXECUTIVE SUMMARY

Although Ecuador is responsible for only 0.11% of global greenhouse gas emissions, Ecuador understands the global and regional risks associated with climate change and has proven to be a leader in the implementation of conservation initiatives.[1] In 2008, Ecuador became the first country to recognize the rights of nature in its Constitution, and in 2019, Ecuador was one of the first countries to receive results-based payments for tropical forest protection from the United Nation's REDD+ program and the Green Climate Fund .[2] This report evaluates opportunities for Ecuador to achieve financial sustainability for current conservation and restoration initiatives, notably the Socio Bosque Program, by utilizing available carbon pricing mechanisms.

To ensure long-term funding for Ecuador's conservation efforts, our team recommends two distinct approaches. The first approach, which respects the limitations on carbon pricing posed by Ecuador's current legal framework, is to implement and support the Ecuadorian Ministry of the Environment's Carbon Neutral Environmental Recognition Program, a novel type of certification carbon crediting mechanism, convene a working group to determine proper incentives for the private sector, and launch an associated marketing campaign to attract international investment.

The second approach is for Ecuador to employ the carbon crediting mechanism that will deliver financial stability for national conservation programs, contingent upon a change in the constitution allowing carbon crediting mechanisms to be permissible. While carbon crediting mechanisms have the potential to reduce total mitigation costs, market-based mechanisms tend to have socioeconomic and equity implications that should be considered when entering into a carbon pricing scheme.

While the current constitution in Ecuador prohibits the implementation of carbon pricing mechanisms, there is growing recognition of the potential of these market-based policies to leverage private sector funds for conservation initiatives, and there are ongoing conversations regarding opportunities to amend these constitutional restrictions. As an increasing number of individuals, international organizations, and private sector entities hope to receive credit for investment in tropical forest conservation programs like the Socio Bosque Program, carbon crediting mechanisms may deliver a path to financial stability while preserving biodiversity and cultural diversity.

PROJECT FRAMEWORK AND METHODOLOGY

RESEARCH QUESTIONS

In partnership with Conservation International Ecuador, our team formulated two research questions to guide the project:

1. What options exist to fund conservation initiatives such as the Socio Bosque Program using carbon pricing and private sector funding, and what are the barriers to using these mechanisms in Ecuador?
2. What are the gains and losses from participating in international/private sector carbon pricing schemes?

RESEARCH APPROACH

While there are many options for carbon pricing and private sector engagement in conservation, we chose to focus on three recommended approaches for Ecuador:

1. Emissions tax ("carbon tax")
2. Emissions trading system ("cap-and-trade")
3. Carbon crediting

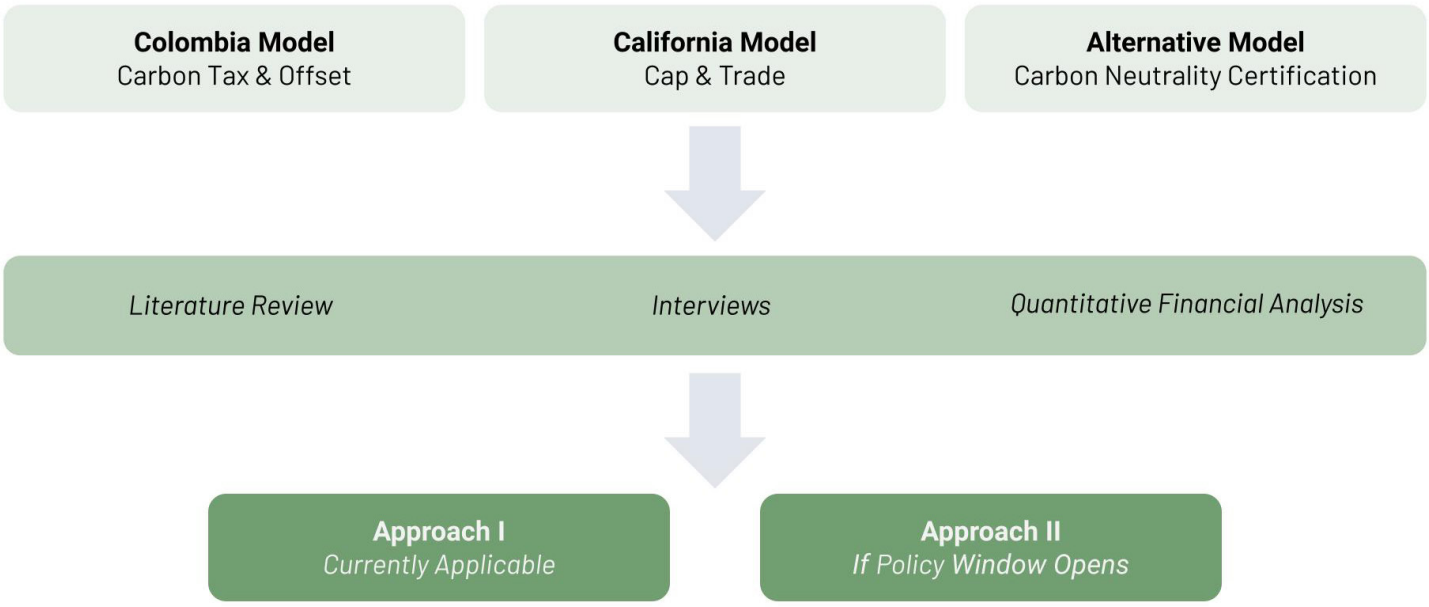

Figure 1: Project Scope.

The feasibility of each pathway was then tested against the following research considerations to determine if implementation would generate revenue and/or be constitutional.

RESEARCH CONSIDERATIONS

For each recommended approach we considered:

1. What are the barriers to implementing this system in Ecuador?
2. What are the political, social, and financial outcomes?

The research was conducted through expert interviews, an extensive literature review, and a quantitative financial analysis.

EXPERT INTERVIEWS

In order to gain insight into the different perspectives of stakeholders engaged in Ecuador's conservation and carbon pricing mechanism opportunities, the team interviewed members of the Ecuadorian government, environmental think tanks, and the private sector. The complete list of interviewees, including their organization, position, and interview date, can be found in the Appendix: Expert Interviews, Table 1. For each interview, a set of guiding questions were derived in accordance with the interviewee's professional background (Appendix: Expert Interviews, Table 2). The interviews were used as a qualitative tool to gather expert knowledge and different assessments of key opportunities and challenges related to Ecuador's forest conservation efforts and carbon pricing policies.

BACKGROUND

ECUADOR'S DEFORESTATION AND GREENHOUSE GAS EMISSIONS

Ecuador contains 2% of the Amazon Rainforest, a portion of the world's largest land-based carbon sink.[3] Prior to 2008, Ecuador had the highest rate of deforestation in South America.[4] Much of Ecuador's deforestation began with its oil boom in the 1970s, and more recently by agricultural expansion.[5] The Ecuadorian government, along with international oil companies, failed to acknowledge local land rights, removing large tracts of territory from indigenous control and failing to mitigate or compensate communities for pollution damage.[6] These drivers of deforestation are closely linked to Ecuador's economy, which is largely based on the export of oil and agricultural products.[7]

In a bid to slow the rate of deforestation and protect its economy, in 2008 the Ministry of the Environment launched a national initiative, the Socio Bosque Program, to conserve forests and alleviate poverty. Since 2011, Ecuador's efforts to reduce deforestation have been funded in part through the United Nations' REDD+ program. Ecuador was the second country, after Brazil, to enter into this program.[8] In recognition of its conservation efforts, resulting in 3.6 million tons of CO_2 equivalent emissions avoided between 2014 & 2015, Ecuador received $18.6 million from the UN Green Climate Fund in 2019.[9]

Based on Ecuador's greenhouse gas (GHG) emissions in 2010, the UN Intergovernmental Panel on Climate Change (IPCC) determined that Ecuador was responsible for 0.15% of the world's overall emissions.[10] Ecuador's energy sector accounts for 50% of its emissions, while agriculture, forestry and other land uses (AFOLU) account for 43%.[11] In 2020, Ecuador updated its 2015 Nationally Determined Contribution (NDC), advancing beyond reduction targets that had only covered two sectors, energy and AFOLU, to an aggregate unconditional target to reduce emissions of the agricultural, energy, industrial processes and waste sectors 9% by 2025, or conditionally up to 20.9% if Ecuador receives international support.[12]

Photo (above): Aerial shot of deforestation in Ecuador. ***Photo Credit:*** Mongabay.

ECUADOR'S LEGAL FRAMEWORK

Ecuador's current legal framework has a strong emphasis on Indigenous rights and the rights of nature. Historically, in many countries, nature's legal protections have been derived from the rights of humans to enjoy nature in its unspoilt form, and benefit from ecosystem services. In 2008, the amendments to the Ecuadorian Constitution formally recognized that nature has rights of its own. This marks a shift away from the more common anthropocentric view and promotes one that is increasingly aligned with the beliefs of Indigenous populations.[13]

Ecuador's constitutional recognition of nature's rights has important consequences for carbon pricing mechanisms. Under the 2008 revisions to the constitution, it is not permissible to appropriate any of the benefits from nature, including environmental services.[14] The absorption of carbon dioxide by Ecuador's forests is considered an ecosystem service. Therefore, any mechanism which places a price on carbon dioxide emission or mitigation is considered an appropriation of environmental benefits and is not permissible under the current constitution. This means that many common forms of carbon pricing – including the sale of carbon offsets and emissions trading systems – are unconstitutional in Ecuador.[15]

ECUADOR'S NATURE-BASED SOLUTIONS (Socio Bosque Program)

Between 1990 and 2015, Ecuador's annual rate of deforestation was roughly 0.6% due to the expansion of agriculture, oil refineries, mining, roads, and illegal logging activities, as well as insecure land rights and fragile public institutions.[16] In response to the country's growing rates of deforestation, in 2008, the Ministry of the Environment of Ecuador (MAE) in collaboration with NGOs, introduced the Socio Bosque Program. This Program involves conservation agreements between Ecuador's private and communal landowners by offering economic incentives in the form of cash transfers conditional on the commitment of land owners to promote long-term forest protection and maintenance.

The Program is explicitly aimed to financially support the poorest landowners and communities in Ecuador and thus prioritizes funding for these groups. The Socio Bosque incentive scale for forest protection works

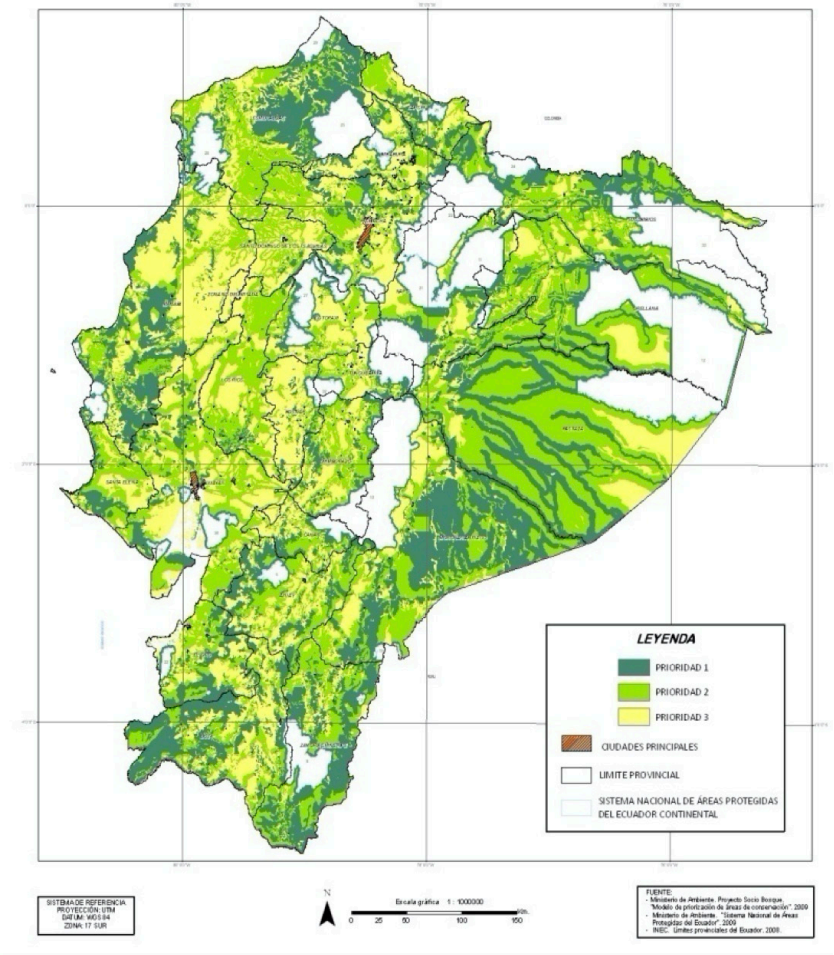

Photo (above): Prioritization Map: Areas with high deforestation threats.
Photo Credit: Ministry of the Environment of Ecuador.

as follows: each individual with twenty hectares or less of forest receives US $60 per hectare per year of forest land protected. Landowners with more than twenty hectares of forest land receive US $30 per hectare per year of forest land protected for the first fifty hectares.[17] Since the program's inception the government of Ecuador has invested US $61 million, which has protected over one and a half million hectares of forest coverage, and has made a huge impact in reducing Ecuador's annual net deforestation rates from 77,000 hectares to roughly around 44,000 hectares.[18]

INDIGENOUS AND AFRO-ECUADORIAN COMMUNITIES

There are an estimated 1.1 million indigenous peoples in Ecuador who constitute 14 different indigenous nationalities and make up over 37 villages across Ecuador.[19,20] Of these indigenous nationalities, 8 are found in Amazonia, 4 along the coast, and 2 in the Sierras.[21] Communities of African descent, often called Afro-Ecuadorian communities, make up around 3% of the country's population. The indigenous and Afro-Ecuadorian communities suffer from extensive discrimination, high levels of poverty, and low levels of education and access to basic health services.[22] Many consider themselves victims of capitalism, neoliberalism, and market policies that have promoted an extractive economy and exploited their natural resources. Thus, in 1986, the indigenous groups formed CONAIE (Confederation of Indigenous Nationalities of Ecuador), a national organization that established a participatory democracy to represent the interests of indigenous groups. Members of CONAIE are unified in their fight for rights to their land and natural resources, against civil and religious oppression, and for political representation, among other goals.[23]

Photo (above): The Achuar People. ***Photo Credit:*** Esteban Barrera.

The indigenous movement of Ecuador is one of the most active in the Americas, and the indigenous communities under CONAIE have garnered considerable political force and influence.[24]

The indigenous groups were one of the most influential groups in the creation of Ecuador's new constitution, which recognizes the rights of nature. This is, in part, based on *sumac kawsay*, the indigenous notion of good life.[25] However, the reform did not play out as the indigenous groups expected. While many communities hold land titles to their ancestral territories, the state retained ownership of subsurface minerals, effectively rendering the state the ultimate authority over natural resources such as oil reserves and the issuance of extraction permits.[26]

Communities are acutely aware of changing environmental conditions and have witnessed considerable changes in their environments and weather patterns. More than 60% of the country's forests are on indigenous lands and 24% of indigenous communities live in the Amazon, such that these communities are essential to maintain sustained forest conservation.[27,28] Many indigenous groups are skeptical of carbon pricing mechanisms, which have suffered pushback from indigenous groups who, until recently, were largely ignored during the development of such schemes and are at risk of losing ownership of their ancestral lands or being forced to operate within a framework developed by outsiders. There is now growing recognition of the importance of empowering indigenous peoples as part of environmental protection programs.

The Socio Bosque Program has great potential to lift families out of poverty while protecting the Amazon. It represents a viable way to equitably involve indigenous communities in national conservation and deforestation mitigation strategies while compensating communities for their safeguarding of forests through financial support. It is widely agreed that empowering indigenous communities is essential for successful conservation efforts.

CONSERVATION INTERNATIONAL
The Research Request

Conservation International is a non-profit environmental organization working towards empowering societies to responsibly and sustainably care for nature, our global biodiversity, and for the well-being of humanity. Our team at Columbia University has been working to help Conservation International Ecuador identify potential solutions to deforestation and GHG emissions through carbon pricing mechanisms and nature-based solutions that can be shared with decision makers and government representatives. Our task is to find a way to leverage funding from the private sector to sustainably fund conservation initiatives, primarily the Socio Bosque Program, that promote equity and work directly with Indigenous and Afro-Ecuadorian forest communities.

Conservation International Ecuador's requested we had five key objectives:

1. Determine how Ecuador can use carbon pricing mechanisms to fund conservation initiatives
2. Analyze the gains and losses of Ecuador entering international carbon markets
3. Evaluate emissions tax, emissions trading systems and carbon offset scenarios
4. Understand Ecuador's legal framework in relation to carbon pricing mechanisms
5. Compare and contrast other countries successfully implementing carbon markets and if this could be a viable option for Ecuador.

DISCUSSION OF KEY TOPICS

Photo: An aerial view above the canopy layer in the tropical rainforest of Ecuador after a storm.
Photo Credit: Evan Austen.

DISCUSSION OF KEY TOPICS

Carbon Pricing

Carbon pricing assigns a price to GHG emissions, shifting the societal external cost of the emissions towards the businesses responsible.[29] Reflecting the 'polluter pays' principle, responsible carbon pricing systems should strive to distribute costs equitably, ensuring vulnerable groups do not bear a disproportionate burden.[30] With a carbon price, both producers and consumers of carbon-intensive products are forced to recognize the social cost of their behavior.[31] Carbon pricing is an example of an incentive-based policy and generally considered by economists to be more efficient than a regulatory approach.[32] There is growing consensus that carbon pricing will have a fundamental role in the transition to a global decarbonized economy.[33] In 2020, 64 carbon pricing initiatives implemented or scheduled for implementation covered a total of 12GtCO_2e, ~22% of global GHG emissions. (Figure 1) Carbon pricing initiatives have an explicit price on GHG emissions, usually expressed as a value per ton of carbon dioxide equivalent (tCO_2e).[34] The two main types of carbon pricing initiatives are a carbon tax (emissions tax) and an emissions trading system.

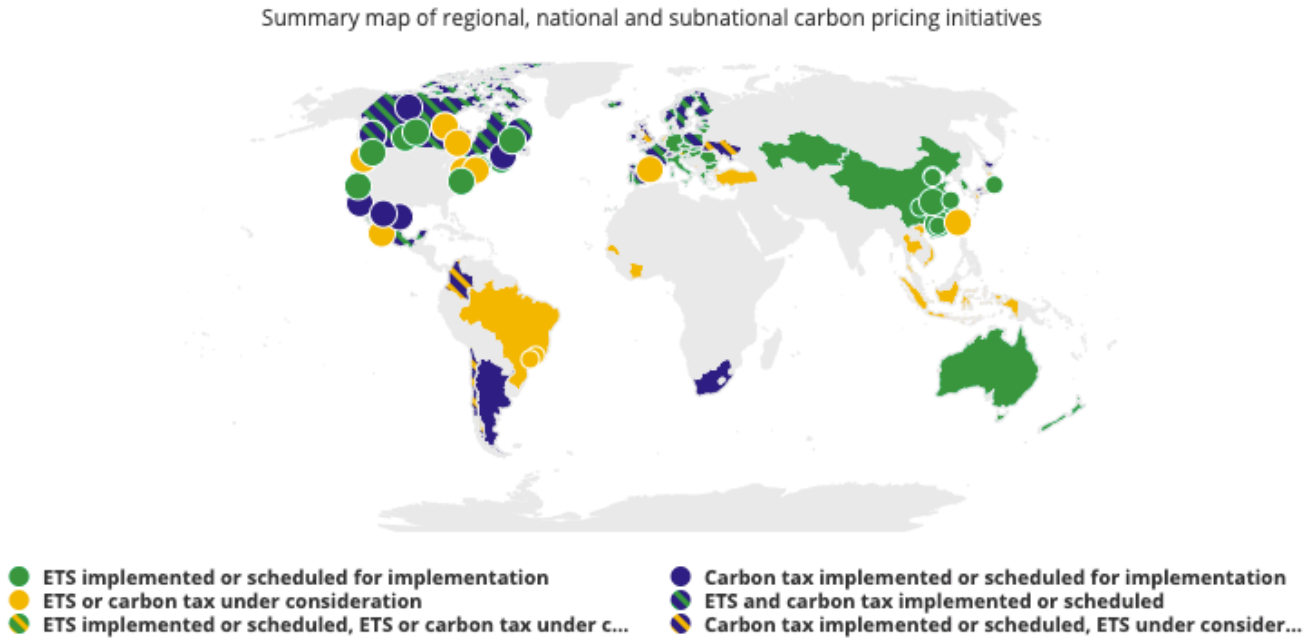

Figure 2: Summary map of regional, national and subnational carbon pricing initiatives (World Bank Group, 2021).[40]

An emissions tax sets a price on emissions by levying an explicit tax rate. The tax provides an incentive to lower emissions to reduce the tax obligation. Most commonly, an emissions tax is placed on the carbon content of fossil fuels, raising the price of carbon.[35] Econometric analysis has found a higher price for carbon will reduce the demand for fossil fuels and will induce a reduction in carbon emissions.[36] An emissions tax provides certainty over the price of emissions but provides no certainty over emissions.[37] Relative to an emissions trading system, an emissions tax provides a more stable price signal to investors and often has a higher price for emissions.[38] As of February 2017, 24 countries or subnational jurisdictions had adopted or had plans to adopt an emission tax. (Figure 2) As schemes continue to be adopted around the world, emissions taxes have proven to be a versatile instrument to achieve varying policy aims.[39]

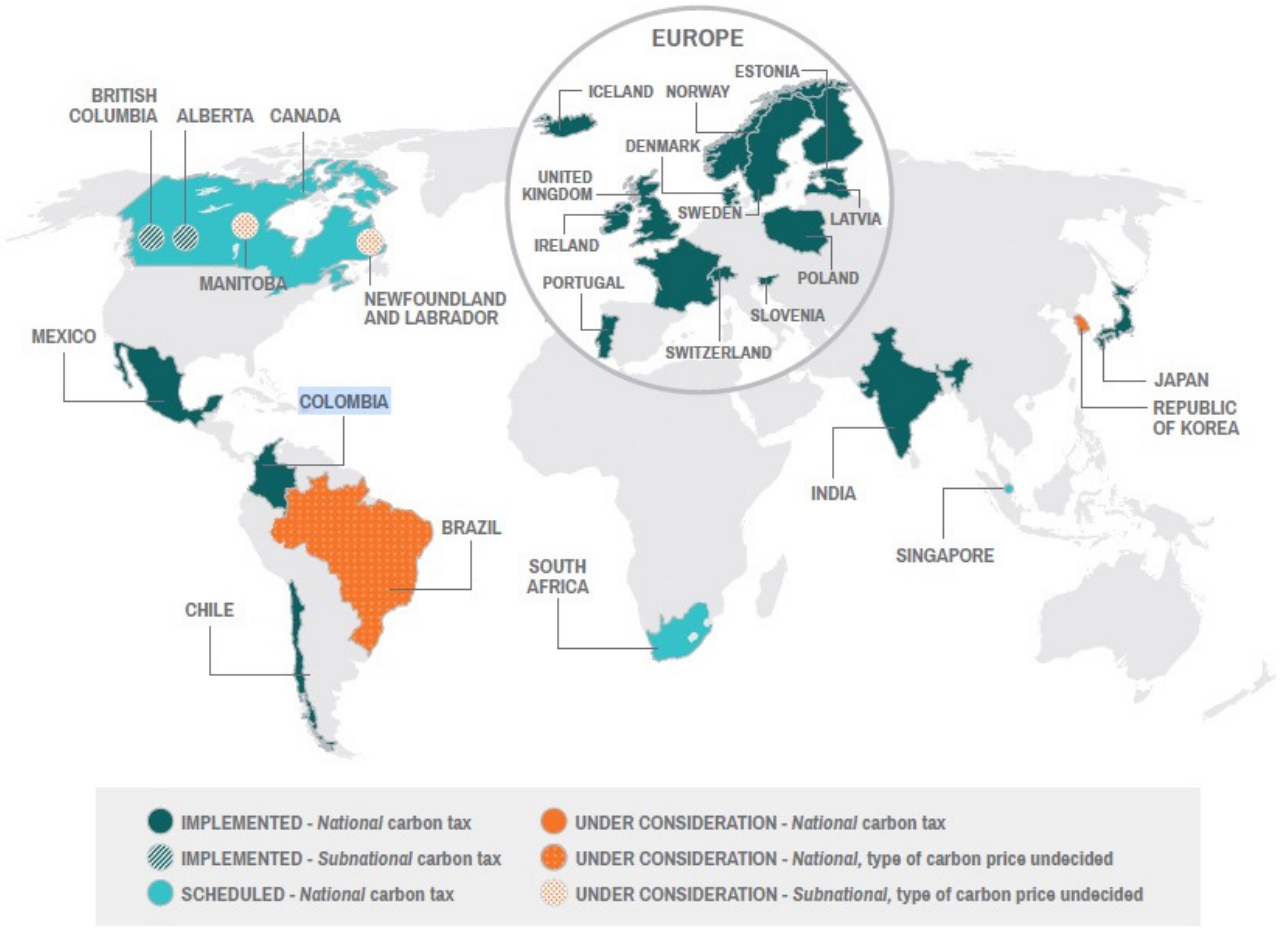

Figure 3: Carbon taxes in operation, scheduled, or under consideration (World Bank Group, 2017).[41]

An emission trading system (ETS) is a flexible and cost-efficient market-based instrument for climate change mitigation.[42] An ETS provides certainty over emissions but provides no certainty over the marginal cost of emissions.[43] Sometimes referred to as a cap-and-trade program, an ETS restricts or 'caps' the quantity of GHG emissions permitted within defined sectors of the economy. Over time, the cap typically declines, reducing pollution and providing a growing incentive for firms to reduce emissions.[44] Regulators first determine the 'cap', the upper limit of emissions within the economy, and then split the cap into a number of allowances. Each allowance permits a firm to emit one ton of emissions. The 'cap' provides greater environmental control of overall emissions than an emissions tax, which defines a fixed emissions price but does not restrict emissions. Allowances, or permits to emit within a defined time period, are allocated to firms within defined sectors of the economy, either freely or through an auction.[45] Firms are then allowed to emit a set amount of GHGs, as determined by the number of allowances they hold.[46] At the end of each defined time period, firms must surrender a number of allowances equal to their respective emissions over the defined time period. Firms with leftover allowances can 'bank' allowances for future use or 'trade' allowances to other firms that pollute more, in effect selling their right to pollute. By focusing on emission reductions in firms with the lowest mitigation costs, an ETS can offer economic efficiency. An ETS provides flexibility, rewards innovation and encourages firms to reduce pollution faster than otherwise would be expected.[47]

As of 2020, jurisdictions comprising 42% of global GDP and ⅛ of the global population are using an ETS, with 9% of global emissions covered.[49] (Figure 3) To reach mitigation targets, more jurisdictions are considering complementary carbon pricing initiatives beyond existing carbon pricing systems.[50] Carbon crediting mechanisms have begun to occupy a substantial part of the market and are increasing in use as jurisdictions strive for net-zero.[51] The majority of crediting mechanisms are set up for domestic compliance.[52] The World Bank estimates that the largest use of carbon credits in the near future will be by companies to offset part of their emissions to fulfil compliance obligations or voluntary commitments.[53] Policymakers can choose to link credits to an emissions tax or emissions trading scheme to provide regulated emitters an alternative means of compliance.[54]

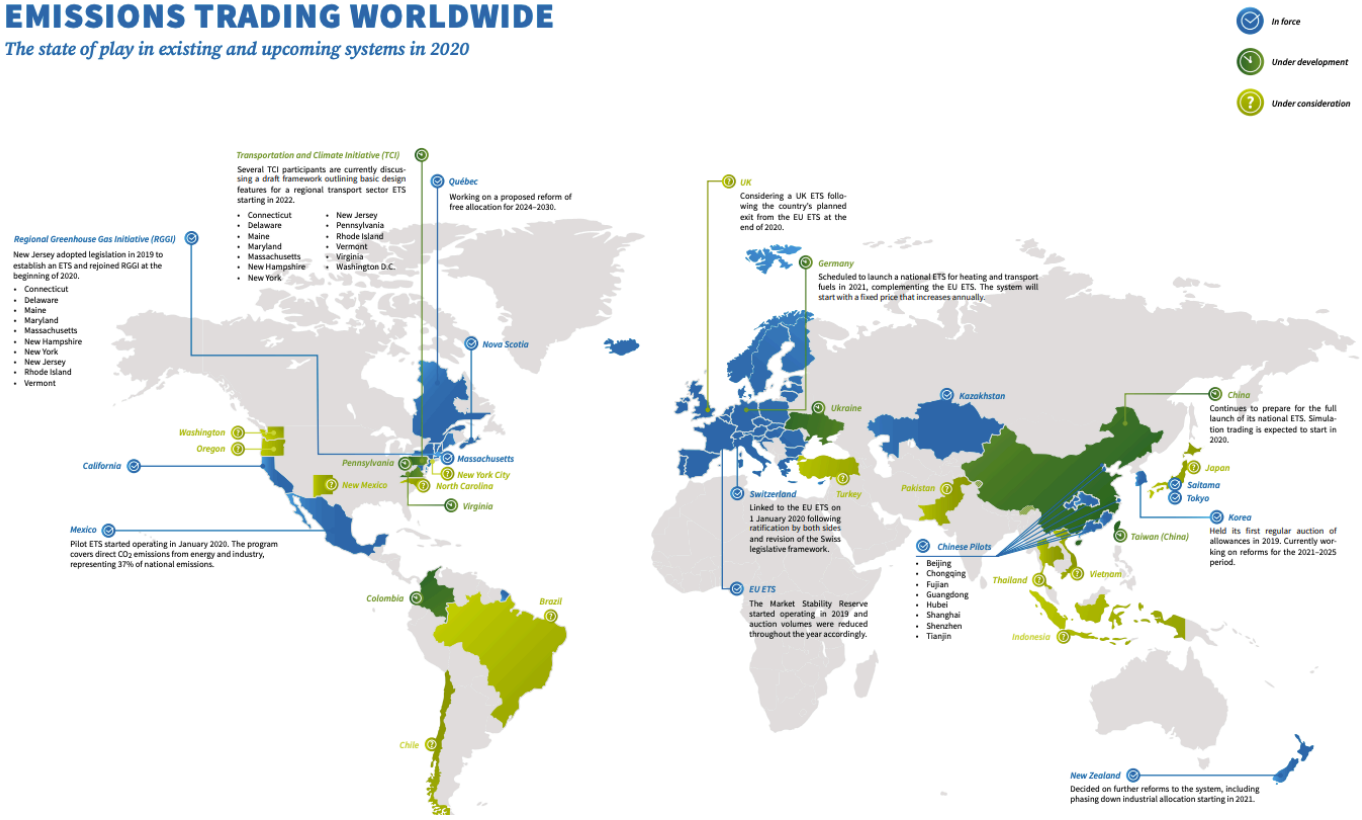

Figure 4: Emissions Trading Worldwide (ICAP, 2020).[48]

With crediting mechanisms, GHG emission reductions from project-based or program-based activities are sold domestically or internationally.[55] Actors or entities that implement approved emission reduction activities are issued tradable units, 'credits'.[56] Generated both by public and private entities, credits are registered and issued according to the project-based or program-based accounting protocol.[57] Credits are equal to avoided or sequestered emissions relative to the emissions associated with business-as-usual operations, as shown in the figure below.[58] (Figure 4)

Credits issued under carbon crediting mechanisms can be used as 'offsets', allowing the emission reductions achieved by one entity to offset the emissions of another. Offsets can be used by regulated entities to meet the mandatory compliance obligations of an emissions tax or emissions trading scheme or used by individuals and organizations to meet voluntary compliance or corporate social responsibility goals.

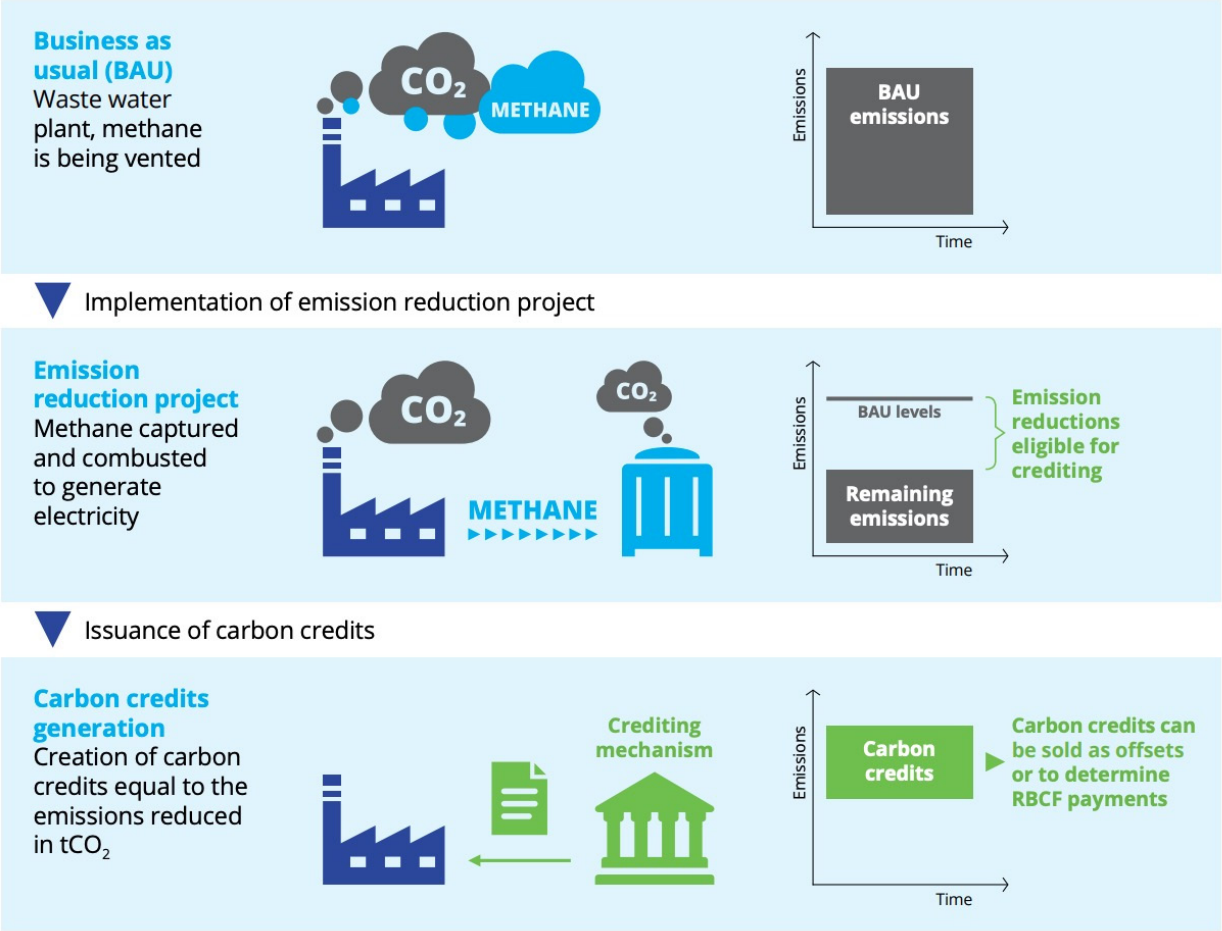

Figure 5: Carbon crediting explained (World Bank Group, 2020). [59]

Voluntary Carbon Markets

Voluntary Carbon Markets (VCMs) allow for the voluntary purchase of carbon credits in a relatively unregulated market. VCMs remain informal without clear standards or price transparency. VCMs allow interested parties in unregulated sectors that have not ratified the Kyoto Protocol, for example the US, to offset emissions.[60] The market is less stringent in terms of verification than compliance markets and therefore allows for more experimentation and innovation of projects and methods of offsetting, allowing companies to gain experience with carbon markets to facilitate future participation in cap-and-trade.[61] VCMs have been criticized for the related challenges with quality assurance and implementation of projects that would have happened anyways.[62] By 2019, VCMs had achieved 608 million tCO_2 emission reductions.[63]

Given the voluntary and unregulated nature of these markets, there is currently no centralized repository for VCM price and volume data.[64] As VCMs grow, prices are projected to decrease, and there is a mounting urgency for the market to evolve into a formalized system to mitigate potential future supply shortages.[65] It is estimated the VCM market could reach a value of $50 billion by 2030, and VCMs are promoted as important sources of financing for climate-action related projects, specifically those relating to biodiversity protection.[66] To scale up VCMs to meet demand, experts suggest strengthening verification methods, advertising demand signals to encourage investor lending, and setting quality standards to facilitate buyer-supplier partnerships.[67]

There is currently a high demand for carbon offset projects associated with REDD+ in developing countries.[68] The Global South has the largest potential for nature based sequestration projects, and the future supply of carbon credits is predicted to primarily come from nature based sequestration and avoided nature loss projects in a concentrated number of small countries, including Ecuador.[69]

Other Existing Crediting Mechanisms

Emergent: Forest Finance Accelerator[70]
Emergent operates as a professional market facilitator, purchasing and selling verified REDD+ credits. Emergent hopes to pair the ambitious climate ambition of the private sector with forest protection. Despite conversations with the Ministry, the international non-profit Emergent has yet to establish a partnership with Ecuador.

Plan Vivo: For Nature, Climate and Communities[71]
Plan Vivo certifies ecosystem service projects for carbon credits to be sold on the voluntary carbon market. Internationally recognized Plan Vivo has been in operation for over 20 years and is the leading standard for community land-use projects. Four Plan Vivo-certified projects have won international awards (UNDP Equator Prize and UNDP SEED Award).

Multinational Compacts

Joint Declaration of Intent II
The Joint Declaration of Intent II refers to a results-based payment program for reduced deforestation. It includes multilateral agreements between the Kingdom of Norway, the Federal Republic of Germany, and the United Kingdom of Great Britain and Northern Ireland and another country that is seeking assistance to reduce GHG emissions from deforestation and forest degradation. Previous participating countries include Colombia, Brasil, Peru, and Indonesia. The implementation of such an agreement depends largely on the political willingness of the country wishing to reduce deforestation.[72]

Norway's International Climate and Forest Initiative[73]
At the UNFCCC Climate Change Summit COP13 the Prime Minister of Norway pledged an annual investment of up to 3 billion NOK (~USD 348 million) to reduce deforestation. Since 2007, the Norwegian government has supported efforts to reduce deforestation in 70 countries. The initiative was scheduled to end in 2020 but was extended until 2030.

Gains and Losses of Ecuador Not Entering International Carbon Markets

Gains

The last decade has showcased global growth of climate financing mechanisms. In 2019, there were 61 carbon pricing initiatives that were either in place or scheduled for implementation, earning a total of $45 billion in revenue.[74] Despite the increase in carbon pricing projects in many jurisdictions, they are not substantial enough to meet the goals and timeline of the Paris Agreement or the Nationally Determined Contributions (NDC) that individual nations have committed to.[75] Moving forward in countries' abilities to meet their NDCs, nature-based solutions will be imperative. While the primary goal of carbon pricing mechanisms is to reduce emissions, well-designed initiatives can deliver substantial environmental, economic, and social benefits.

Although Ecuador is responsible for only 0.11% of global GHG emissions, Ecuador understands the global and regional risks associated with climate change and has proven to be a leader in the implementation of conservation initiatives.[76] In 2008, Ecuador became the first country to recognize the rights of nature in its Constitution, and in 2019, Ecuador was one of the first countries to receive results-based payments from the REDD+ program and the Green Climate Fund.[77] Ecuador's energy sector is the largest contributor to its GHG emissions, contributing 47% of the country's GHG emissions, followed closely by the Land Use, Land Use Change, and Forestry (LULUCF) sector, which contributes to 25% of the country's GHG emissions.[78]

As a part of their NDCs to the Paris Agreement, Ecuador has committed to reducing emissions from its LULUCF sector by 4%, or an additional 16% if aid from international institutions is available.[79] Ecuador has been able to tackle this commitment through funding from REDD+, the Global Climate Fund, and the Socio Bosque Program. However, funding for conservation projects and LULUCF emissions reductions projects can be delayed and are not always guaranteed. Participating in carbon pricing initiatives can lower the costs of meeting emissions targets. An analysis of carbon pricing policies conducted by the Environmental Defense Fund, an environmental non-profit organization, found that employing global carbon emissions trading to meet Paris Agreement pledges could reduce total mitigation costs by 79%.[80] Reinvesting these savings in the Socio Bosque Program or other forest conservation programs would enable Ecuador to catalyze their ability to meet their NDCs.

Losses

Carbon pricing mechanisms and international carbon markets have become important components of climate change policy and mitigation around the world. However, concerns have been raised in regards to the use of the market to reduce emissions. Some of these concerns include the socioeconomic and equity implications of market-based emissions regulations and the ethical dilemmas of putting a price on the natural environment. As stated throughout this report, there are several mechanisms by which GHGs can be reduced including carbon taxes and cap-and-trade systems. Each of these approaches have undesirable results, creating winners and losers through distributional impacts.

There are a number of persistent issues with carbon pricing. A primary dilemma associated with carbon pricing is that of equity, including the potential regressive impact of increased energy prices on low income households and the economic hardship that may be placed on individuals and communities that are reliant on fossil fuels for their livelihoods. Should Ecuador choose to participate in global carbon markets, or other carbon pricing initiatives, there would need to be mechanisms in place to ensure that revenue is distributed properly. These types of mechanisms can include re-distribution of revenue, investment in local clean energy initiatives, tightening regulations on pollutants, or greater investment in reforestation and afforestation projects.[81]

In addition to unintended social consequences, the efficacy of international carbon markets would require the participation of all sectors and industries, ideally a uniform price being placed on carbon. In the absence of uniform pricing, there is a risk that some sectors or nations will take advantage of the efforts of others. However, establishing a uniform global price requires a level of international cooperation and coordination that has not yet been achieved. Additionally, a universal approach to carbon pricing will require well-functioning international structures and regulatory competencies and monitoring systems that are currently not in place to the extent that they need to be to prevent exploitation of the system.[82]

CASE STUDIES

Colombia's Emission Tax

In 2017, Colombia implemented a Col$ 15,000/tCO_2e tax on liquid fossil fuels. The tax is applied upstream to companies that import liquid fossil fuels to Colombia or produce liquid fossil fuels in Colombia. "Piggybacking" on existing tax instruments, the emissions tax is integrated with the country's existing fuel tax regime which offers administrative, legal and political advantages.[83] The tax covers 24% of the country's GHG emissions.[84] The Departamento Nacional de Planeación (National Planning Secretary) estimates the tax reduced the country's emissions by ~1% within the first year of the tax's enactment.[85] Unlike many other emission taxes, Colombia provides companies the flexibility to exempt part or all of their tax obligation by certifying national carbon offsets. To provide businesses flexibility in tackling emissions, countries are increasingly pairing a domestic carbon tax with a crediting mechanism. Companies that import liquid fossil fuels to Colombia or produce liquid fossil fuels in Colombia can opt to invest in low-carbon development projects that align with national priorities rather than pay the tax. The tax raised US$ 161 million in 2017 and US$ 90 million in 2018. All of the revenue raised from the tax will finance environmental and rural development projects with 30% of total revenue raised allocated to natural climate solutions.[86]

Photo (above): Serrania de Chiribiquete Natural National Park, Colombia. ***Photo Credit:*** César David Martínez / WWF Colombia.

California's Emissions Trading System (ETS)

California passed the Global Warming Solutions Act in 2006 and implemented a cap-and-trade program in 2012.[87] The ETS set a limit on emissions while providing firms the flexibility to find the lowest-cost reductions.[88] California has demonstrated that economic growth can be paired with climate ambition, with a 20% increase in Gross State Product and a 13% reduction in GHG emissions between 2006 and 2017. Climate investments from the ETS' revenues have preserved or restored over 250,000 acres of land in California since 2012.[89]

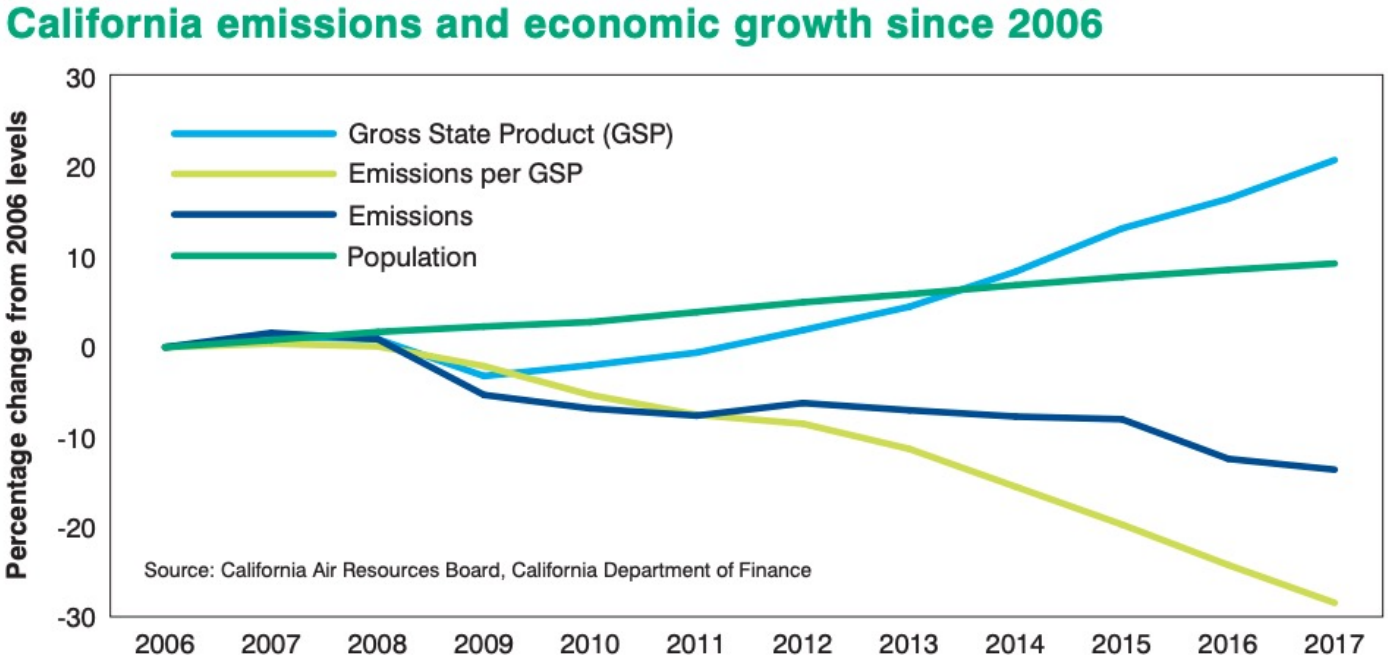

Figure 6: California emissions and economic growth since 2006. (Environmental Defense Fund).

The program covers 80% of the state's GHG emissions and includes five sectors: power, industry, transportation, residential and commercial. Over a five year period, from 2013-2018, the program raised US$ 9.5 billion and reduced emissions from sources subject to the cap by 10%.[90] Since the program started, US$ 2 billion of revenues raised have been invested to benefit disadvantaged communities. On an annual basis, 35% of revenues raised are dedicated to disadvantaged and low-income communities. In 2018, the ETS raised US$ 3,019 million in revenue. In 2014, California and Quebec connected their systems to build a strong market with great potential.[91]

Financial Analysis

We conducted a basic financial analysis of potential revenue generation from a carbon tax and offset system in Ecuador. We modeled this based on the current Colombian system. As our analysis is ultimately concerned with revenue generated for the government, we did not consider revenue to individual offset project owners, although the overall revenue generated for offsets in total was estimated. While our model links the offset market with the carbon tax insofar that the quantity of total taxable emissions is reduced by the number of offsets sold, we did not consider the impacts of offset price as compared to tax rate in our analysis. In theory, when the offset price is lower than the tax rate, more emissions will be offset, and tax revenue will be lower. However, in Colombia this has also been constrained by offset availability, as the price of offsets has consistently been lower than the tax rate, and yet the number of offsets retired each year is smaller than the quantity of emissions for which the tax is paid.

We estimated Ecuador's emissions from liquid fuels over a ten-year period based on historical emissions data from the World Bank.[92] We then considered the tax revenue from these emissions without a complementary offset market in place. The revenue in Year 1 under this scenario was found to be approximately $240 million, if we assume a tax rate of $5 per tCO_2.

For the offsets, the trends in the offset price compared to the Colombian tax were variable, and we were unable to derive a relationship. This is due to the influence of multiple factors and the relatively short time period for which data exists. For this reason, we simply assumed an offset price of 85% of the tax rate. As we are more concerned with government revenue than revenue to offset projects, we felt this was a reasonable simplification.

The net tax revenue was calculated from the emissions quantity that is not offset. We considered various starting tax rates, ranging from $3 to $10 per tCO_2 emitted, and considered the tax rate to increase each year by between 0% and 10%. Under these assumptions we found that a tax rate of $5 per tCO_2 would generate approximately $165 million in the first year in tax revenue. The lowest tax rate considered was $3 per tCO_2, and this was projected to generate $100 million for the Ecuadorian government. While this is below a tax rate that most environmental economists would consider effective, this is a reminder that our primary concern in this analysis is revenue generation rather than emissions reduction.

We conducted some high-level financial analysis using the California ETS as a model framework for an ETS implemented in Ecuador. The analysis was modeled after the first two years of the California ETS, as in 2013 California expanded the system to merge with Quebec and create a joint ETS. We assumed a nationally bounded system for Ecuador, and so limited our data to the comparable years of the Californian ETS before the expansion to include Quebec. While an ETS will generate revenue for certain participants who choose to sell permits to other participants, our analysis is primarily concerned with government revenue. For this reason, the financial analysis is solely concerned with revenue generated during the permit auction process.

Using emissions and auction data from the California Air Resources Board, we estimated the cap level as a percentage of total emissions for the years in which the ETS has been operating.[93] We also identified the annual changes in the initial auction price of the allowances. However, during the first years of the ETS prices were very variable, so we chose to consider multiple predetermined cases for the annual price change in auctioned allowances.

Based on these data and Ecuador's emission data, we established an initial emissions cap for an ETS in Ecuador of approximately 47 $MtCO_2$ under a 10% emissions cap scenario. We tested annual cap changes of 2%, 1%, and negative 1%. We used an auction price of $5 per allowance for most scenarios, but also tested a scenario with a starting price of $10 per allowance. We assumed the auction price would grow by 5% each year.

Based on the above assumptions, we estimate that an Ecuadorian ETS could generate approximately $23 million in its first year of operation. However, this simple model did not explore the relationship between emissions cap and auction price. For a larger emissions cap scenario, there are a greater number of allowances to auction, but the decreased scarcity would likely result in a decreased auction price.

CONSIDERATIONS

POLITICAL BARRIERS

There are various political barriers that may impact Ecuador's progress toward achieving its sustainability objectives. At the root of these political considerations is an understanding of the political feasibility of implementing an environmental policy. This process involves analyzing Ecuador's current political agenda and it's priorities, while also seeing if there is the potential for a political window or some political momentum to successfully implement environmental policies.

In order to determine if a policy is politically feasible, we must assess three interdependent aspects: 1) whether the actor or the person lobbying for a policy or initiative has the ability to influence and implement policies; 2) whether all policy alternatives have been carefully considered and; 3) whether there is a time sensitive external event that can be leveraged as an incentive for action.[94]

One potential political barrier Ecuador is currently facing is that both candidates of the 2021 Presidential run-off election are highly conservative and have yet to publicly state their intent to prioritize environmental policies. This poses a challenge for the implementation of effective environmental policies as they may not be at the forefront of the political agenda. Additionally, the majority of Ecuador's environmental programs are tied to the current administration, presenting a challenge for the longevity of these initiatives. Despite these challenges, the Socio Bosque Program is an example of a successfully implemented long-lasting environmental initiative. The Program has persisted in part because it is decentralized from national control and reflects local concerns. These characteristics have led to broad political support for the program, and demonstrate the importance of taking advantage of the 2008 political window and constitution change. These two factors were crucial as they helped anchor the MAE's combined objectives of nature conservation through forest management and poverty alleviation within the framework of the revised constitution.

SOCIAL IMPACTS OF CARBON PRICING MECHANISMS

The following section will attempt to evaluate the social impacts of carbon pricing mechanisms, as well as discuss established best practices to promote forest conservation that prioritizes community empowerment.

Scholars have recognized that the impacts of carbon taxes have not been comprehensively evaluated in developing countries, and carbon pricing policies often have regressive economic impact.[95] In general, carbon taxes and cap-and-trade schemes disproportionately impact low-income households for which increases in prices of goods, notably fuel and energy, represent a larger share of their household income.[96] However, this impact can be neutralized with measures to re-distribute carbon tax revenue. Since 1997, the government of Costa Rica has implemented a carbon dividend program to accompany their carbon tax. The revenue from the tax is directed towards the Payment for Environmental Services program, distributed by National Forestry Financing Fund (FONAFIFO), which incentivizes land owners to improve land management practices and promote conservation in return for payouts.[97] The government prioritized highly forested, poorer districts for these payouts and assisted indigenous communities in submitting requests for funds, such that 40% of the beneficiaries of the carbon tax revenue are people living below the poverty line.[98] However, given the larger proportion of poor communities living in highly forested districts, some scholars argued that the government should have been more explicit in using the revenue to support social development projects directly, such as helping to achieve many of the Sustainable Development Goals (SDGs), including SDG 1: eliminate poverty, SDG 2: zero hunger, and SDG 3: good health and wellbeing.[99]

While Costa Rica was seemingly successful in developing a more equitable system of carbon taxation, there exists widespread criticism of the genuine capacity of carbon pricing mechanisms to benefit forest communities. The Climate Justice Alliance and the Indigenous Environmental Network strongly advocated against carbon pricing schemes in a 2017 report, stating these policies "quantify Earth's resources to be sold as units in financial markets" at the expense of both the cultural and economic benefits that indigenous communities derive from the land.[100] The report finds that revenues from carbon pricing mechanisms rarely successfully benefit the communities, and rather the promise of compensatory revenues creates additional challenges for these communities to prosper in the long run.[101] Carbon pricing mechanisms can promote a paradigm of human domination over nature, which is often at odds with the belief systems of many indigenous communities.[102]

When forests are monetized, indigenous communities inhabiting the forests are forced to operate within the frameworks determined by foreign actors that focus on ecosystem-services, threatening existing ways of interacting with the forests, for example, by restructuring food-producing practices. A eucalyptus tree plantation in Sao Jose do Buriti, Brazil, funded by BP as a carbon offset soaked up vast amounts of water in the environment, severely impacting the ability of locals to grow their traditional subsistence and medicinal plants.[103] The plantation used herbicides and pesticides that killed surrounding crops and poisoned streams.[104] The Climate Justice Alliance and the Indigenous Environmental Network both argue native communities should be left to be natural caretakers of their land, a theory for which there is extensive supporting evidence.

Photo (above): Achuar community members. ***Photo Credit:*** Esteban Barrera.

In 2014, the World Resources Institute issued a report titled "Securing Rights, Combating Climate Change", outlining the various benefits that establishing Indigenous peoples and community rights to land provides. The study presents a multitude of statistics and covers various examples from around the world illustrating how granting land rights to indigenous communities is one of the most cost-effective forest conservation and climate mitigation strategies.

Community and indigenous owned forests experience consistently lower rates of deforestation. In Bolivia, Original Community Titles (OCT) grant indigenous people rights to manage the land. The government does not hold formal ownership, and while communities are not allowed to sell their land, they can request a permit from the government to exploit forest resources for commercial use.

Deforestation rates in regions with secured indigenous rights were 35% lower than in regions without secured tenure.[105] In Mexico, community managed forests in the Calakmul Biosphere Reserve experienced a 0.7% rate of deforestation from 2000 to 2005, while the nearby community managed forest experienced a near zero rate (0.002%).[106] Given the vast expanse of the Amazon rainforest and the high numbers of indigenous communities, Brazil provides a particularly informative case study.

The World Resources Institute estimates that, in Brazil, deforestation of indigenous community forests could have been 22 times higher without their legal recognition.[107] The creation of Article 231 during the constitutional reform of 1988 in Brazil recognized Indigenous rights to traditional lands. Since then, more than 300 indigenous lands have been recognized, including rights to subsurface resources, and while the government retains formal ownership, the indigenous peoples are allowed to manage the land and can use forest resources for commercial purposes that have been approved by the government. From 2000-2012, forest loss was 0.6% in Indigenous Lands, as compared to 7% in non-Indigenous lands.[108] This deforestation led to 27 times more carbon dioxide emissions than produced on indigenous community lands.[109]

The benefits of community-managed forest practices extend beyond just Latin America. Over the last 30 years, the government of Niger has increased support of farmer-managed natural tree regeneration. Forests used to be under government ownership, but these policies limited the benefits communities could derive from the land and increased community dependence on the government. In the 1990's, the government moved to recognize community land rights and allow farmers to harvest their timber. Over the past 20 years, farmers have regenerated around 200 million trees across 5 million hectares of agricultural land, with economic benefits amounting to up to USD $900 million annually.[110]

Photo (below): Traveling by boat into the Amazon jungle in Cuyabeno National Park, Ecuador. ***Photo Credit:*** Shutterstock.

In addition to lower deforestation rates, forests under indigenous ownership are larger carbon sinks due to effective management practices. Brazilian indigenous owned forests hold an estimated 36% more carbon per hectare than other areas of the Amazon, while deforestation of 22.5 million hectares of non-indigenous land from 2000-2012 released 8.7 billion tonnes of CO2.[111,112] Indigenous Reserves in Colombia have higher carbon density, at around 145 tonnes per hectare, as compared to non-Indigenous managed regions, which store an estimated 128 tonnes per hectare.[113] In Nepal, locals hold forest rights and are allowed to use them for subsistence and commercial purposes under Community Forest User Groups (CFUGs). As of 2013, CFUGs constituted around 1.6 million hectares of forest, 93% of which reported improvements in forest conditions under community management, including a 22% increase in vegetation density that significantly increased the carbon storage potential of these forests.[114]

These CFUGs have provided additional social co-benefits. Given the ability to subsist from the forests, around 32% of the population in Nepal benefits from CFUGs.[115] The government requires that at least 25% of the revenues derived from these forests are re-invested in rehabilitating the forest, and the rest of the funds must be used to support other community development projects. As a result, CFUGs have been a primary source of poverty reduction in the country.

Photo (above): Looking up the trunk of a giant rainforest tree, Ecuador.
Photo Credit: Dr. Morley Read.

As this section illustrates, there exist a wide array of academic works evaluating the social impacts of securing indigenous land rights. However, community land rights policies must be accompanied by robust government support and enforcement of these rights, if they are to be effective. While Peru recognizes Native Community Lands, poverty and migrant pressures coupled with government ownership of subsurface minerals undermine the ability of indigenous peoples to manage forests successfully. Over 83% of deforestation in Peru occurs near roads, such that when governments pursue mining operations, they attract settlers and illegal loggers that deforest the lands.[116] In Colombia, the widespread armed conflict that has plagued many regions has significantly limited the ability of the government to protect the rights of peoples to their forests.[117] While deforestation has been low on Indigenous Reserves, with a rate of 0.3% from 2000-2012 compared to 3.2% in other Amazon regions, a significant amount of forest (5-7%) has been lost to armed conflict and coca farming.[118]

Moreover, implementation of any strategy must explicitly address the concerns of indigenous and marginalized communities and must be sensitive to the history, politics, economics, and social contexts of the localities involved. For example, the large money transfers involved in REDD+ policies have created opportunity for corruption and negotiation of the rights of indigenous peoples throughout Latin America.[119] Various failures of policy and regulatory frameworks relating to forests have resulted in unsuccessful REDD+ implementation throughout the region.[120] The excessive regulations can be overly demanding of small forest operators, who often need far more support to comply with the requirements of forest conservation stipulations than they are granted.[121] Carbon pricing policies, including REDD+, are complex and depend on the capacity of the government to create incentives for international, national, private, and forest land owners and users to address the underlying causes of deforestation, requiring extensive cooperation that is often limited by political conflicts and tensions among stakeholders.

While REDD+ policies in Ecuador have been championed as successful by many, Confederation of Indigenous Nationalities of the Ecuadorian Amazon (CONENIA) have expressed concern that REDD+ infringes on their freedom to manage resources and does not present a real solution to climate change.[122] Studies have shown that lack of coordination among government ministries has hampered the development of a national conservation strategy and limited the effectiveness of REDD+ policies to address the concerns of indigenous communities.[123] These policies can jeopardize their rights to territories, sovereignty, and self-determination, with a particular fear that their land may be replaced by monoculture tree plantations that increase the carbon stock at the expense of the ecosystems integrity, as discussed in the aforementioned Sao Jose do Buriti, Brazil, case study. Indigenous communities argue that they have not participated in the consumerism that has caused the problems the REDD+ policies they must operate under are trying to address, pulling from a similar argument as that which the Global North-Global South debate hinges on.

Illegal logging further threatens any conservation initiatives and is particularly problematic if the government does not combat it with rigor, which is often the case given the limited resources of most Ministries of Environment. While Forest Stewardship Certification (FSC) can provide economic incentives for improved forest management, in Ecuador, the limited government implementation of FSC and thus limited government issued incentives for FSC has stymied the success of the tool.[124] FSC certification or any other conservation initiatives are rendered ineffective if there are high rates of illegal logging, as was the case in Peru.

Finally, assuming any carbon pricing mechanisms implemented are accompanied by compensatory mechanisms for the owners of the forests, then policies must establish ways of adequately evaluating the services an ecosystem provides. Ecosystems provide multiple services beyond just carbon sequestration, including hydrological services and benefits from biodiversity, that should be considered when determining the compensatory benefits allocated to communities.

TAX INCENTIVES AND THE ECUADORIAN CARBON NEUTRAL ENVIRONMENTAL RECOGNITION PROGRAM

In 2021, Lorena Tapia, the former Minister of the Environment in Ecuador issued the 264th Agreement of the Ministry of the Environment, creating the only carbon crediting mechanism permissible by the country's constitution. In Ecuador, the Ministry of Environment has exclusive authority of carbon neutrality.

"The state will maintain exclusive authority over forest resources and environmental services cannot be subject to appropriation and are therefore regulated only by the state" (articles 261 and 74 of constitution)

The objective of the Ecuadorian Carbon Neutral Environmental Recognition is to promote the green premium of carbon neutrality and to encourage investments to reduce and offset emissions in production processes. The goal of the ministerial agreement is twofold: (i) to motivate private corporations to quantify their emissions at a corporate and product level (ii) to motivate private corporations to compensate for their emissions by participating in conservation and ecosystem restoration in Ecuador. Private corporations can now offset their emissions in Ecuador, directly funding an ongoing government conservation initiative, such as Socio Bosque, in return for a 'green point' (punto verde) certification that provides the company the reputational benefits of contributing to ecosystem conservation. The program will include different levels of certification depending on the degree of engagement of the company with an initiative. At a base level, it will require companies to quantify their emissions, a first step towards developing reduction targets. The ministry relayed that the ministerial agreement will fit within the framework of the national climate plan (NDCs). The protection and restoration of forests are imperative to meet NDCs. To limit global warming to 2 °C, 30% of necessary emissions reductions can be provided by halting tropical deforestation and degradation and allowing tropical forests to continue to sequester carbon and regrow.[125]

As an Environmental Authority, Minister Tapia is calling all citizens, public and private companies to preserve the natural environment for the well-being of future generations. Ms.Tapia emphasized the importance of an effective response to climate change and highlighted the opportunities of the Ecuadorian Carbon Neutral Environmental Recognition as a carbon credit mechanism. The Ministry of the Environment hopes all sectors of the economy will become active participants in carbon neutrality and wants to link carbon neutrality mechanisms with Ecuador's NDCs. In addition to the environmental benefit, Ms.Tapis believes the eco-efficient measure will become an added value for products and services.

To reduce emissions and promote carbon neutrality, the Ministry of Environment has granted environmental authorization to implement a tax incentive. With the tax incentive, a deduction for the entire depreciation and amortization of machinery, equipment and technologies that reduce emissions can be made. To further incentivize both the public and private sector, Andrés Hubenthal, Ecuador's Undersecretary of Climate Change in the Ministry of the Environment (MAE), presented a Carbon Neutral mechanism (hereinafter referred to as 'Carbon Neutral') to the market. Carbon Neutral is the only environmental mechanism that is recognized by the Ministry of Environment. Carbon Neutral certifies that emissions have been captured or removed. Carbon Neutral certifies that the ultimate result of any activity, product or service is emissions neutral. The Carbon Neutral certification will be extended by the Ministry of the Environment to both companies and persons. To obtain the Carbon Neutral certification, a company or person must present (i) baseline emissions, (ii) the emission reduction strategy and (iii) the compensation strategy. The Ministry of Environment will review the information and provide Carbon Neutral certification upon approval.

For the crediting mechanism to be successful at protecting and restoring the forest, we recommend the Ministry of Environment consider the following:

1. How can the Carbon Neutral certification best fund Socio Bosque and other nature based solutions?
2. How should the Carbon Neutral certification interplay with crediting mechanisms?
3. How can the Carbon Neutral certification promote international private investment?

A representative at the Ministry relayed that the mechanism will function similar to international certification mechanisms but the details required to evaluate that statement have yet to be released. In 2020, the World Bank released best practice principles for carbon crediting based on International Carbon Reduction and

Real: All emission reductions and removals—and the project activities that generate them—shall be proven to have genuinely taken place.

Measurable: All emission reductions and removals shall be quantifiable, using recognized measurement tools (including adjustments for uncertainty and leakage), against a credible emissions baseline.

Permanent: Carbon credits shall represent permanent emission reductions and removals. Where projects carry a risk of reversibility, at minimum, adequate safeguards shall be in place to ensure that the risk is minimized and that, should any reversal occur, a mechanism is in place that guarantees the reductions or removals shall be replaced or compensated. The internationally accepted norm for permanence is 100 years.

Additional: Additionality is a fundamental criterion for any offset project. Project-based emission reductions and removals shall be additional to what would have occurred if the project had not been carried out.

Independently verified: All emission reductions and removals shall be verified to a reasonable level of assurance by an independent and qualified third-party.

Unique: No more than one carbon credit can be associated with a single emission reduction or removal as one (1) metric ton of carbon dioxide equivalent (CO_2e). Carbon credits shall be stored and retired in an independent registry.

Figure 7: Best practice principles for carbon crediting (World Bank Group, 2020).[128]

GUIDING PRINCIPLES

Photo: Coca, Ecuador.
Photo Credit: Andrés Medina.

GUIDING PRINCIPLES

Through our research and analysis, we found several recurring themes important to any carbon pricing mechanism. We distilled these into four guiding principles that we believe are critical aspects of a successful system. Within each guiding principle, we outlined several important findings from our work.

(i) Monitoring is paramount

Finding 1: Reducing deforestation will be an important instrument to achieve the objectives of the Paris Agreement. It is critical that public and private entities continue their efforts to monitor the forest. Nature based solutions will be imperative in countries' abilities to meet their NDCs moving forward.[129] The Socio Bosque Program, central to Ecuador's conservation strategy, provides money to landowners in Ecuador to preserve biodiversity to conserve forests. Current streams of revenue are insufficient to the challenge at hand.[130] As donor funds diminish, the sustainability of financing must be considered.

Finding 2: Continued government support of initiatives as well as robust anti-illegal logging efforts are essential for the continued success of conservation programs. Consistent political support of forest reform programs, clear national conservation strategies, and forest management regulations that are sensitive to the capacities of small landowners are needed for productive forest governance reform.[131] The frequency of illegal logging can significantly jeopardize conservation initiatives at both national and local scales and should thus be a priority consideration.[132]

(ii) Consider forest communities

Finding 3: There exists widespread criticism of the genuine capacity of carbon pricing mechanisms to benefit forest communities.[133] An empirical analysis by Conservation Strategy Fund and the World Resources Institute found that most carbon market prices do not reflect the existing value of environmental services provided by standing forests.[134] Impacts of carbon taxes have not been comprehensively evaluated in developing countries, and carbon pricing policies often have regressive economic impacts.

Finding 4: Securing indigenous land rights has been found to be one of the most efficient ways to promote forest conservation, and indigenous-managed forests can tend to have larger carbon stocks. An extensive study by the World Resources Institute published in 2017 presents a series of cases exemplifying the benefits of allocating land rights to the indigenous and local communities of the forest. Across Latin America, including Mexico, Brazil, Colombia, Guatemala, and Bolivia, indigenous owned lands experience lower rates of deforestation and sequester more carbon due to more comprehensive land management practices.[135]

(iii) Provide proper incentives

Finding 5: To incentivize international stakeholders in forest carbon markets, quantifiable receipt of payment must be provided. Reputational advantage is not currently sufficient to ensure investments, other considerations must be made.[136] The sovereign rights of nature in Ecuador must fit within the international voluntary market framework and fit ESG goals.[137] What would incentivize private industry to contribute to climate finance without recognition from the Ministry of Environment (e.g. streamlining government permitting)?

What incentives will have links to the private sector?

"Unless coupled with some type of incentive from the government, international stakeholders in forest carbon markets will be hard-pressed to justify working on a system that works only in Ecuador".
- Leonardo Pradela, Senior Manager, Sustainability (Sustainable Supply Chains), Walmart

Finding 6: Economists consider an incentive-based approach to be more efficient than a regulatory approach.[138] California's cap and trade program set a firm limit on emissions while providing firms the flexibility to find the lowest-cost reductions.[139] California has demonstrated that economic growth can be paired with climate ambition, with a 20% increase in Gross State Product and a 13% reduction in GHG emissions between 2006 and 2017.

An empirical analysis found that potential buyers in carbon markets (both voluntary and future compliance) are willing to pay USD $7-9.4 if a project is developed in a tropical forest.[140] With an additional USD $2.3 if a project is developed in an impoverished or marginalized area and USD $5.1 if a project is developed in intact ecological regions.[141]

Finding 7: Funds to stop deforestation can be tied to conditions or certain types of reforms.[142] The conditions set forth by the international community may not completely align with national interests or sovereignty and/or may pose administrative challenges. A lesson can be learned from the Indonesia Climate Change Trust Fund (ICCTF), a fund owned and managed solely by the Republic of Indonesia with the objective of aligning international development assistance for climate change with domestic policies and programs for mitigation and adaptation.[143] ICCTF is seen as a new model for international support for climate change, where a greater role in managing resources is given to national funding entities.[144]

(iv) Consider the Constitution

Finding 8: Funding environmental services without ownership respects the sovereign right of nature and is permissible by the constitution. In Ecuador, environmental services are not an object of appropriation. It therefore is not possible to establish an ownership relationship between an entity or person and an environmental service. The regulation of a carbon stock or a carbon market is considered an ecosystem service and thus its regulation in a market is prohibited by the constitution.[145] There are, however, two examples of successful environmental services that are permissible by the constitution: Results Based Climate Financing (RBCF) and the Socio Bosque Program. There is no transaction (no purchase or sale) of an environmental service, and thus there is no ownership. With RBCF and the Socio Bosque Program, environmental services are not retired outside of Ecuador.

Finding 9: There is only one environmental carbon crediting mechanism that is recognized by the Ministry of Environment.The Ecuadorian Carbon Neutral Environmental Recognition program and its carbon crediting mechanism is scheduled to begin its pilot within the next 100 days. The carbon crediting mechanism will be extended by the Ministry of the Environment to both companies and persons. This mechanism can be a good first step in building capacity, compiling data, and piloting any future form of a carbon crediting market (constitutional change dependent).

Finding 10: Employing global carbon emissions trading to meet Paris Agreement pledges could reduce total mitigation costs by 79%.[146] Ecuador should consider the most cost-effective manner to meet its NDCs. Co-benefits of international carbon market cooperation include strengthened political, economic and cultural alliances, as well as enhanced ambition.[147] It is estimated that global carbon markets could nearly double total emission reductions at the same total cost of existing policies.[148]

Photo (below): Aerial panorama of the Rio Napo at dawn in the Ecuadorian Amazon with the first rays of sunlight illuminating the forest canopy.
Photo Credit: Dr. Morley Read.

RECOMMENDED APPROACHES

Given the above guiding principles, and our research, we determined two separate recommended approaches in Ecuador.

Approach I :
(if Constitution were to remain unchanged)

Implement the only permissible carbon crediting mechanism that is supported by the Ministry of the Environment and launch associated marketing campaign

- Pathway 1: Use Ministry approved carbon credit mechanism to fund successful environmental services that are permissible by the constitution
    - Case Study: Ecuadorian Carbon Neutral Environmental Recognition
- Supporting action: Convene a working group to discuss the incentives that would be required to support the Ministry's carbon crediting mechanism
    - Case Study: Climate financing with no ownership
- Pathway 2: Continue to support existing initiatives to acquire international funds

Approach II :
(if Constitution were to change)

Allow all carbon crediting mechanisms and ensure that the best option for Ecuador is applied (well-designed, high integrity international market)

- Pathway 3: Emissions tax and offset ("carbon tax")
    - Case Study: Colombia
- Pathway 4: Emissions trading system ("cap-and-trade")
    - Case Study: California
- Pathway 5: Carbon crediting mechanisms (e.g. Emergent, voluntary carbon markets)

Photo: Tangle of lianas in the understory of tropical rainforest in the Ecuadorian Amazon. ***Photo Credit:*** Dr. Morley Read.

Photo: The Ecuadorian forest at sunset.
Photo Credit: WWF.

CONCLUSION

As stated, we believe there are two possible approaches to solving the issue of implementation of carbon pricing mechanisms within the legal framework of Ecuador. Our first approach is within the framework that the constitution was to remain unchanged. In this case, an option would be to implement the only permissible carbon crediting mechanism that is supported by the Ministry of the Environment and launch associated marketing campaigns. An option such as this will need to include an approved carbon credit mechanism to fund successful environmental services that are permissible by the constitution such as the Ecuadorian Carbon Neutral Environmental Recognition. In addition, a supporting action of organizing a working group to discuss the incentives that would be required to support the Ministry's carbon crediting mechanism such as a climate financing option with no ownership. A second option under the same first approach would be to consider continued support for existing initiatives to acquire international funds.

Alternatively, to approach number one where the constitution would not change, approach number two identified scenarios applicable to Ecuador if the constitution were to change or there was political feasibility for the constitution to change. Under this approach, the Ecuadorian system could allow all carbon crediting mechanisms to be permissible to ensure an optimal option for Ecuador is applied, however, it would require a well-designed, highly just international market. Various pathways of opportunity are found in emissions tax and offset (commonly referred to as carbon taxes), emission trading scheme (commonly referred to as cap-and-trade), or carbon crediting mechanisms (e.g. Emergent, voluntary carbon markets).

Overall, there are viable options for revenue generation both within the current constitutional boundaries, and for consideration in the event of constitutional change. Given appropriate considerations to potential consequences of carbon pricing or carbon neutrality initiatives, these mechanisms can be used to generate significant revenue to protect and restore the forest. However, the exact choice and design of a potential system will have the largest ultimate impact on whether such a system can provide sustainable support for the Socio Bosque Program in the future.

APPENDIX

Photo: El Pailón del Diablo, Baños de Agua Santa, Ecuador.
Photo credit: Andrés Medina.

INTERVIEW GUIDE

Interviews were semi-structured segments of 30-60 minutes with stakeholders from the public sector, non-profit, academia, and the private sector between January 12th to March 12th, 2021.

Table 1: List of Interviews Interviewees, affiliation, and date of interview. (Note: all interviews were conducted via videoconferencing)

NAME	ORGANIZATION	POSITION	DATE
RUBEN LUBOWSKI	ENVIRONMENTAL DEFENSE FUND (EDF)	CHIEF NATURAL RESOURCE ECONOMIST	02/10/2021
CAROLINA JARAMILLO	GLOBAL GREEN GROWTH INSTITUTE (GGGI), LATIN AMERICA	GGGI'S COLOMBIA COUNTRY REPRESENTATIVE	02/12/2021
MAARIT CRUZ	GENERAL MOTORS, SOUTH AMERICA (WEST)	SUSTAINABILITY & CSR HEAD	02/12/2021
LUCIANA GALLARD LOMELI	WORLD RESOURCES INSTITUTE (WRI)	RESEARCH ASSOCIATE, INITIATIVE 20X20	02/16/2021
LEONARDO PRADELA	WALMART	SENIOR MANAGER, SUSTAINABILITY (SUSTAINABLE SUPPLY CHAINS)	02/17/2021
XIMENA HERRERA	MINISTRY OF THE ENVIRONMENT AND WATER OF ECUADOR (MAAE)	SPECIALIST TECHNICIAN IN FOREST MONITORING AND FOREST INVENTORIES	02/19/2021
MOON HERRICK	EMERGENT	VP NATURAL CLIMATE SOLUTIONS	02/20/2021
MARCELA ANGEL	MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT) ESI	ENVIRONMENTAL PLANNING RESEARCHER AT MIT ESI	02/23/2021
LUIS SUAREZ	CONSERVATION INTERNATIONAL (CI) - ECUADOR	VICE PRESIDENT OF CI ECUADOR	02/25/2021
GRAHAM WATKINS	INTER-AMERICAN DEVELOPMENT BANK (IADB)	CHIEF OF THE CLIMATE CHANGE DIVISION AT IADB	03/02/2021
RODRIGO SOARES AND ERIKA SCHOCH	SWISS RE INSURANCE	PROPERTY AND SPECIALTY UNDERWRITING	03/02/2021
ROCIO SANZ CORTES AND MOON HERRICK	EMERGENT	AGRICULTURAL ENGINEER AND FORESTRY SPECIALIST	03/02/2021
LUIS G. MURILLO-URRUTIA	MIT ENVIRONMENTAL SOLUTIONS INITIATIVE (PREVIOUSLY: COLUMBIAN MINISTRY OF ENVIRONMENT)	PROFESSOR AT MIT'S ENVIRONMENTAL SOLUTIONS INITIATIVE	03/05/2021
MURALI KANAKASABAI	CONSERVATION INTERNATIONAL, ECUADOR	DIRECTOR OF SUSTAINABLE FINANCE (CI ECONOMIST)	03/05/2021
JESSICA GALLEGOS	MINISTRY OF THE ENVIRONMENT AND WATER OF ECUADOR (MAAE)	NATIONAL MITIGATION DIRECTOR	03/12/2021

Figure 1: List of guiding interview questions.

Ecuador specific interview questions:

1. What are the major challenges facing Ecuador?
2. What are the barriers to implementing carbon pricing mechanisms in Ecuador?
3. How are market-based policy instruments regarded in the political arena, and what could be their legal basis?
4. What kind of role does the international community (i.e. private sector) is expected for if Ecua dor were to institute an international carbon market?
5. Do you think carbon pricing or a carbon tax is a feasible option to reach national emissions targets?
6. What opportunities and/or challenges does Ecuador's revised constitution have on introducing carbon pricing mechanisms in Ecuador?
7. Can you elaborate on how Socio Bosque and REDD+ interact?
8. Could Ecuador implement a system similar to Columbian's hybrid model with a carbon tax and cap-and-trade model?
9. What are the gains and losses of Ecuador not entering an international carbon market?

Carbon market-related interview questions:

1. What are the different types of carbon offset markets, such as renewable energy provision versus nature-based solutions? What does a renewable energy carbon offset program look like?
2. What options are available to address issues relating to voluntary offsets executed in one coun try but purchased in another? (Relating to countries meeting their NDCs).
3. What mechanisms are available to promote price security in voluntary offset markets?
4. Do you think a public-private partnership or approach is necessary to implement a successful carbon market for countries like Ecuador?
5. What are the potential social implications of introducing and implementing a carbon tax or carbon offset system?
6. Any advice for Ecuador implementing a carbon tax and offset system?

Private sector interview questions:

1. How can private sector conservation initiatives leverage community partnerships?
2. Is there an initiative that links the private sector to forest conservation and protection in Ecua dor?
3. Would (insert company name) engage in a voluntary carbon offsetting program by receiving a receipt of adherence but no monetary value attached?
4. Has (insert company name) engaged in other countries' carbon market programs before? Would this something that (insert company name) be interested in participating in?

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TO: CONSERVATION INTERNATIONAL ECUADOR
FROM: COLUMBIA UNIVERSITY GRADUATE STUDENT CONSULTANT TEAM
SUBJECT: EVALUATING CARBON PRICING MECHANISMS TO PROMOTE NATURE-BASED SOLUTIONS
DATE: APRIL 14, 2021

Objective 1. To evaluate carbon pricing mechanisms and private sector funding options available to fund nature-based solutions, including the Socio Bosque Program
Objective 2. To analyse the potential gains and losses of Ecuador participating in international carbon markets

Below we present two approaches for carbon pricing mechanisms in Ecuador:
Approach I. No constitutional change - carbon crediting systems
A. Ecuadorian Carbon Neutral Environmental Recognition
B. Climate financing with no ownership - results-based climate financing
Approach II. Constitutional change - carbon pricing mechanisms
A. Emissions tax and carbon offset program - Colombia case study + financial analysis
B. Emissions trading scheme - California case study + financial analysis
C. Carbon crediting mechanisms

Research Methodology
We conducted a literature review and fifteen expert interviews to assess key opportunities and challenges to Ecuador's forest conservation efforts and carbon pricing policies.

Guiding Principles
A. Monitoring is paramount
Finding I: Nature-based solutions are important instruments to meet Ecuador's Nationally Determined Contributions (NDC). Robust monitoring of deforestation, including for illegal logging, and consistent support for conservation initiatives, including administrative assistance, are necessary.
B. Forest community inclusion is essential
Finding I: A prevalent concern is to ensure whether carbon pricing mechanisms can fully benefit forest communities given existing carbon prices do not reflect the complete value of services a forest provides.[1] Comprehensive scientific estimation of all ecosystem services is necessary to accurately value forests and adequately compensate communities.
Finding II: Securing indigenous land rights can be one of the most efficient ways to promote forest conservation. Indigenous-managed forests tend to have larger carbon stocks.[2]
C. Provide proper incentives
Finding I: To incentivize international stakeholders to participate in forest carbon markets, quantifiable receipt of payment must be provided. Reputational advantage is not currently sufficient to attract significant investment. (See Approach I.A.)
Finding II: Many economists consider incentive-based approaches more efficient than regulatory approaches.
Finding III: Funds to stop deforestation can be tied to conditions or certain types of reform which may not align with national interests and may pose administrative challenges. [3]
D. Consider the current constitution
Finding I: Article 74 of the Constitution prohibits the appropriation of ecosystem services, limiting the ability to institute carbon pricing mechanisms that depend upon receipt of services.

Approach I
A. Ecuadorian Carbon Neutral Environmental Recognition and its carbon crediting mechanism
The only constitutionally permissible carbon crediting mechanism will be launched by the Ministry of Environment within the next 100 days. This program will allow corporations to directly fund a conservation initiative of their choice in return for a 'punto verde' certification from the national government, intended to provide a reputational advantage for participation. The program is designed to work at the corporate and product level and is compliant with ISO 14064 and 14017. It can serve as a first step in gathering data, as it requires corporations to quantify emissions, and may be useful in building capacity for any future carbon pricing mechanism (dependent on constitutional change). The Minister must consider the incentives that would best attract international investment.
B. Climate financing with no ownership
As jurisdictions strive for net-zero, results-based climate financing (RBCF) is increasing. RBCF requires no purchase or sale of an environmental service and thus no ownership.
Approach II
A. Emissions Tax and Carbon Offset - Colombia Case Study
In 2017, Colombia instituted a Col$ 15,000/tCO2e tax on liquid fossil fuels, covering 24% of the country's greenhouse gas (GHG) emissions.[4] Colombia provides companies the flexibility to exempt part or all of their tax obligations by certifying national carbon offsets. The tax raised

US$ 161 million in 2017 and US$ 90 million in 2018.[4] All of the revenue is intended to finance environmental and rural development projects.

Financial Analysis for Ecuador

We conducted a financial analysis of potential revenue generation from a carbon tax and offset system in Ecuador modeled after the Colombian system. The model assumed an offset price of 85% of the tax rate but was unable to derive a direct relationship between the offset price and tax due to limited data. We considered various starting tax rates, between $3 to $10 /tCO2, with a yearly increase in tax rate between 0% and 10%. Under these assumptions, a tax rate of $5/tCO2 would generate approximately $990 million, while a $3/tCO2 would generate $350 million in Year 1 . This analysis is primarily concerned with revenue generation rather than emissions reductions. See Final Report (page 23).

B. Emissions Trading System - California Case Study

California implemented a cap-and-trade scheme in 2012, covering 80% of the state's GHG emissions.[5] Climate investments from the ETS revenue have preserved or restored over 250,000 acres of land in California since 2012.[3] From 2013-2018, the program raised US$ 9.5 billion and reduced emissions from sources subject to the cap by 10%.[5] Since the program started, US$ 2 billion of revenue have been invested to benefit disadvantaged communities.[5]

Financial Analysis for Ecuador

Based on several assumptions about Ecuador's emissions data and estimations of the California ETS system, this model established an initial cap in Ecuador of 47 MtCO2 under a 10% cap scenario. The model tested annual cap changes of 2%, 1%, and -1% and used an auction price of $5 per allowance, assuming the price would grow by 5% annually. An ETS model in Ecuador could generate an estimated $23 million in Year 1. The analysis suggested that the emissions cap is more important than the assumed allowance price in estimating the amount of revenue generated. See Final Report (page 23).

C. Carbon Crediting Mechanisms

To reach mitigation targets, more jurisdictions are considering complementary carbon pricing initiatives beyond an emissions tax or emissions trading scheme.[6] Carbon credits will largely be supplied by nature-based sequestration and avoided nature loss. Ecuador and other countries in the Global South have the largest potential to supply these nature-based carbon credits.[7]

A. Emergent: Forest Finance Accelerator

The international nonprofit organization Emergent (founded in 2019) is a forest finance accelerator that hopes to pair the climate ambition of the private sector with forest protection. As a professional market facilitator, Emergent purchases and sells verified REDD+ credits. It has been in conversations with the Ministry of Environment in hopes of establishing a partnership with Ecuador.

B. Voluntary Carbon Markets

Voluntary Carbon Markets (VCM) allow for the voluntary purchase of carbon credits in a relatively unregulated market. They remain informal without clear standards or price transparency, and there is no centralized repository for VCM data.[8] Voluntary and future compliance continue to increase the demand for carbon credits as interested parties seek to offset emissions. VCMs will remain important options for financing climate-action related projects.[9]

Gains of Participating in International Carbon Markets

Ecuador has committed to reducing emissions from its Land Use, Land Use Change, and Forestry sector to meet NDCs. Funding comes from initiatives such as REDD+ and the Green Climate Fund, however, funding is not always sufficient. Participating in carbon pricing initiatives can lower the costs of meeting emissions targets. Employing global carbon emissions trading could reduce total mitigation costs by 79%.[10] Reinvesting these savings in the Socio Bosque Program or other forest conservation programs would help Ecuador meet their NDCs and expand these programs.

Losses of Participating in International Carbon Markets

Concerns over carbon pricing include the socioeconomic and equity implications of market-based emissions regulations and the ethical dilemmas of putting a price on the natural environment. Increased energy prices disproportionately impact low income households and the communities reliant on fossil fuels for their livelihoods.[11]

Social Impact Analysis

The impacts of carbon taxes have not been comprehensively evaluated in developing countries.[12] The regressive impacts of carbon pricing mechanisms can be countered with measures to re-distribute revenue.[3] However, studies have found that revenues from carbon pricing mechanisms rarely successfully benefit indigenous communities[13] in part because they force indigenous communities to operate within foreign frameworks that focus on ecosystem-services, threatening traditional ways of interacting with the forest.[14][15]

A 2014 report by The World Resources Institute, "Securing Rights, Combating Climate Change", concluded that granting land rights to indigenous communities is one of the most cost-effective forest conservation strategies. Indigenous-managed forests averaged annual deforestation rates 35% lower in Bolivia, 40% lower in Brazil, and 50% lower in Colombia compared to non-indigenous forests.[16] Additionally, forests under indigenous ownership are larger carbon sinks.[17]

Local conflicts, illegal logging and inconsistent national strategies jeopardize conservation initiatives.[18] Large money transfers involved in REDD+ policies may create opportunities for corruption and to negotiate the protection of the rights of indigenous peoples.[19] REDD+ regulations can be overly demanding of forest operators. Ecuador's CONAIE (Confederation of Indigenous Nationalities of Ecuador) expressed concern that REDD+ infringes on their freedom to manage resources and does not present a real solution.[20]

Endnotes

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[3] Since 1997, Costa Rica has implemented a carbon dividend program to accompany their carbon tax. The revenue is directed towards the Payment for Environmental Services program, distributed by FONAFIFO (National Forestry Financing Fund), which incentivizes land owners to improve land management practices and promote conservation in return for payouts.[22] The government prioritized highly forested, poorer districts for these payouts and assisted indigenous communities to submit requests for funds, such that 40% of the beneficiaries of the carbon tax revenue are people living below the poverty line.[5]

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[14] Bohm, Steven, and Siddhartha Dabhi. Upsetting the Offset: The Political Economy of Carbon Markets. University of Essex, 2009, https://www.researchgate.net/publication/239642909_Upsetting_the_Offset_The_Political_Economy_of_Carbon_Markets.

[15] A eucalyptus tree plantation in Sao do Buriti, Brazil, funded by BP as a carbon offset soaked up vast amounts of water from the environment, and used large quantities of herbicides and pesticides that severely impacted the ability of locals to live safely and grow their traditional subsistence and medicinal plants.[14]

[16] Stevens, Caleb, et al. Securing Rights, Combating Climate Change | How Strengthening Community Forest Rights Mitigates Climate Change. World Resources Institute, 2014, https://files.wri.org/s3fs-public/securingrights-full-report-english.pdf.

[17] Brazilian indigenous-owned forests hold an estimated 36% more carbon per hectare than other areas of the Amazon. Indigenous

Reserves in Colombia have higher carbon density (145 tonnes per hectare) as compared to non-Indigenous managed regions (128 tonnes per hectare).[16]

[18] Over 80% of deforestation in Peru occurs near roads, such that when governments pursue mining operations, they attract settlers and illegal loggers that deforest the land.[16] In Colombia, the widespread armed conflict has limited the ability of the government to protect the rights of indigenous peoples to their forests. While deforestation has been low on Indigenous Reserves, with a rate of 0.3% from 2000-2012 compared to 3.2% in other Amazon regions, a significant amount of forest (5-7%) has been lost to armed conflict and coca farming.[16]

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