

Comparative descriptive analysis of the Nationally Determined Contributions (NDCs) to climate
change mitigation and adaptation by Costa Rica and México

by
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A THESIS

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Zachary J. Pinard for the degree of Honors Baccalaureate of Science in Environmental Science presented on November 26, 2019. Title: Comparative descriptive analysis of the Nationally Determined Contributions (NDCs) to climate change mitigation and adaptation by Costa Rica and México.

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Gregg Walker

Under the Paris Agreement, parties submitted documents outlining their commitments to climate change mitigation and adaptation, called Nationally Determined Contributions (NDCs), which are set to be updated to increase ambition by 2020. Costa Rica and México are known for their significant national actions on climate change, so comparing these two NDCs will inform the international climate regime of best practices. The two NDCs were compared on mitigation within the categories of emissions goals, land use, land use change, and forestry (LULUCF), and energy. They were compared on adaptation within adaptive capacity, climate finance, and technology transfer. Overall, Costa Rica's emissions goals were significantly more ambitious than México's, and its energy goals were more specific, but México had more specific LULUCF goals. Both NDCs were ambiguous regarding their adaptation goals, with Costa Rica tending to refer to separate official documents for more specific information, and México mentioning very little related to climate finance and technology transfer. Overall, Costa Rica's current NDC is compatible with the Paris Agreement's 2°C goal, and México's is insufficient. Still both Costa Rica and México, as well as other nations across the globe, could improve their own NDCs using the information from this comparison.

Key Words: Costa Rica, México, Mexico, NDC, climate change, Paris Agreement, COP

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

Zachary J. Pinard, Author

INTRODUCTION

The Founding and Development of the International Climate Change Regime

The UNFCCC (United Nations Framework Convention on Climate Change) is the official body organizing the international environmental regime on climate change. The Convention hosts negotiations between various stakeholders including nation-states, NGO's, the private sector, everyday citizens, and more. The nation-states that have ratified the UNFCCC are known officially as "Parties to the Conference" (UNFCCC eHandbook, n.d.). These countries have met annually since 1995 to discuss their national obligations to address climate change, monitor the implementation of solutions, and take stock of progress towards stated goals (UNFCCC eHandbook, n.d.). This annual meeting is referred to as the "Conference of the Parties" (COP), and COP has become the premier international stage for negotiating official climate change actions at the highest level.

In the 1980's, the international community conducted a period of information gathering to develop a scientific understanding of climate change and its potential effects (Chasek et. al., 2017). This included the Intergovernmental Panel on Climate Change (IPCC), an international network of scientists organized by the World Meteorological Association and the UN Environment Programme to provide scientific information to governments of all levels looking to create climate policy (Intergovernmental, n.d.[a]). After the IPCC's First Assessment Report in 1990 confirmed global warming was a serious threat to human way of life, the Intergovernmental Committee for a Framework Convention on Climate Change met in February 1991 for the first round of official international climate change negotiations (Chasek et. al., 2017). These negotiations to determine whether to have a convention on climate change culminated in the high-profile "Earth Summit" in Rio de Janeiro in June of 1992 (Encyclopedia, n.d.), where 154 countries signed the UNFCCC, which would need to be ratified by 50 countries before entering into force (Chasek et. al., 2017). This requirement was met in March of 1994 and the first COP took place a year later (Chasek et. al., 2017).

The focus of the early UNFCCC negotiations was to develop a protocol for the Convention to strengthen the regime. The Kyoto Protocol was agreed to in 1997, which included legally binding greenhouse gas reductions targets for developing countries (UNFCCC eHandbook, n.d.). This early implementation of hard law was vehemently opposed by a veto coalition of nations including the United States, which notably announced its refused to ratify the Kyoto Protocol under the leadership of President George W. Bush (Chasek et. al., 2017). This was notable because at the time, the U.S. was the largest greenhouse gas emitter among all Annex 1 parties (a group of forty industrialized countries), and the document could not go into effect until the ratifying Annex 1 parties constituted 55% of carbon dioxide emissions of Annex 1 parties in 1990 (Chasek et. al., 2017). Nonetheless, Russia's ratification in November 2004 met this requirement, and the Kyoto Protocol entered into force on February 16, 2005 without the support of the U.S. - the world's largest emitter (Chasek et. al., 2017). This first commitment period would last until the year 2012 (UNFCCC eHandbook, n.d.).

Over the course of the 2000's more nations debated and adopted the Kyoto Protocol. However, it became a growing problem that only Annex 1 countries were required to limit greenhouse gas

emissions, since this exempted the developing, but heavy-polluting economies of China and India (CNN, 2018). Sentiment started growing for an agreement that included all countries. After the first commitment period under the Kyoto Protocol ended in 2012, the COP met in Doha, Qatar to address various problems with it as it stood (UNFCCC eHandbook, n.d.). Many of the nations with binding commitments from the first period, such as Russia, Japan, and Canada, refused to take on commitments in the second period, and some fast-developing countries with some of the largest greenhouse gas emissions (i.e. China and India) still weren't covered (Chasek et. al., 2017). Thus, the Kyoto Protocol effectively only covered 15% of global greenhouse gas emissions in 2012 (Chasek et. al., 2017). To address these problems, the COP agreed on the Doha Climate Gateway, in which it "strengthened its resolve" and planned to adopt a new, all-encompassing global climate change agreement by 2015 that would take effect starting in 2020 (UNFCCC, n.d.[d]). The COP also formalized the second commitment period of the Kyoto Protocol to last from 2013-2020 to act as a transitional measure (Chasek et. al., 2017).

The Paris Agreement

To avoid coming up with an agreement in 2015 with no specific follow up actions, the COP used their meetings following the Doha Climate Gateway to plan domestic preparations within each member state for creating their own "Intended Nationally Determined Contributions (INDCs)" (UNFCCC eHandbook, n.d.). The word "intended" was used purposefully to avoid the resentment of hard law that characterized the early stages of the Kyoto Protocol, but reflected the intention of formalizing these commitments at the 2015 meeting. In these INDCs, countries outlined concrete actions they each would take to address climate change with much more specific language than had been used previously. For example, Chile's First National Communication to the UNFCCC after signing the Kyoto Protocol was specific in detailing its sources of emissions, but its follow up objectives were mostly ambiguous statements such as "implement a National Action Plan for Climate Change" and conduct "Technical and institutional training to identify projects and carry out specific studies" (Chile, 1999). By contrast, Chile's INDC stated the country was committed to reducing its CO₂ emissions per GDP unit by 30% below 2007 by the year 2030 (Gobierno, 2015). Before COP21 in Paris, most parties had submitted an INDC that was available for public record in the INDC portal on the UNFCCC's website, which the UNFCCC Secretariat then published in a synthesis report on November 1st, 2015 (UNFCCC eHandbook, n.d.).

Given this context, the unique importance of the next UNFCCC meeting was highlighted in the time leading up to COP21. The international community understood that whatever agreement came out of this conference would effectively replace the Kyoto Protocol (CNN, 2018) and serve to develop the new "complex architecture for global climate governance" (UNFCCC eHandbook, n.d.). Under this architecture, or "framework", parties would negotiate and agree to future specific actions addressing climate change. Finally, on November 30, 2015, the COP met in Paris to discuss the future of the international effort to address climate change. The parties' main goal for these talks and the resulting framework was to limit average global temperature rise to well under 2.0°C above pre industrial levels, and ideally to 1.5°C (UNFCCC eHandbook, n.d.). According to the IPCC, a warming of 1.5°C would result in 10 cm lower sea level rise and ten times less frequent ice-free summers in the Arctic, as compared to 2.0°C (Intergovernmental,

2018). Additionally, coral reefs are expected to decline 70-90% with 1.5°C warming as opposed to 99% with 2.0°C warming (Intergovernmental, 2018). According to an October 8, 2018 report by the IPCC, reaching the 1.5°C goal would require reduction of emissions by 45% by 2030 and net zero by 2050 (Intergovernmental, 2018).

There were many productive outcomes that came from the negotiations in Paris. First, the Convention obliged its member parties to cooperate in greenhouse gas emissions reductions by sharing technology and providing financial support (UNFCCC eHandbook, n.d.). It also narrowed its focus to six main areas producing the vast majority of emissions: energy, transport, industry, agriculture, forestry, and waste management (UNFCCC eHandbook, n.d.). With respect to development, 1994's 12 original members of the OECD (Organization for Economic Cooperation and Development) and 12 additional countries with economies in transition from central and eastern Europe that had been grouped into "Annex 1 Parties" were expected to make the most reductions as the source of the majority of current and past emissions (UNFCCC eHandbook, n.d.). However, the Convention also accepted that developing countries had a responsibility to mitigate climate change as well, and the share of emissions reductions borne by developing countries would grow as they develop economically (UNFCCC eHandbook, n.d.). This compromise differed from the Kyoto Protocol in that all countries, developed and developing, were brought under the same goal of mitigating climate change (UNFCCC eHandbook, n.d.).

In addition to mitigation, the Convention emphasized adaptation to climate change. Adaptation is defined as "changes in processes, practices, and structures that reduce... vulnerability to climate change impacts such as sea-level rise or food insecurity" (UNFCCC eHandbook, n.d.). In the early years of the UNFCCC, adaptation had been largely overlooked in favor of mitigation, but the 2012 Cancún Adaptation Framework established the Adaptation Committee (AC) to address this work, which has since become a focal point of each COP (UNFCCC eHandbook, n.d.). Throughout the Paris talks, parties acknowledged that any action on adaptation should be "country-driven, gender-responsive, participatory, and fully transparent," and additionally that adaptation would need to include stakeholder engagement and management of knowledge in order to be successful (UNFCCC eHandbook, n.d.).

One of the major, definitive outcomes of the negotiations surrounding the Paris Agreement was the formalization of countries' INDCs into Nationally Determined Contributions (NDCs). Throughout this process, countries were encouraged to add to their INDCs by conserving and enhancing carbon sinks and reservoirs (UNFCCC eHandbook, n.d.). Developing countries were encouraged to contribute to mitigation through forestry by protecting against deforestation and implementing sustainable forest management (UNFCCC eHandbook, n.d.). Under the Paris Agreement, each country agreed to report on the progress of their NDCs every five years starting in 2020 (UNFCCC eHandbook, n.d.). According to the international nonprofit Climate Analytics, implementation of all these NDCs submitted for COP21 would limit global temperature rise to 2.7°C, failing to meet both goals of 1.5°C and 2.0°C (Climate, n.d.). These targets appear increasingly difficult to attain, as warming reached .85°C in 2012 (Intergovernmental, 2018) and broke 1.0°C three years later in 2015 (Climate, n.d.). Regardless of these shortcomings, the NDCs are currently the substance behind all negotiations on mitigation and adaptation taking place at COP.

The Paris Agreement consists of 16 preambular clauses citing reasons for coming to an agreement on climate change and acknowledging the values the convention commits to upholding, followed by 29 Articles explaining what the parties are agreeing to do (United, 2015). Article 1 defines terms, while Articles 2-4 explain the specific goals of limiting warming to 1.5 or 2.0°C and codifying INDCs into NDCs, while outlining the expectations for the frequency and quality of communication by the parties to the convention (United, 2015). Article 5 addresses utilization of “carbon sinks” such as forests to mitigate climate change, Article 6 addresses voluntary cooperation between parties for meeting the targets in their NDCs, and Article 7 focuses on adaptation (United, 2015). Articles 8-15** address various considerations for meeting NDC goals, such as the provision of financial resources, recognizing countries’ various levels of loss and damage due to climate change, and taking stock of implementation among others (United, 2015). The last Articles 16-29** officially establish subsidiary bodies, and address more basic housekeeping items such as when the agreement takes effect, formalization of roles of various entities, and rules concerning withdrawal and prohibiting acceptance with reservations (United, 2015).

The Paris Agreement was adopted on December 12, 2015 at the conclusion of negotiations. However, it wouldn’t go into effect until thirty days after it was ratified by 55 countries representing at least 55% of global greenhouse gas emissions (UNFCCC, 2019d). This occurred on October 5, 2016, and the Agreement entered into force on November 4, just before COP22 kicked off in Marrakech, Morocco (Sustainability, 2016). Thus far, 187 of the 197 Parties to the Convention have both signed and ratified the Paris Agreement* (UNFCCC, 2019d).

Preeminent Bodies within the Convention

The decisions made at each COP constitute a “rulebook” of procedures and guidelines to follow while implementing the Paris Agreement (UNFCCC eHandbook, n.d.). The main subsidiary body responsible for this was created in 2016, called the Ad Hoc Working Group on the Paris Agreement (APA) (UNFCCC, n.d.[a]). The APA governs the procedures behind creating a flexible transparency framework referred to in Article 13 of the Paris Agreement (UNFCCC, n.d.[a]). It must also develop the procedures surrounding the global stocktake referred to in Article 14, promote compliance and facilitate compliance according to Article 15, and provide guidance in relation to the mitigation and adaptation components of each parties’ NDCs (UNFCCC, n.d.[a]).

In addition to the APA, two older, permanent subsidiary bodies work on the Paris Agreement “rulebook” and other aspects of the Convention’s work. These are the Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific and Technological Advice (SBSTA). SBI’s agenda consists of enhancing the “ambitions of parties” matters relating to transparency, mitigation, adaptation, finance, technology, and capacity building (UNFCCC, n.d.[b]). It does this by monitoring the implementation of frameworks for each of these matters developed at previous COPs, such as the Least Developed Countries (LDCs) Work Program for adaptation, and the two frameworks launched at COP7 to guide capacity building (UNFCCC, n.d.[b]). SBI focuses on the Measurement, Reporting, and Verification (MRV) of greenhouse

gas emissions in an annual International Assessment and Review (IAR) process designed to promote comparability of efforts by developed countries (UNFCCC, n.d.[b]). It also launched the International Consultations and Analysis (ICA) process to ensure the “transparency of mitigation actions, their effects, and capacity building needs, in a manner that is non-intrusive, non-punitive, and respectful of national sovereignty” (UNFCCC, n.d.[b]). Through these efforts and many others, SBI ensures that the Paris “rulebook” developed by APA is implemented successfully.

The other permanent subsidiary body working on the Paris Agreement is SBSTA, which informs and advises the parties of scientific and technological matters. Some common areas of work include the impacts of climate change and parties vulnerability to them, transfer of environmentally-sound technologies, and promoting collaboration in climate research and observation (UNFCCC, n.d.[c]). SBSTA is also the key liaison between the policy-oriented needs of the COP, and the scientific information provided by the Intergovernmental Panel on Climate Change (IPCC), a body comprised of scientific experts to inform the parties (UNFCCC, n.d.[c]). SBSTA and SBI often work together on issues that follow under both bodies’ purviews, and usually meet together twice per year: once during the COP, and once at a separate conference in Bonn, Germany. Under this “complex architecture for global climate governance”, parties are obliged to share technology, provide financial support, cooperate to reduce greenhouse gas emissions, and report on these national efforts (UNFCCC eHandbook, n.d.).

In addition to the three primary subsidiary bodies to the Convention, APA, SBI, and SBSTA, there are a number of smaller, “constituted bodies” established from previous COP decisions focusing on more specific issues to support Parties. One example is the Technology Executive Committee (TEC), which meets twice per year identifying policies to accelerate the development and transfer of low-emission, climate-resistant technologies (Technology, 2018). The Standing Committee on Finance (SCF) was established at COP16 to improve the delivery of climate change financing, rationalize the Financial Mechanism, mobilize financial resources, and ensure adequate measurement, reporting, and verification of support provided to developing country Parties (UNFCCC, 2019e). Other active constituted bodies to the Convention include the Adaptation Committee, the Paris Committee on Capacity Building, the Executive Committee of the Warsaw International Mechanism for Loss and Damage, the IPCC, and the Global Environment Facility (GEF) (UNFCCC, 2019f).

The Modern Paris Agreement

Given the implementation of the NDCs submitted for COP21 would limit global temperature rise to 2.7°C, thereby failing to meet both goals of 1.5°C and 2.0°C, the Convention called for a facilitative global conversation to take stock of Parties’ efforts to increase global ambition in meeting the goals of the Paris Agreement (UNFCCC, 2018). This conversation was named the Talanoa Dialogue, which was introduced at COP23 in Bonn in 2017 (UNFCCC, 2018). “Talanoa” is a Fijian term for an inclusive, participatory, and transparent dialogue, and reflects the objective of participants building trust and advancing knowledge through empathy and understanding, free from blame and critical observations (Talanoa, 2018b). The Talanoa Dialogue was launched in January 2018, and is accompanied by an online portal to house

Talanoa Dialogue inputs related to the questions “Where are we?”, “Where do we want to go?”, and “How do we get there?” (UNFCCC, 2018). This portal is available to all country Parties and non-party stakeholders including businesses, investors, cities, regions, and civil society, in order to contribute ideas, recommendations, and information to assist in taking climate action to the next level (Talanoa, 2018b).

The Talanoa Dialogue is divided into two phases: the Preparatory Phase and the Political Phase (Talanoa, 2018a). The Preparatory Phase started in January 2018 and ended after COP24 in December 2018 (Talanoa, 2018a). In the period up until October 19, 2018, the Talanoa platform received a total of 473 inputs, 44 from Parties and 429 from non-Party stakeholders (Talanoa, 2018a). During over 90 total events associating themselves with the Talanoa Dialogue, 305 participants shared 474 stories related to the three questions (Talanoa, 2018a). In response to the first question, the general consensus regarding “Where are we?” was that overall climate action is on the rise, but so are greenhouse gas emissions (Talanoa, 2018a). The majority of national governments have put in place national climate policies and are advancing the integration and mainstreaming of climate into development, and private businesses are making significant commitments as well (Talanoa, 2018a). However, despite these efforts, atmospheric greenhouse gas concentrations and global average temperature are still on the rise, and the harmful effects of climate change are already being felt worldwide (Talanoa, 2018a).

With respect to “Where we want to go?”, the aim resulting from the Talanoa Dialogue is to have emissions peak and be on a rapid decline by the year 2030 (Talanoa, 2018a). The final goal is to have achieved net-zero emissions by balancing CO₂ additions to and removals from the atmosphere by the year 2050 (Talanoa, 2018a). As for the final important question of “How do we get there?”, the Talanoa Dialogue concluded that heads of state, private sector leaders, civil society organizations, and international and regional organizations must prioritize climate action, strengthen engagement, increase climate financial flows, and build capacity amongst public and private entities in the developing world to achieve low-emission development (Talanoa, 2018a).

After the Talanoa Dialogue, Parties still have a chance to further strengthen their NDCs to meet the 2.0°C warming goal. Article 14 of the Paris Agreement outlines the process for a “global stocktake” starting with COP24 in Katowice, Poland in 2018 and taking place every five years from 2023 on (United, 2015). This global stocktake will serve as a kind of progress report, informing subsequent NDCs, which also must be submitted every five years, the next versions of which are due in 2020 (UNFCCC, 2019c). With the understanding that peak greenhouse gas emissions will take longer to achieve for developing countries than for developed countries, it is expected that for all Parties, each successive NDC represents a progression compared to the previous one, and that the latest version will reflect the highest possible ambition for lowering nationwide greenhouse gas emissions (UNFCCC, 2019c).

The most recent Conference of the Parties was COP24, which took place from December 2 to December 14, 2018. The focus of COP24 was to finish and evaluate the aforementioned Talanoa Dialogue, as well as develop the rulebook for the Paris Agreement. This merited significant work from the APA, and joint sessions between SBSTA, SBI, and other bodies to develop detailed, comprehensive processes to govern the implementation of important aspects of the climate change regimes (COP24.gov, 2018). This included taking into account the differences in

capacity between developed and developing countries, as well as the establishment of a Committee to review the global stocktake and “discipline but not punish” Parties that do not fulfill their reduction or reporting obligations (COP24.gov, 2018). At the end of the talks in Katowice, as with most COP events, many celebrated a perceived success while many others lambasted the conference for not going far enough. Regardless, this current, complex framework is what all 196 Parties and the European Union have determined will govern the international climate change regime into the future. Thus, we can use this framework to investigate the participation of specific countries and compare apparent ambition in climate efforts. This paper compares the ambition of two Latin American Parties - México and Costa Rica - by analyzing their most recent NDCs presented to the UNFCCC.

Footnotes:

*Parties to the convention which have ratified but haven't signed the Paris Agreement are Syria and Nicaragua, and parties which have signed but haven't ratified are Yemen, Turkey, South Sudan, Libya, Lebanon, Kyrgyzstan, Iraq, Iran, Eritrea, and Angola (UNFCCC, 2019d).

**Subjects of Articles 8-29 of the Paris Agreement: 8 = loss and damage, 9 = developed countries providing financial resources, 10 = technology development and transfer, 11 = capacity building, 12 = cooperating to enhance education and awareness, 13 = transparency and flexibility, 14 = convention taking stock of implementation, 15 = facilitating implementation and promoting compliance, 16 = COP is the meeting for parties to this agreement, 17 = establishing secretariat, 18 = SBSTA and SBI, 19 = other subsidiary bodies, 20 = when the agreement is open for signature, 21 = when the agreement enters into force, 22 = provisions of Article 15 entering into effect, 23 = provisions of Article 16 entering into effect, 24 = provisions of Article 14 entering into effect, 25 = each party getting one vote, 26 = Secretary General of the UN is the depositary for the agreement, 27 = there can be no reservations, 28 = when parties can withdraw, 29 = agreement is deposited with the Secretary General of the UN.

METHODOLOGY

The most current versions of NDCs were submitted by Costa Rica on October 13, 2016 and by México on September 21, 2016. Both are the INDCs that these countries committed to in the leadup to the Paris Agreement in 2015.

Both of the focal countries' (Costa Rica and México) NDCs will be analyzed in terms of commitment to climate change mitigation with respect to three categories: greenhouse gas emissions reduction, LULUCF (Land use, land use change, and forestry), and energy portfolio. Since greenhouse gases are responsible for rising global temperatures, reducing emissions directly is the most effective way any country can mitigate climate change. LULUCF is included because México and Costa Rica both have a relatively high percentage of forest cover, and forests are prominent carbon sinks removing greenhouse gasses from the atmosphere to mitigate climate change. Finally, a country's production of energy is usually its largest source of emissions, so its energy portfolio will determine the success of its emissions reduction goals.

Both focal countries' NDCs will also be analyzed in three categories relating to adaptation: adaptive capacity, climate finance, and technology transfer. Adaptive capacity is a country's ability to respond to a large-scale problem such as climate change without severely impacting its culture, economy or the overall wellbeing of its citizens. Climate Finance deals with the money developed countries will give to developing countries for climate change projects for both mitigation and adaptation, in order to address climate change's impact on local communities and ecosystems. Finally, technology transfer outlines how various solutions from other parts of the world will be made available to and implemented in Costa Rica and México to address the impacts of climate change.

These commitments will be compared between countries to determine which country is taking stronger climate change mitigation and adaptation actions. The differing practices for each category will be discussed in order to make recommendations for the country not pursuing them, or pursuing weaker versions of them, as well as to help further an understanding of the differing political, economic, and geographic characteristics that might underlie them. The most significant difference between the two countries is size, so the comparison should provide an effective model for how this variable affects a country's overall NDC.

JUSTIFICATION FOR COMPARING COSTA RICA AND MÉXICO

Given that México and Costa Rica do not have comparatively high nationwide emissions, and indeed all of Latin America combined emits less carbon pollution than the United States, it is fair to ask why it is important to focus research on Costa Rica and México. The region in Latin America and these two countries in particular, were not chosen to analyze places with the most work to do to reduce emissions, but rather places closer to the maximum end of climate action that serve as examples for the rest of the world. The region of Latin America generates a significant proportion of its energy from renewable hydropower, is endowed with flourishing, protected natural areas, and with Santiago, Chile originally set to host COP25 (which has since been moved to Madrid, Spain due to safety concerns) is currently looking to demonstrate a strong commitment to the Paris Agreement, the UNFCCC, and the international community.

Costa Rica and México share many similarities in the international climate change regime. The majority of citizens in both countries experience similar climates, the countries have similar histories and cultures, and both have had representatives hold the highest official position at the COP. The Mexican politician Patricia Espinosa is currently serving as the executive secretary of the UNFCCC, the highest ranking official in the Secretariat, responsible for supporting the complex architecture of bodies surrounding the COP negotiations (UNFCCC, 2019a). Before her, this title was held by Christiana Figueres from Costa Rica, who presided over COP21 and the signing of the Paris Agreement. Additionally, the Happy Planet Index, which takes into account wellbeing, life expectancy, inequality of outcomes, and ecological footprint to rank countries from most to least happy, puts Costa Rica at #1 and México at #2, out of 140 nations surveyed (Happy, n.d.).

Costa Rica especially has a well-known international reputation for environmental stewardship. In 2009, it famously committed to becoming the world's first carbon neutral

country by 2021 (World, 2017), though this distinction is also being sought by other nations, including the Maldives. Part of this process will be achieved by implementing a C-neutral label to certify that tourism and certain industrial practices mitigate all the carbon they emit (World, 2017). Additionally, Costa Rica's tropical forests have an abundance of diverse flora and fauna, which the country has taken advantage of by becoming the poster child for the ecotourism industry in the early 1990's (Honey, 1999). Because Costa Rica's pristine natural wilderness drives a major sector of its economy, 25% of the country's landmass is protected forest or reserves (Ubelong, 2018). Entities producing carbon can also use forests to offset their emissions, with a \$10 per ton voluntary tax that goes into conservation, reforestation, and research (World, 2017).

While Costa Rica is considered the model for ecotourism and protecting forests in Latin America, México is seeking to develop in this sector, and shows considerable ambition in trying to lower emissions. It recently committed with the U.S. and Canada to achieve 50% clean power generation across the continent and reduce methane emissions from the oil and gas sector by 40% —both by 2025 (Taraska et. al., 2018). Additionally, all three major presidential candidates in the 2018 Mexican presidential election came from parties with platforms that call for increasing renewable energy and limiting fossil fuel use to some extent, including the winner, Andrés Manuel López Obrador (Taraska et. al., 2018). It also introduced a carbon pricing program in 2014, similar to Costa Rica's, which started in 1997 (Roberts, 2017). México has demonstrated “substantial regional and global leadership” on climate change according to the Natural Resources Defense Council, signing memorandums of understanding with California to share tech and jointly implement low carbon, clean energy, and energy efficiency (Natural, 2017). However, more emissions reductions can be achieved to meet the goals of its NDC.

Costa Rica and México are also facing similar barriers preventing further climate action, particularly in the transportation industry. In both countries, this sector is currently reliant on fossil fuels, and growing substantially. In Costa Rica, less than 2% of personal cars are hybrid/electric, and the purchase of gasoline increased by 11% in 2016 (Fendt, 2018). Costa Rica also has 287 cars per thousand people, surpassing both the Latin American and the world average (Fendt, 2018). México, as the 13th largest greenhouse gas emitter in the world and 2nd in Latin America behind Brazil (Natural, 2017), also has a fossil fuel-dependent transportation industry. The subject is culturally sensitive due to a nationwide history of Mexican families donating their personal property to support a nationalized petroleum industry to oust foreign oil companies in the 1930's (Agren, 2018). Additionally, owning a car in México is something of a status symbol, seen as a sign of personal advancement and success, making any voluntary reduction of personal transportation a tough sell (Agren, 2018). As such, President López Obrador is in favor of building a new refinery to freeze the price of gasoline, and the Mexican public generally agrees, seeing it as a benefit from petroleum industry that they have earned (Agren, 2018).

Thus, due to the similarities in both strengths and weaknesses related to lowering emissions, Costa Rica and México are excellent candidates for comparison of what should be two relatively high levels of climate ambition. The major difference between Costa Rica and México that this research intends to explore is size. Given México has a population of over 120 million people compared with Costa Rica's just under 5 million, its overall GDP and carbon emissions are both

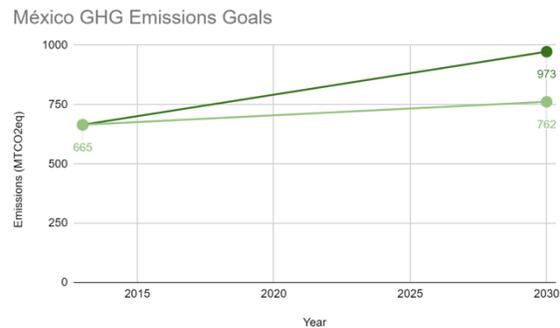
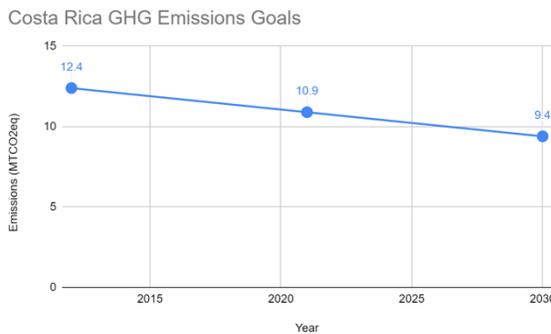
significantly higher than those of Costa Rica. Without jumping to the conclusion that every difference in ambition between the Costa Rican and Mexican NDCs’ is due to size, this research will attempt to determine the feasibility of instituting one country’s “best practices” in the other, while carefully taking this variable into account. If it is found that many of Costa Rica’s best practices can be applied to México, this comparison might provide a good example of a situation in which climate ambition can be “scaled up” from a smaller, lower-emitting country in a region, to the larger emitters in that region, which could then be used to inform other such discrepancies across the globe.

COMPARISON OF NDCS

Greenhouse Gas Emissions Goals

The NDCs of both Costa Rica and México are specific and quantitative when addressing greenhouse gas emissions reduction goals. Costa Rica reiterates its national goal to become completely carbon neutral by 2021 as a culmination of its pre-2020 actions. This goal means that the total level of carbon emissions that can be attributed to Costa Rica are sequestered, offset, or removed in some other way by Costa Rica, making the country’s contribution to global greenhouse gas emissions effectively zero. México’s NDC makes no mention of a goal for nationwide carbon neutrality.

Costa Rica used a baseline at 2012 levels of emissions to measure reductions goals. The emissions level from 2012 is 12.441 MtCO₂e (Megatons of CO₂ equivalent). The NDC goal is straightforward: to reduce this to 10.907 Mt CO₂eq by 2021, then to 9.374 Mt CO₂eq by 2030, then finally to 5.965 MT CO₂eq by 2050. México’s NDC used 2013 emissions levels as a baseline for its goals, which totaled 665 MtCO₂e. Because México has a much larger population, GDP, and land area than Costa Rica, this significantly higher baseline emissions level is to be expected. México’s NDC goal is to limit its increase in emissions to 762 MtCO₂e by 2030. The Mexican NDC expects a business as usual (BAU) scenario would raise nationwide emissions to 973 MtCO₂e, so the increase to 762 MtCO₂e corresponds to a 22% decrease from BAU, equal to 210 MtCO₂e. Figure 1 puts these disproportionate emissions goals into perspective.



a)

b)

Figure 1: Costa Rica’s (a) and México’s (b) GHG Emissions Goals as stated in their NDCs

The Mexican NDC’s commitments are more complex than those of the Costa Rican NDC. First, it breaks down emissions targets for the specific industries most responsible for carbon emissions. These industries are Transportation, Electricity Generation, Residential and Commercial, Oil and Gas, Industry, Agriculture and Livestock, and Waste, and the specific goals for each are outlined in Table 1. While the Costa Rican NDC’s Appendix 1 outlines general actions that specific industries can take to lower emissions, it does not specify any quantitative emissions goals for each industry, instead keeping its quantitative goals at the national level.

-22% GHG

	Baseline				GHG emissions (MtCO ₂ e)
	2013	2020	2025	2030	2030 Goal
Transport	174	214	237	266	218
Electricity generation	127	143	181	202	139
Residential and commercial	26	27	27	28	23
Oil and gas	80	123	132	137	118
Industry	115	125	144	165	157
Agriculture and livestock	80	88	90	93	86
Waste	31	40	45	49	35
SUBTOTAL	633	760	856	941	776
LULUCF ¹	32	32	32	32	-14
TOTAL EMISSIONS²	665	792	888	973	762

-22%

NOTES:

¹ LULUCF: land use, land use change and forestry.

² Subtotals do not coincide with the total because of rounding.

Table 1: The Mexican NDC’s Breakdown of emissions goals by sector

The two NDCs also differ in terms of gases covered in their measurements of greenhouse emissions. Costa Rica includes Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur hexafluoride (SF₆). These are commonly defined as the most significant greenhouse gases responsible for climate change (Environmental, 2019). México, by contrast, does not directly specify which gases it includes in its measurements. While measuring emissions from the fossil fuel industry, it cites CO₂ as “the most important greenhouse gas.” Elsewhere, while measuring radiative forcing (essentially how much influence a factor has on earth’s energy balance) of some greenhouse gases, it includes CO₂, CH₄, Halocarbons (such as HFCs and PFCs), and N₂O. Thus, it is unclear whether México’s NDC greenhouse gas emissions measurements include solely CO₂, the additional list from Figure A, or some other definition entirely.

However, México’s NDC includes more than traditional greenhouse gases in its emissions goals. It spends considerable time explaining Short-Lived Climate Pollutants (SLCPs), which are other emitted gases that contribute to the greenhouse effect, but spend less time in the

atmosphere than more commonly defined greenhouse gases. Of the SLCPs, México makes specific goals targeting emissions of Black Carbon with the same level of detail as its goals for greenhouse gases, including a breakdown of targets for each polluting industry. México's baseline black carbon emissions are 125 metric tonnes, with an overall goal to reduce that to 75 metric tonnes by 2030. This constitutes a 51% decrease in black carbon emissions from the estimated BAU level in 2030 of 152 metric tonnes. Costa Rica's NDC makes no mention of black carbon or SLCPs.

Finally, the Mexican NDC also includes an additional "conditional" section. The aforementioned greenhouse gas goals are considered "unconditional", but México includes specific "conditional" targets in its NDC as well for both greenhouse gases and black carbon, and these are more ambitious than the unconditional commitments. The conditional commitments are a 36% reduction in greenhouse gas emissions from the BAU level by 2030, as opposed to 22%, a 70% reduction in black carbon emissions from the BAU level by 2030, as opposed to 51%. México clearly calls for more international support to set these conditional goals, but its NDC is non-committal regarding the specific conditions that must be met. It does however list some general actions that "could" increase the unconditional commitments "if a global agreement were reached that would include for example international carbon pricing, carbon-sensitive levies, technical cooperation, access to low-cost financial resources and technology transfer on a scale equivalent to the global climate change challenge". Questions such as whether all or some of these conditions must be met to set México's conditional goals, what constitutes sufficient levels of "technical cooperation" and "access to resources", and what scale is "equivalent to the global climate change challenge" are not specified and instead left to interpretation. Costa Rica, by contrast, does not include a "conditional" portion in its NDC.

Both Costa Rica and México outline the initiatives they plan to take to achieve their respective emissions goals. Costa Rica groups these into Appendix 1: Mitigation Options, where it lists four broad policy options of reducing energy demand, decarbonizing the energy supply, fuel switching, and enhancing carbon sinks. Most of this section consists of describing the governing documents and various government institutions tasked with implementing these policy options, rather than describing the goals themselves. Still, Costa Rica anticipates an increase in the transportation sector's electricity demand, so meeting its NDC goals require "ambitious investment" in the expansion of electric public and private transportation as well as integration of the public transportation system for intercity travel. For decarbonization, Appendix 1 highlights Costa Rica's VII National Energy Plan goal to use 100% renewable energy by 2030, as well as the bureaucracy tasked with implementing the solid waste sector's emissions goals, including increased use of lumber, adoption of technology, new material, and sustainable urban development. The carbon sinks options are described in more detail in the following section.

México's subdivision of emissions goals into different industries allows it to outline the country's specific mitigation initiatives directly, and the initiatives mentioned in its NDC are more numerous. Under Energy and Industry, México aims to substitute heavy fuels with natural gas and/or clean energy, reduce methane leaks by 25%, and control industrial soot particles. For the transportation industry, México aims to standardize NAFTA environmental regulations and norms, utilize ultra-low sulfur gasoline and diesel, increase and modernize its vehicle pool, and promote multi-modal transportation for freight and passengers. Finally, for the urban sector,

México aims to encourage sustainable buildings and low carbon footprint cities, promote residential solar, and implement methane recovery in landfills.

The level of detail above is all that is mentioned about Costa Rica's and México's initiatives because the purpose of an NDC document is primarily to communicate to the international community what a country is responsible for under the climate change regime rather than the means by which it intends to uphold those responsibilities.

LULUCF

Both NDCs make ample mention of LULUCF as a major component towards meeting their climate goals, but there is a discrepancy in the level of detail offered by both countries. Costa Rica's NDC refers to the sector as AFOLU (Agriculture, Forestry, and Other Land Use) and states that it is included within Costa Rica's broader national emissions goals. In its Methodological Approximations and Assumptions section, the NDC states that Costa Rica has been improving its metrics to quantify emissions in this sector, and that it will continue to do so using many different tools in order to improve the accuracy of the sector's contribution to national emissions. It makes no mention of a specific estimation of or target for emissions in this sector, but does estimate that 804,593,099 tons of CO₂ are contained within the countries' forests. The additional sequestration potential of these forests is "being evaluated" in light of these improved metrics. Though a numerical estimate is not provided, Appendix 1 states that the potential emission reduction from LULUCF is likely lower than previous estimates due to most of Costa Rican forests being mature, with high carbon stocks, and therefore a lower carbon fixing capacity.

México's NDC has more specific LULUCF emissions measurements and goals. It calculates that the sector contributes 32 MtCO₂e to national emissions and absorbs 173 MtCO₂e, so it has a net absorption of 141 MtCO₂e. In its unconditional set of goals for 2030, México commits to lowering the sector's contribution from 32 MtCO₂e to -14MtCO₂e, presumably by eliminating the sector's remaining emissions and adding 14 MtCO₂e sequestration. LULUCF's contribution to national black carbon emissions is 4 metric tonnes, and México's goal is to have that figure remain at 4 metric tonnes by 2030. México separates its Agricultural and Livestock sector from LULUCF, so these sectors have separate emissions goals. The current contribution of Agriculture and Livestock to México's nationwide emissions is 80 MtCO₂e, and the unconditional goal by 2030 is to increase this to 86 MtCO₂e. This is reduced from a BAU estimation of 93 MtCO₂e by 2030 for the sector.

Costa Rica does not put forth many concrete mitigation actions for its LULUCF sector. In Appendix 1, "enhancing carbon sinks" such as forests and wetlands is one of four major mitigation policy options, but it is not explained further. The NDC mentions Agriculture as the second largest emitter in the country, and assures that the sector "is looking earnestly into emission reduction," but does not commit to any specific actions for the sector. In Appendix 1, it does detail many potential market roles for financing mitigation efforts in this sector, including carbon auctions, offering credit and microcredit for lower energy use, and developing Nationally Appropriate Mitigation Actions (NAMAs) for the coffee, livestock, and biomass sectors. None of these initiatives are committed to in the NDC however. The remaining mentions of LULUCF

in the context of mitigation are in the context of a green and inclusive rural development policy that includes synergies between forestry and agriculture to address environmental services of forests and other land uses besides reduction of greenhouse gas emissions.

México, by contrast, gives more specific mitigation actions for its LULUCF sector as a result of its NDC breaking down emissions targets by specific industry. In addition to the more ambiguous goal of improving forestry management, México aims to have a 0% deforestation rate by 2030, drive technification in the agricultural and livestock sectors, promote the use of biodigesters in livestock farms, and enhance recuperation of grasslands. While these actions themselves are more direct commitments than those of Costa Rica, the Mexican NDC does not outline specific, measurable goals for any of them except for the 0% deforestation rate.

Both countries intersperse LULUCF in other sections of their NDCs as well. Costa Rica refers to it in its National Setting section, while the final section of México's NDC is a box a little over one page long dedicated to LULUCF in calculating the Mexican contribution. Costa Rica's National Setting explains its role in using market tools to finance forestry initiatives in the 1990's before the Kyoto Protocol, and how a combination of the Environmental Services Payment Program and National Conservation Areas System allowed it to increase the country's total forest cover from 26% to 52.4% in 2013. México's LULUCF box mostly defines LULUCF, and explains its importance. In explaining the role of forests as a carbon sink, it mentions México is a "fortunate" country due to its extensive forest cover, which gives it the aforementioned net negative carbon emissions contribution. It also highlights that there is currently no global consensus on how to account for different land uses in emissions mitigation commitments, and that México's use of projections of land use change as opposed to current land use "highlights ambition of [its] goals".

Finally, both NDCs reference LULUCF in the context of Adaptation. Costa Rica's Appendix 2 detailing Adaptation options includes Community-based LULUCF adaptation actions involving, among other things, increasing resilience of agricultural producers, securing sustainable coastal zone development, and implementing sustainable productive systems in priority rural areas. Its Ecosystem-based adaptation section touts the success of their National Protected Area System in doubling national forest cover to 54.4%, and affirms a goal to continue current practices to reach 60%. Finally, for adaptation through Local Planning and Management of Territory, Costa Rica commits to ensuring every city and every coastline county has a land use plan that considers vulnerabilities to climate change. Generally, these adaptation actions are more specific commitments than Costa Rica's proposed mitigation actions related to LULUCF, and most (all but the Community-based actions) are tied to specific, measurable goals.

México also references LULUCF in the Adaptation section of its NDC. Its final table of Adaptation goals and actions includes an Ecosystem-based column. This column includes the actions of reforesting high, medium, and low watersheds, increasing ecological connectivity and carbon capture through conservation and reforestation, conserving coastal ecosystems, REDD+ Synergies, and the integral management of water for its multiple uses. These actions are described at roughly the same level of detail as México's mitigation actions related to LULUCF, though again, the Mexican NDC does not outline specific, measurable goals for them.

Energy

The portions of the Costa Rican and Mexican NDCs highlighting the countries' energy generation illustrate the discrepancy between their national settings. Costa Rica's NDC explains that the country's long history of hydropower makes over 98% of its electricity generation renewable. Thus, Costa Rica's primary sources of emissions related to energy come from sectors other than electricity generation, such as transportation. México's national settings makes no mention of its status regarding energy or electricity. Outside of the National Setting section, Costa Rica's NDC mentions energy in three of the four broad mitigation policy options in Appendix 1 (the last relating to LULUCF, as mentioned previously). México cites specific goals for the "Energy and Industry" sector, as well as separate goals for the Transportation sector.

The first policy option the Costa Rican NDC details is reducing energy demand. To accomplish this, it refers to its VII National Energy Plan, which defines energy efficiency and distributed generation, especially in residential and industrial infrastructure, as priorities. The Plan also has a goal to achieve and maintain a 100% renewable energy portfolio by 2030. The second policy option mentioned is decarbonizing the energy supply, not just in the electricity sector, but also in liquids and gases. The final energy-related policy option is fuel switching in the end uses of the fuel, such as in buildings and industry. These final two options are only listed in Appendix 1 in the NDC, and not specifically explained further.

México's goals for the Energy and Industry sector are to reach 35% clean energy by 2024, and 43% by 2030, and to substitute heavy fuels with either natural gas, clean energy, or biomass. It also aims for the specific goal of a 25% reduction in methane leakage, as well as the more ambiguous "control of soot particles in industrial equipment and installations". As noted in Table 1, México's Electricity emissions goals are to increase 2013's 127 MtCO₂e to 139 MtCO₂e by 2030, a decrease from the 202 MtCO₂e BAU estimation.

The two NDCs handle the transportation sector differently. Whereas Costa Rica integrates it into its reducing energy demand mitigation policy option, México separates Transportation from its Energy sector. Costa Rica anticipates an increase in demand from transportation, so the NDC's goals depend on greater use of electric public and private transportation, and improving fleet composition. It includes integrating its public transportation system through improved routes, better non-motorized options, an improved freight sector utilizing multi-modal options, and especially the prioritization of an intercity train system around the San José metro area. México's has similar goals for its transportation sector, including standardizing NAFTA environmental regulations, utilizing ultra-low sulfur gasoline and diesel, increasing and modernizing its vehicle pool, and promoting multi-modal transportation for freight and passengers. Its emissions goals for the transportation sector, as noted in Table 1, are to increase 2013's 174 MtCO₂e to 218 MtCO₂e by 2030, a decrease from the 266 MtCO₂e BAU estimate.

Adaptive Capacity

For effective climate change adaptation, both Costa Rica and México addressed the need to increase national adaptive capacity in their NDCs. "Adaptive capacity" is defined by the IPCC as the ability to adjust to potential damage, take advantage of opportunities, or respond to

consequences (Intergovernmental, n.d.[b]). In this case, it is the ability of Costa Rica and México to respond to climate change. Both NDCs include major sections planning for adaptation to climate change, or in other words, increasing this adaptive capacity as the effects of climate change become more pronounced. Thus, the majority of the Adaptation sections of both NDCs relate to adaptive capacity.

All parties to the UNFCCC are required to “engage in adaptation planning processes” which may include “the process to formulate and implement National Adaptation Plans (NAPs)” in addition to NDCs. Costa Rica’s NDC references its plans to complete a separate National Adaptation Plan (NAP) in 2018. However, it also devotes one paragraph towards outlining its “Contribution in Adaptation,” and then a 3.5-page Appendix 2 devoted to specific adaptation actions. In the one-paragraph “Contribution in Adaptation” section, it refers to its Green and Inclusive Development Policy, which includes such adaptation actions as strengthening conservation programs and including ecosystem-based adaptation in its environmental services payments program. It also plans to “promote renewable energies, integral environment management through agroforestry systems and watershed management, as well as municipal land use planning as tools to lower long term vulnerabilities of its population, enhance its food security and the resilience of its infrastructure.” More detailed information is included in Appendix 2.

México devotes a considerable portion of its NDC to Adaptation as well, though most of it is presented in the form of boxes and figures, rather than in paragraph form like most of the NDC. In the Adaptation main text, México commits to strengthening adaptive capacity in at least 50% of “most vulnerable” municipalities (160 municipalities), establishing early warning and risk management in lower level government, and achieving 0% deforestation rate by 2030. Like in its mitigation portions, México has both an unconditional and a conditional set of adaptation actions to pursue before 2030. Unlike with mitigation however, México does not describe any specific adaptation targets that are contingent on some other action by the international community. In its adaptation diagram, it simply lists Capacity Building, Transfer of Technology, and Finance for Adaptation as conditional goals. It does not list what the conditions for pursuing these are, or whether they are the same as the conditions for increased mitigation commitments, which were international carbon pricing, carbon-sensitive levies, technological cooperation, and access to low cost financial resources and technology transfer. “Technology transfer” being listed as both a conditional goal and the condition for that conditional goal is a potential source of confusion.

In these more detailed adaptation sections, both countries split actions into categories. For Costa Rica, the categories in Appendix 2 include developing an NAP, Disaster Risk Reduction, Community-Based Adaptation, Ecosystem-Based Adaptation, Local Planning and Management of Territory Adaptation, Public Infrastructure Adaptation, Environmental Health as an Adaptation Measure, and finally, Capacity Building, Technology Transfer, and Financing Adaptation. Each section contains roughly one paragraph of information. Ecosystem-based adaptation has already been touched on in the LULUCF section of this thesis, and the Capacity Building, Technology Transfer, and Financing Adaptation will be touched on in later sections. México’s primary content devoted to adaptation actions is a table broken up into just three categories: Social Sector, Ecosystem-Based Adaptation, and Strategic Infrastructure and

Productive Systems. The Ecosystem-Based Adaptation section has already been described in detail by this thesis, so the following analysis will focus on the other two sections.

Costa Rica commits to an NAP by 2018 to include a sectoral and territorial focus, with specific plans for ten sectors: Biodiversity, Agriculture, Water, Coastline, Fishery, Health, Infrastructure, Energy, Tourism, Cities. For disaster risk reduction, it plans to finalize a National Disaster Risk Management Policy for the 2016-2030 period, including the pillars of Risk Reduction, Disaster Response and Readiness, and Disaster Recovery, “with climate change adaptation as a cross-cutting issue.” It’s Community-based adaptation mainly consists of the aforementioned Green and Inclusive Development plan from 2016-2026 to implement sustainable productive systems in priority rural areas. The Local Planning and Management of Territory section commits Costa Rica to ensuring every every city and every coastline county has a land use plan considering vulnerabilities to climate change under the Territory and Urban Planning Organization. The Public Infrastructure sector commits to creating a National Vulnerability Monitoring Plan by 2020 for all infrastructure, but especially for public infrastructure which is most vulnerable. Finally, Environmental Health as an Adaptation Measure recognizes that things such as sanitation, waste management, and appropriate water quality are necessary to decrease vulnerabilities to climate change impacts, and as a result, Costa Rica commits to increasing sewer and storm drain coverage by 90% by 2030, and establishing an environmental health surveillance program by 2018.

México’s NDC breaks adaptive capacity actions into fewer sections represented by a table with three columns (pictured below as Table 2). Each column consists of a series of actions related to that section, the first of which is bold. The NDC does not explain the significance of its bold action. Its Social Sector’s first emboldened goal is to “attain resilience in 50% of the country’s most vulnerable municipalities”. Afterwards, it lists the actions of incorporating a gender and human rights approach to planning and risk management, adding financial resources for disaster prevention, regulating land use, integrating watershed management, and ensuring capacity building and social participation in adaptation policy. The first emboldened goal of the Strategic Infrastructure and Productive Systems column is to “establish early warning systems and risk management at the three government levels”. Under this, México commits to guaranteeing and monitoring performance of wastewater treatment in settlements of over 500,000 inhabitants, guaranteeing the security of strategic infrastructure, incorporating climate change in agricultural and livestock programs, implementing environmental standards for coastal tourism, and incorporating adaptation criteria for public investment projects. The NDC does not include details regarding what specific standards and criteria are being applied, nor does it reference another document that does.

Social Sector	Ecosystem-based adaptation	Strategic Infrastructure and productive systems
Attain resilience in 50% of the country's most vulnerable municipalities	Fulfillment of 0% deforestation rate by the year 2030	Establish early warning systems and risk management at the three government levels
<ul style="list-style-type: none"> • Incorporate a climate, gender and human rights approach to all territorial planning instruments and risk management 	<ul style="list-style-type: none"> • Reforest high, medium and low watersheds considering native species 	<ul style="list-style-type: none"> • Guarantee and monitor the performance of urban and industrial waste water treatment in human settlements larger than 500,000 inhabitants
<ul style="list-style-type: none"> • Increment the financial resources for disaster prevention and attention 	<ul style="list-style-type: none"> • Increase ecological connectivity and carbon capture through conservation and restoration 	<ul style="list-style-type: none"> • Guarantee the security of strategic infrastructure
<ul style="list-style-type: none"> • Set the regulation of land use in areas at risk 	<ul style="list-style-type: none"> • Increase carbon capture and the protection of coasts through the conservation of coastal ecosystems 	<ul style="list-style-type: none"> • Incorporate climate change criteria in agricultural and livestock related programs
<ul style="list-style-type: none"> • Integrated watershed management in order to ensure access to water 	<ul style="list-style-type: none"> • Synergies of REDD+ actions 	<ul style="list-style-type: none"> • Implement the standards for environmental protection and adaptation specifications in coastal tourism developments
<ul style="list-style-type: none"> • Ensure capacity building and social participation in adaptation policy 	<ul style="list-style-type: none"> • Guarantee the integral management of water for its different uses (agriculture, ecological, urban, industrial and domestic) 	<ul style="list-style-type: none"> • Incorporate adaptation criteria for public investment projects that include infrastructure construction and maintenance

Table 2: The Mexican NDC’s list of actions to increase adaptive capacity to climate change

Climate Finance

There is a major discrepancy between the amount of content related to climate finance in the Costa Rican and Mexican NDCs. Costa Rica devotes far more content to various aspects of climate finance in its NDC and goes into far more detail than does México.

First, as mentioned previously, Costa Rica explains in its National Setting section how, in the 1990’s, the country helped finance forestry activities using market tools/approaches in its Environmental Services Payment program, even before the Kyoto Protocol called for it. It also clarifies how its 2007 National Climate Change Strategy, which announced its Carbon Neutral by 2021 goal, offers offsets to some difficult to reduce emissions in its National Forestry Finance Fund and allows Costa Rica to “reserve the right” to use a Domestic Carbon Market currently in its pre-operations stage to achieve goals as a complement to National emissions reduction goals.

Costa Rica addresses climate finance in its Means of Implementation section as well. Here, it labels the period from 2015-2020 as a time to “align the allocation of financial resources” with the mitigation and adaptation goals that it sets elsewhere in the NDC. It also mentions that the emissions reduction goal definition process included a review of marginal abatement costs for its primary mitigation measures, which serves to inform future investment priorities. It uses construction of an inter-city electric train as an example of a priority where they found they

would require the development of both additional internal fiscal resources and external financial resources to complete. The funding for Costa Rica's adaptation strategies would be outlined in its NAP. Finally, the Means of Implementation section states that Costa Rica has "made headway" in its Green Climate Fund, and that its recently approved readiness program will help create institutional and fiduciary structures to manage it.

Many of Costa Rica's aforementioned mitigation and adaptation goals imply the development of a significant climate finance mechanism, such as the 10-year implementation of sustainable productive systems in rural areas via Green and Inclusive Development, or the establishment of a National Vulnerability Monitoring Plan for infrastructure. However, the NDC does not go into detail regarding the financing behind each of these actions specifically.

México's NDC mentions climate finance far less frequently. Its first reference is in a section titled "México's Commitment to Combat Climate Change," which highlights the country's implementation of a Climate Change Fund and a national carbon tax on fossil fuels in 2014. It also names the development of an international price on carbon emissions as a possible driving force for México addressing its conditional mitigation and adaptation commitments. Later, it more generally mentions that its emissions commitments "could" increase if international carbon pricing, carbon-sensitive levies, and increased access to low-cost financial resources were to be realized. The only specific commitment México makes to providing some of its own climate finance is in its Social Sector adaptation goals, one of which is to "increment the financial resources for disaster prevention and attention."

Technology Transfer

Both NDCs make relatively few references to technology transfer. First, in its short Contribution in Adaptation section, Costa Rica implies that one of its adaptation commitments, the National Disaster Risk Management Policy, will achieve capacity building through resilience and technology transfer. However, its more detailed Disaster Risk Reduction section within Appendix 2 doesn't mention technology transfer specifically. In its Appendix 1 Mitigation Options section, it sites the importance of credit and microcredit for ensuring the uptake of low emission technology development in the agricultural sector.

The most direct reference Costa Rica's NDC makes to technology transfer is in its Planning Process section, where it mentions a 2011 Technological Needs Assessment (TNA), which details a strategy for the transfer of technology to support both mitigation of climate change and reduction of vulnerability to its adverse effects. According to Costa Rica's NDC, the TNA prioritizes public transportation integration and decongestion, and energy conservation and efficiency.

México's NDC mentions technology transfer less often than Costa Rica's. First, in introducing its conditional segment of its intended contribution, the NDC cites México being given more resources and technology transfer as factors that could allow implementation to its proposed conditional actions. This is similar to its request of an international price on carbon in the realm of climate finance to transition to including the conditional commitments. The NDC then reaffirms this stipulation at the end of its Mitigation of National Emissions section, this time

citing technical cooperation and access to technology transfer as additions to a global agreement which “could” increase the SLCP and GHG reduction commitments.

The only other places México’s NDC references technology is in its Agriculture and Forestry sector mitigation goal to “drive the sustainable technification of the agricultural and livestock sectors,” and in its Adaptation section where it considers the modification and innovation of technology to support “adaptation in aspects such as infrastructure protection, water, transport and soil recuperation”.

DISCUSSION

Costa Rica’s NDC is much stronger than México’s NDC on its greenhouse gas emissions goals. First, Costa Rica starts off with an advantage in its emissions reduction goals, with a significantly lower baseline level of national emissions at 12.441 MtCO₂e compared with México’s 665 MtCO₂e. It also has less than half the per-capita emissions at 2.46E-6 MtCO₂e/capita (World, 2019) than does México at 5.19E-6 MtCO₂e/capita (Worldometers, 2019). However, Costa Rica also intends to lower these figures in the near future more significantly than México does. In addition to its emissions goals, Costa Rica intends to have a completely carbon-neutral economy by 2021, partially by implementing a national C-neutral label to certify that tourism and certain industrial practices mitigate all the carbon they emit (World, 2017). México, by contrast, intends to continue to raise emissions levels until 2030 in its NDC goals, though their goals are lower than their expected BAU scenario levels. México’s characterization of its emissions goal as a 22% reduction of greenhouse gases emissions is misleading, as this actually constitutes an increase in emissions levels compared to the baseline. Similarly, its 51% reduction of black carbon by 2030 compared to the BAU actually constitutes a 40% reduction from current levels.

The independent scientific analysis Climate Action Tracker (CAT) utilizes national policies and NDC commitments to evaluate whether countries’ mitigation commitments are compatible with the goals of the Paris Agreement (Climate, 2019a). As mentioned previously, these goals are to keep overall climate warming to well below 2°C above pre-industrial times, while pursuing efforts to keep warming below 1.5°C (United, 2015). According to CAT, Costa Rica’s climate action commitments are 2°C Compatible, meaning that if every country were to make commitments similar to those of Costa Rica, the Paris Agreement goal of keeping warming to less than 2°C would be met (Climate, 2019b). Costa Rica is one of only five countries, the others being Bhutan, Ethiopia, India, and the Philippines, to make 2°C Compatible commitments. Only two countries, Morocco and The Gambia, have made stronger commitments that are 1.5°C Compatible. The rest of the world falls under either Insufficient, Highly Insufficient, or Critically Insufficient (Climate, 2019b). México’s commitments are “Insufficient” according to CAT, meaning that warming would surpass the 2°C goal, but be kept to less than 3°C if all countries were to adopt similar commitments (Climate, 2019b). Thus, in terms of greenhouse gas emissions, Costa Rica’s NDC is one of the strongest commitments and México’s NDC is in the Insufficient category along with the majority of countries surveyed (commitments from European countries within the EU are analyzed collectively and listed as Insufficient) (Climate, 2019b). However, México’s NDC is still stronger than that of most

major-emitting countries like the Highly Insufficient China or the Critically Insufficient United States (Climate, 2019b). Figure 2 illustrates the most recent results of CAT’s analysis.

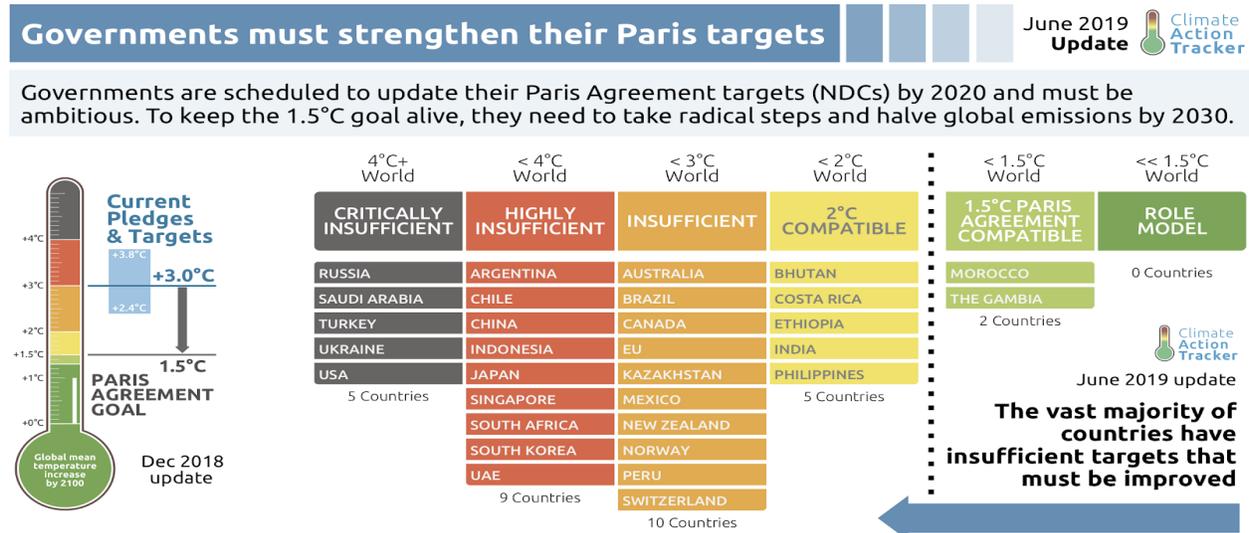


Figure 2: Climate Action Tracker’s June 2019 analysis of various national pledges to climate change and their compatibility with the Paris Agreement

México’s NDC is also unique in that it contains both conditional and unconditional goals. In terms of greenhouse gas emissions, México’s conditional goal of a 36% reduction from BAU levels by 2030 would result in total emissions levels at about 623 MtCO₂e, which would constitute an actual minor decrease from baseline levels at 665 MtCO₂e. In terms of Black Carbon, México’s unconditional goal of a 51% reduction from the BAU already constituted an actual decrease from current levels by 40%, but their conditional goal of a 70% reduction from the BAU would result in about 46 thousand metric tonnes total, or a substantial 63.5% actual reduction from the baseline. However, México’s insistence that these goals are met based on conditions of the international community outside of their control, such as the institution of an international price on carbon, indicates an unwillingness to show leadership on climate action. As mentioned previously, México clearly calls for more international support in the form of “technical cooperation, access to low-cost financial resources and technology transfer on a scale equivalent to the global climate change challenge” to be able to set these conditional goals, but its NDC is non-committal about whether these postulates would be sufficient to transition from its unconditional goals to its conditional goals. México and the international climate regime as a whole would both benefit from greater clarity in the Mexican NDC regarding the specifics of the conditions that must be met in order to transition the country to pursuing its conditional goals.

Still, even if México’s actual emissions goals leave much to be desired, the NDC’s structure does provide an arguably better model than does the NDC of Costa Rica. México’s emissions goals being broken down by industry allow for more clarity and transparency as to which climate action investments the national government intends to make, compared with the overarching national goals mentioned in Costa Rica’s NDC. This model also clearly indicates where the majority of México’s national emissions are coming from and which sectors need the strongest investments to make a meaningful difference in terms of national emissions. This model is perhaps more appropriate and necessary for a country as large as México, as the industries

themselves are much more complex and have significantly higher carbon footprints than those of smaller countries. That being said, most of México's highest-emitting sectors, such as Transportation, Oil and Gas, and Industry, also correspond to the highest intended emissions increases by percentage, indicating that México is not prioritizing emissions reductions in its highest-emitting sectors except for Electricity Generation.

Although more ambiguous on its overall emissions goals, México is more specific than Costa Rica on its LULUCF goals. This is a direct result of México's NDC breaking down emissions goals by sector. While Costa Rica's goals in the LULUCF sector rely on mostly obscure statements such as "improve metrics to quantify emissions" and "enhance carbon sinks," México assigns numerical values to its LULUCF goals as it does with its other sectors. México's goal to completely eliminate emissions and increase absorption of greenhouse gases from its LULUCF sector is very strong, and since Costa Rica does not go into the same level of detail in this sector, the two are very difficult to compare. However, Costa Rica's mentioning of its goal to increase forest cover from 54.4% to 60% by 2030 implies a negative net deforestation rate, whereas México commits to a 0% deforestation rate by 2030, indicating Costa Rica's deforestation commitment is stronger.

Additionally, the two NDCs are different in that Costa Rica includes Agriculture in its LULUCF, which it names AFOLU (Agriculture, Forestry, and Other Land Use), whereas México separates Agriculture from its LULUCF sector. The UNFCCC's page describing LULUCF connects the two, saying "management and/or conversion of land uses (e.g. forests, croplands and grazing lands) affects sources and sinks of CO₂" (UNFCCC, 2019b). Therefore, México's separation of Agriculture and LULUCF is problematic, as agriculture is one of the primary factors related to land-use and land-use change on a national scale, as well as being inextricably linked with forestry, especially in Latin American countries. Since México's Agriculture sector emits a baseline of 80 MtCO_{2e}, and its unconditional goal is to increase this to 86 MtCO_{2e}, it still results in a net negative LULUCF contribution when the sector is included. However, this figure drops considerably from -155 MtCO_{2e} to -69 MtCO_{2e}. This separation of the sectors artificially inflates the amount of greenhouse gases México's LULUCF sector absorbs. In order to improve transparency of its goals, México should include Agriculture in its measurements of LULUCF emissions and absorptions of greenhouse gases.

The energy portfolios of Costa Rica and México are especially disparate, mostly due to the discrepancy in size between the two countries. Since Costa Rica is a small country of 5,065,901 people (World, 2019), which is a little over half the size of México City, it is much easier to meet a higher proportion of its comparatively small energy demand using renewable energy. As such, Costa Rica has managed to generate 98% of its electricity from renewables, largely thanks to its hydropower resources. México does not reference its electricity portfolio in its NDC, but according to the U.S.'s Energy Information Administration, México generated about 80% of its electricity from fossil fuels in 2015 (Energy, 2016). Thus, México's energy goals, as described in its NDC, are to address this by reaching 43% clean energy by 2030, and substituting heavy fuels with natural gas, clean energy, or biomass. While these goals are significant, they are perhaps inevitably behind those of Costa Rica. Additionally, it is worth noting that México's Electricity Generation sector emissions goal is still an increase from 2013's 127 MtCO_{2e} to 139 MtCO_{2e} by 2030. Though this is a significant decrease from the 202 MtCO_{2e} BAU estimation,

the fact that it is still an overall increase calls into question México's dedication to significantly lowering its energy emissions.

Energy includes more than just sources of electricity generation however, and both countries still commit to energy goals in Transportation and industry. Transportation and Industry are México's first and third largest sources of greenhouse gas emissions by sector respectively. These sectors are also difficult to compare as Costa Rica does not break down emissions targets by sectors like México does, and the two countries vary considerably in which mitigation actions they are pursuing in these sectors. Costa Rica mostly focuses on reducing demand for transportation, whereas México focuses on decarbonizing its infrastructure by improving its vehicle fleet and fuel sources. Both of these approaches appear to be valid means to achieving emissions reductions given the countries' national circumstances.

With the advent of the NAPs, both countries seem to have limited specific information in their explanation of goals for national adaptive capacity. Both NDCs limit the main text devoted to adaptation to either one paragraph (Costa Rica) or two (México). México does not outline adaptation targets as clearly as it did with mitigation, and both countries mention a variety of very general goals, most of which are without any numerical targets. This makes them considerably less measurable, and therefore less transparent, than they otherwise could be. Still, there are some examples of specificity, as México commits to strengthening adaptive capacity in at least 50% of "most vulnerable" municipalities (160 municipalities), though what "strengthening adaptive capacity" entails exactly remains unclear. Costa Rica similarly includes the goal of ensuring every city and every coastline county has a land use plan considering vulnerabilities to climate change under the Territory and Urban Planning Organization, which is fairly easy to measure and determine if the goal has been met. Still, the majority of adaptive capacity actions that both countries' NDCs mention suffer from a high degree of ambiguity. This is illustrated by most of Costa Rica's goals being to essentially "create a plan" for something specific, or by México's omission of further explanation of the actions listed in Table 2. México is also ambiguous when its NDC uses phrases like "attain resilience" in a proportion of municipalities or "incorporate adaptation criteria" in investment projects.

México is even more ambiguous in terms of its conditional goals. As mentioned previously, México's NDC simply lists Capacity Building, Transfer of Technology, and Finance for Adaptation as its three conditional components for its adaptation strategy. It does not explain what the conditions for pursuing these are, or whether they are the same as the conditions for increased mitigation commitments. If the conditions are the same, "technology transfer" is listed as both a conditional goal and a condition for pursuing México's conditional goal, resulting in a level of ambiguity that is almost comical.

Costa Rica contains ambiguity as well, but most of this is the result of its NDC consistently referencing other documents or policies for specifics. This includes the NAP, which is to contain specific plans for ten different sectors, a National Disaster Risk Management Policy, a Green and Inclusive Development plan, and a National Vulnerability Monitoring Plan. The contents of these documents are, for the most part, not explained in the NDC beyond what sectors they serve, but it is implied that they explain more specific targets for climate change adaptation in

these sectors. An in-depth analysis of the goals within these referenced documents however, is beyond the scope of this thesis.

Both NDCs devote far less time addressing climate finance than they do with any of the categories examined so far. That being said, Costa Rica's NDC touches on the subject more, and with more detail, than México's. Most references to climate finance come in the form of past climate change achievements by each country. Costa Rica mentions its Environmental Services Payment program and México, its carbon tax. However, Costa Rica devotes some space to explaining that there will be a process from 2015-2020 to "align the allocation of financial resources" with its mitigation and adaptation goals as well as a review of marginal abatement costs for its primary mitigation measures. Outside of the initial reference to their carbon tax, México's NDC only mentions climate finance as a prerequisite for switching to its conditional goals, and as a goal to provide financial resources for disaster prevention. It is clear México sees climate finance not as something to provide for its national climate actions, but as something to be received from elsewhere to facilitate climate action. The NDCs' content regarding climate finance once again illustrates the disparity in climate leadership between the two countries.

In the final comparison category of Technology Transfer, there is again a relatively low amount of content devoted to the subject compared with the other categories. Costa Rica and México both make sporadic references to the phrase in a few of their mitigation and adaptation goals, and México again mentions it as a prerequisite for switching to its conditional goals. In this realm however, Costa Rica's NDC references its 2011 TNA, which, as mentioned previously, details a strategy for the transfer of technology to support both mitigation of climate change and reduction of vulnerability to its adverse effects. The TNA serves to reference some presumably more specific intended processes to achieve effective transfer of technology in sectors that will improve Costa Rica's climate action. Indeed, Costa Rica's page on the TNA website goes into more detail, not only in technology priorities in Transportation and Energy Conservation as mentioned in the NDC, but also in Infrastructure, Water, Forestry, Agriculture, and Livestock (Technology, 2018). Again, in-depth analysis of this separate TNA document is beyond the scope of this thesis, but some cursory research indicates there is information explaining Costa Rica's national goals for climate finance in this document, whereas México's NDC does not go further than recognizing the need for climate finance and calling for more of it from abroad. Overall, a comparison of the two NDCs can be summarized in that México's is more specific in mitigation, while Costa Rica's includes stronger goals. Though México is specific, it is also misleading in some sections, like LULUCF. On adaptation, both are ambiguous, though Costa Rica refers to documents that provide more specific insight. In order to prepare for the upcoming strengthening of NDCs in 2020, México could strengthen its goals, either by making its conditional commitments unconditional, or by specifying what specific requirements must be met by the international community and committing to increase the commitments once those are met. Additionally, México could be more transparent by acknowledging that their current unconditional emissions goals actually constitute an increase in overall emissions. Costa Rica could improve its NDC and increase transparency by breaking its mitigation goals down by sector and naming more specific initiatives that will be pursued to meet each one.

More research should be conducted on how each of Costa Rica's referenced documents sets adaptive capacity goals for the country, as well as if there are similar documents outlining

México's commitments in these areas. Additionally, analysis comparing the NDCs of a country with a higher climate-action commitment to that of another country in the same region could help illustrate potential for increased commitment in many regions across the globe. For example, Morocco's NDC, which is one of only two in the world that are 1.5°C compatible, could be compared with NDCs of other Middle-Eastern and North African countries, and India's 2°C compatible NDC could be compared with other countries in Asia. If countries' NDCs are judged based on those of their neighbors, a competitive process of strengthening national commitment might result in greater overall climate action for the upcoming Global Stocktakes. Through this comparative international lens, a higher degree of national accountability could develop, which might set countries on a path that is compatible with meeting the ambitious Paris Agreement goals to avert the climate crisis.

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