LEARNING by DOING

Scaling up Ambitious Leadership Learning By Doing

México

ANNUAL REPORT 2021



Scaling up Ambitious Leadership Learning By Doing

México

ANNUAL REPORT 2021

Ciudad de México June 08th, 2022





CIES consorcio de investigación económica y social Construyendo conocimiento para mejores políticas



Contents

1.	Executive summary	4
2.	Introduction	5
3.	LBD Project and participants	7
4 ·	Baseline	9
5.	Scrum personnel selection criteria	14
6.	Reports from scrums in 2021	15
7.	Other activities 2021	16
8.	Knowledge insights and Findings from project 2021	18
9.	Peer review and suggestions	23
10.	Impacts of the project	23
11.	Conclusions and view forward	23



Executive summary

During 2021, our team worked on creating visions on Mexican society in 2050 that are consistent with $1.5^{\circ}/2^{\circ}C$ futures. In addition to the content of the narrative and its technical aspects, which are both relevant aspects, we placed special emphasis on discerning about the real-world feasibility of the trajectories towards our 2050 futures, and on thinking about the political and social constraints that our proposed solutions may face.

One of the main contributions of our team is developing technically sound scenarios. We began working on two complementary tasks. First, estimating a baseline (i.e. business as usual) scenario by economic sector. And, second, specifying a general equilibrium model that would state in a rigorous way the trajectories that the core economic sectors should follow to converge to $1.5^{\circ}/2^{\circ}$ C futures.

Yet, knowing what to do to achieve the emissions' goal is a necessary, but not a sufficient condition to actually doing it. A common feature in most societies is that leaders and societies do not enact and/or implement the technically optimal policies and actions for $1.5^{\circ}/2^{\circ}$ C futures. To understand the reasons that explain this issue and to develop potential solutions, we utilize a political-economy approach that incorporates political and social restrictions to our estimations and visions that would create more feasible outcomes and policies.

Another related issues in which we worked, was thinking about new paths outside the model scenarios that consider how to increase leaders ambition. We plan to complement the model's outcomes with specific narratives that imagine the set of (potentially feasible) conditions that would incentive rulers and citizens to scaling up their ambition on policies and actions that effectively mitigate CO₂ emissions towards a $1.5^{\circ}/2^{\circ}$ C future.

From our initial assessment, based on interactions with specialists in multiple fields, Mexico's initial conditions are not ideal at this moment: powerful (high CO₂ emitting) economic sectors; weak societal demand for lesser CO₂ emissions; and, an extremely centralized authority on the national government that does not include climate policy among its priorities and, in addition, it limits local solutions and the connection between citizens and governments.

Mexico's delay in the publication of certain climate policy instruments and lack of transparency and specificity in the methodologies complicates the assessment of how the Mexican government plans to implement its policies and achieve its national and international commitments. None of the pandemic recovery measures have been environmentally sensible, and government spending on fossil fuel infrastructure has increased. The energy policy is at the center of national debate and is key for the President, who has promoted "sovereignty" and "security" measures to strengthen the state-owned companies, hindering private investments that were the only efforts towards increasing renewable energy.

So far, we have identified multiple challenges ahead. Nevertheless, there are also multiple tools and opportunities for successful change, which we develop in this document.



Introduction

The LbD project in Mexico is developing in a complex political context in which the current government administration is strongly pushing for a reform of the energy sector that would backtrack most of the 2014 reforms that had liberalized the energy sector. Because the public discussion on the reform from the government is taking place mostly on ideological grounds, bringing in government officials into the discussion has proven difficult.

In December 2020, Mexico submitted a revised version of its 2015 NDC to the Paris Agreement. However, while it included additional elements regarding gender and adaptation, it did not increase its mitigation ambition. By proposing the same mitigation goal as the one in 2015, the 2020 revision of the NDC failed to meet the principle of progressiveness expected for every update of the NDCs.

At the international level, Mexico caused disappointment among the climate community by joining the group of G20 countries whose NDCs are highly insufficient to align its GHG emissions to a 1.5°C modeled domestic pathway. Domestically, civil society successfully took the government to court through an injunction based on the non-compliance progressiveness principle. At the COP26 in Glasgow, Mexico received for the first time "the fossil of the day award" for their energy policies that favor fossil fuels above renewable energies. Within this context, the Mexican government has stated several times that it will submit a revised and more ambitious NDC in 2022 by COP27.

President Lopez-Obrador (AMLO) offered this commitment to Special Envoy John Kerry a few weeks before COP₂6, reiterating the promise in Glasgow. To our knowledge, Mexico is one of the few emerging economies publicly offering to present an updated and more ambitious NDC in 2022. This offer allows this project to enhance capacities, foster innovation, and strengthen coalitions to work on preparing the new NDC.

We have identified multiple opportunities for improvement leading to a better future in which emissions are effectively reduced. In line with LbD's core goals, our team has pursued on:

- Envisioning a 2050 society that lives a "good life" and one in which the trajectory to 2050 also has ingredients of a "good life".
- Making sense of our 2050 vision with a 1.5-2 C goal.
- Identifying the political, economic and social limits to our vision.
- Modelling the change trajectories by sector.

To contribute to the above tasks, our team has focused on understanding the political, social and economic constraints that limit Mexico's contribution to a 1.5-2 degrees future that implies a better version of Mexican society y multiple dimensions. We have placed a special focus on understanding the determinants of effective social demand for a better environment.

A key component of our visions is a solid understanding on the core sectors of the economy, their contribution to CO₂ emissions, and the sort of changes that each sector would, ideally, undertake to reach an acceptable level of emissions. Our team work progressed during 2021 on specifying a general equilibrium model that state solid scenarios and, the ICM team inquired into Mexico's current climate policies and emissions' status; Mexico's carbon budget and decarbonization scenarios; potential mitigation measures that could be implemented; and specific decarbonization routes for oil, gas, and electricity that are consistent with a 1.5 °C.

For expanding the possibilities for $1.5^{\circ}/2^{\circ}$ C futures, our initial vision—which we are updating as the project unfolds—considers the following four opportunity areas:

• Good will (including political will) is not sufficient for change. In addition to economic restrictions, we need to understand the existing political and societal constraints.

TRANSFORMING THE WAY WE ACT



- We need to create the right incentives for stronger societal demands for better environment conditions. This includes the development of attractive narratives that would incentive citizens to overcome collective action problems and be willing to invest more on change. We consider a strong societal demand as a necessary condition for reaching a 1.5°/2°C future.
- We need to formally induce much greater participation/authority from local governments on CO₂ emissions mitigation policies. Framing the necessary actions for curbing emissions as needed for "saving the planet" or "for the well-being of humanity", may actually have the opposite desired effect, which is to incentive opportunistic behavior (e.g. free-riding) or to reinforce the perception dispersed benefits and focalized costs.
- Given the existing constraints, we need to think on more effective pricing measures on CO₂ emissions, especially those that are more effective to curb power asymmetries.





LBD Project and participants

The Mexico team considers the ITAM members (Juan Carlos Belausteguigoitia, Vidal Romero, and Alberto Simpser); a group of researchers working on the general equilibrium model (María Eugenia Ibarrarán (Universidad Iberoamericana), Alejandra Elizondo (CIDE), and Roy Boyd (Ohio University)). And the group of researchers at Iniciativa Climática de México (ICM).

In our process of information gathering, and for generating and testing hypotheses, we conducted multiple meetings and participated in different seminars:

- Duncan Wood (The Wilson Center). He is an expert on Mexico's energy sector. We talked about the role of the United States in exercising pressure on the Mexican government to align its actions towards Mexico's commitments on climate change.
- Rodolfo Salazar (Consultant and former director of social affairs at Mexico's Energy Ministry). We conversed on the social issues related to the different actions for emissions' mitigation, especially those related to potential losers and the sort of available compensations for economically regressive policies.
- Carlos Murrieta. He is an expert on the energy sector, more specifically on hydrocarbons. We discussed the feasibility of change in the sector and potential alternatives.
- David Victor (Center for Global Transformation, University of California, San Diego). We discussed the different constraints that exists to induce countries to fulfill their mitigation commitments.
- Gabriel Baeza (Centro de Investigaciones Interculturales, Jurídicas y Ambientales (CIIJA)). We talked about the problems that indigenous communities are facing as a product of environmental degradation in Mexico.
- Miguel Messmacher (ITAM, former underministry at SHCP). We discussed the role of fiscal policy on curbing emissions.
- Katya Puga (director of social affairs at Mexico's Energy Ministry). We talked about the regulatory challenges that Mexico faces on social licensing.
- Juan Antonio Le Clercq (Chair, Political Science Department at UDLAP). We conversed on the incidence of social conflict regarding environmental issues.

Project Roles

COUNTRY AUTHORITIES / CORE COUNTRIES act as project owners and lead on UNFCCC work and coalition building.

NATIONAL TEAM LEADERS (NTLs) organize meetings in Mexico for project portfolio and NDC revision, and support capacity and innovation capture.

REGIONAL TEAM LEADER (RTL) organizes regional exchanges, wider ministerial interphase.

Experts provide opening leads on project papers and activities.

CIES administers; ENERGEIA substance and coordination lead.





- Santiago Fernández (Transport specialist at ITDP). We talked on the feasibility of different transportation policies for mitigating emissions.
- Program on sustainable finances and climate risk analysis, sponsored by the UK Pact. We attended the seminars organized by this program and the CIERN at ITAM, which discussed Mexico's current affairs on climate and energy policies.
- Seminars at ITAM's Center on Energy and Natural Resources. We attended this seminars that discussed Mexico's current affairs on environmental policy.
- We organized a meeting to present and gather feedback on ICM's baseline scenario with a group of experts on energy, climate and different economic sectors.
- Meetings with the ICM team to discuss the baseline scenario.
- We have been in contact with FUNDEPS, an Argentinean NGO, to discuss their experiences on social demand for better environment (<u>https://agroquimicos.fundeps.org/)</u>.





Baseline

Our baseline estimation is a combination of different elements. First, estimations from a general equilibrium model that provides precise estimations on the sorts of changes (activity reduction mainly and substitutions) that must be conducted in the core economic sectors.

Second, these estimations are being calibrated for developing a plausible model of the economy that considers the core political and social constraints and that would provide a more solid baseline for working out different scenarios.

Finally, we are developing specific narratives that provide sufficient substance on empirical estimations and constraints that would allow our society to reach a good life by 2050.

Our 2050 vision

By 2050, we envision a Mexican society in which social, environmental and economic development has significantly benefited most societal groups. Progress has taken place hand-in-hand with significant CO2 mitigation and adaptation policies that have allowed the country to fulfill its emissions goals for a 1.5-2 degrees maximum global warming, and to go beyond these by adopting a 2050 net-zero greenhouse gases emissions target. Mexico's green revolution will have focused on the most emission-intensive sectors: energy, transportation, and agriculture.

Mexico in 2050 is a better country than it was three decades ago. Citizens enjoy a better life and are happier. They are physically and mentally healthier. The context has significantly changed. The air and water are cleaner; transportation is not a polluting hassle; and there are more time, information, and opportunities for high-quality living.

Mexico is also a more democratic country in which existing institutions promote governments that are more responsive to citizens, and enterprises have sufficient incentives to behave well. Economic, social, and political conflict is not absent, of course; yet, there are effective ways to solve conflict with low transaction costs.

In 2050 Mexico, communities and local governments are stronger. They have sufficient resources and incentives to minimize risks stemming from climate change---they no longer need to demand the attention of national government and of multiple intermediaries.

In this context, ambitious thinking and policies are feasible.

A Virtuous Circle

In this society that we envision, all relevant actors have incentives to control their CO₂ emissions at the globally-optimal level. A virtuous circle has developed between the incentives and the behaviors of governments, citizens, and industries. This has been possible not only because a change in conscience, but because, given the existing constraints, the "correct" policies were implemented.

Citizens know that they are entitled to a good life---a better one than 30 years ago. They know that they do not have to live in polluted environments and that local and sustainable consumption have significant benefits. A sea change in the national culture has taken place, encouraged by significant support to local organizations that significantly reduce citizens' collective action problems for demanding better living conditions.

Policy-makers at all levels of government are significantly constrained by citizens' demands for lower



greenhouse gas emissions and by subnational authorities that have incentives to have "clean" administrations. Politicians have raised their climactic ambitions and have a shared vision of a better Mexico, which is rewarded by voters.

Thanks to the policies and incentives put in place 30 years ago, carbon pricing has progressively increased from US\$3 up to US\$75 in 2050. Revenues from carbon taxes and other fiscal instruments have allowed governments to invest in *just transitions* that consider the prevention of climate risks, the reduction of regional inequalities, and compensations of various sorts (including retraining, unemployment benefits, and investment in community development) to individuals and communities affected by the demise high-emission industrial activities, as well as by the consequences of climate change.

Power generation is now much cleaner, transportation has significantly changed by embracing low emissions technologies, food production has implemented low-emissions best practices, and food consumption has moved towards zero emissions products.

Industries have gradually adapted to the new regulations and realities, not because of philanthropy, but because consumer preferences are now pro-environment, technological advancements have made change financially feasible, and governments have provided adequate incentives, compensations, vigilance, and sanctioning. Over time, large parts of the population and businesses have acquired a stake in the new lowemissions status quo, rendering it a stable situation from the social, economic, political, and geopolitical points of view.

Our Vision by Core Areas

This future that we envision is built on ambitious changes on institutions, technology, and culture in three core areas that account for most emissions in the previous decades: energy, transportation, and agriculture and forestry.

ENERGY. Thirty years ago, electricity generation accounted for almost one quarter of CO₂ emissions (INEEC). Today, in 2050, the electricity sector significantly decarbonized. Mexico's net zero-power generation policy is constructed around carbon pricing and renewables.

Carbon pricing has been successful at inducing consumers and producers to change their behaviors, leading to less carbon dioxide emissions. In addition, revenues from the carbon tax have been progressively allocated to emissions mitigation policies and compensatory policies to those negatively affected by the transition to a low emissions environment.

Politically powerful stakeholders that were initially opposed to a widespread carbon tax across energy sources—including oil, cement, steel, and coal production—were successfully compensated and incentivized to adopt cutting-edge technologies, and faced an ample coalition of NGOs, local governments, international organizations, and international trading partners that were able to counter its initial resistance to change.

PEMEX (Mexico's state-owned oil company) and **CFE** (Mexico's state-owned electricity company) successfully transitioned to clean energies, mainly solar and wind, in a fair market environment. These state-owned enterprises no longer constitute sectoral monopolies. Methane emissions were successfully minimized in oil and gas production thanks to technological change. Energy-intensive sectors such as steel, chemicals, metals, cement, glass, and paper have successfully adapted to renewable sources.

Government intervention was successful to compensate not only enterprises, but also workers and communities, adding a progressive component to its policy of carbon pricing.

Mexico's change in power generation policies has benefited many communities. Power generation is no longer



an obstacle to a good life. Citizens understand that air and water pollution are not a "necessary" ill associated with power generation. Former "oil towns" have found new economic activities with help from governments and international NGOs that provided resources and incentives for change and innovation.

TRANSPORTATION. Transportation in 2050 Mexico is no longer a massive source of emissions. Thirty years ago it accounted for about 18% of greenhouse gas emissions, formerly projected to double by 2050). This has had a significant positive impact on Mexicans' health, leisure time, and social capital.

Thanks to technological change and government fiscal incentives, as compared to fuel vehicles, electric vehicles (EV) are no more expensive to purchase and there is a wide selection of models. EV are less expensive to operate than fuel vehicles, and public and home charging are widespread. Hydrocarbon fuel subsidies have been fully eliminated.

Modal shift is a reality in 2050 Mexico. The country has been successful in managing transport demand, disincentivizing the use of motorized transport. Walking and cycling are feasible options for many. Many lives have been saved by reducing traffic fatalities. Traffic reduction has meant more free time and less stress by decreasing commuting time. Streets are less noisy now and have become proper public spaces for citizens' interactions.

Congestion charge zones are ubiquitous across Mexico's metropolitan areas. In addition to reducing traffic and improving air quality, revenue from these programs has been invested in community development and compensation to those initially affected negatively by the congestion charge policies.

Cities are more compact. Citizens do not have to commute long distances to work, school, or shopping. This has improved Mexicans' physical and mental health and it has reduced health care costs.

Transportation culture has changed in Mexico. One big transformation has been to remove the stigma among middle and upper economic classes about public transportation as an option only for the poor. Better public transportation has, therefore, contributed to a less stratified society by improving transport equity.

AGRICULTURE AND FORESTRY. Thirty years ago, the bovine industry produced about 13% of all of Mexico's greenhouse gas emissions. Today, the agriculture and forestry sectors have been quite successful at mitigating emissions. Significant changes in supply and demand for products in these sectors have been driven by a combination of change in habits and preferences, technological change, and effective regulation.

The production of meat played a key role. Increasingly, citizens have changed their consumption habits, partly because of limited natural beef supply and its corresponding price increase, and partly because "eating the right thing" is now taken more seriously by many people: a change in culture has taken place.

Some beef producers have gradually switched to more profitable alternatives, such as fish or poultry farming. Others have taken advantage of new technologies, such as silvopasture systems and biodigesters to mitigate emissions. The synthetic meat industry is beginning to flourish, mostly among the younger generations who are growing up with it from the start.

Another key change to mitigate emissions has been a significant reduction in the use of synthetic fertilizers. This has also contributed to better health outcomes.

The protection and restoration of the forestry is a top priority for the Mexican government. The administration of forestry policies has been decentralized to local governments, which have a more direct interest in enforcing regulation, collecting fines, and have more information about what is happening on the ground. The local level of authority also faces more-direct citizen pressure to do a good job.

Mexicans have modified their mindset about environmental protection and conservation thanks to increased exposure to information on these issues and to changing economic incentives. The consumption of locally-



produced food is no longer an expensive fashion, but an affordable and widespread way of living. This has also strengthened social capital in communities and created multiple stakeholders that provide incentives for local governments to support the new status quo.

Baseline and decarbonization scenarios (ICM)

Mexico updated its Nationally Determined Contribution (NDC) in December 2020, complying in a timely manner. In terms of adaptation, even without concrete targets, Mexico did expand the information regarding the important efforts to respond to the impacts of the climate crisis. However, the 2020 NDC has been problematic and was recently suspended by a court for being regressive. By presenting the same GHG emission reduction targets, it did not comply with the PA's principle of progressivity, falling behind in the global race for greater climate action. Additionally, the 2020 NDC lowered its climate ambition and transparency, as not only the conditional and unconditional targets remained unchanged, but its emissions projections under business-as-usual (BAU) increased. For instance, in 2015, the baseline was 973 MtCO2e and with the -22% reductions, emissions should be 773 MtCO2e. That means 1.8% higher in the 2020 NDC than 2015 NDC, in gross CO2e tons.

Furthermore, the Mexican NDC (2015 and 2020) sets an emissions trajectory on a 3°C pathway and is insufficient to comply with the long-term goals of the Paris Agreement. Mexican energy and infrastructure public investments for the COVID19 recovery, according to recent international reports, will have a net climate and environmental impact, which does not help the country to align its efforts to meet the Paris Agreement.

The Climate Transparency Report Mexico Country Profile (2021) reveals that the country's conditional 2020 NDC target would increase emissions to 45% above 1990 levels, (approximately 638 MtCO2e), by 2030, contrasting the 13% increase in emissions that would be the limit to keep the temperature increase at 1.5 °C (383 MtCO2e), leaving an ambition gap of 255 MtCO2e.

The emissions by sector are as presented in the next figure, providing evidence for the urgency to decarbonize the transport, power and industry sectors (Graph 1).



Graph 1 - Emissions from combustion by sector

Source: CTR, Mexico 2021 with data from Enerdata 2021



Mexico can still react and present, at COP 26, an updated NDC with greater ambition in terms of GHG mitigation in the short (2030) and long (2050) term, as well as more information on specific measures for implementation. If Mexico were to align with the announcements of increased climate action by major economies, including its G20 peers, and be in line with the 1.5°C scenario, it should cut its GHG emissions in half by 2030 and have net zero emissions by 2050. Efforts this ambitious require international support, a greater flow of climate finance, technology transfer and a series of institutional, economic and social arrangements to get us closer to 2 °C or 1.5 °C levels without compromising the important effort to combat poverty and inequalities. However, there is an important potential for "cost-effective" mitigation measures; that is, measures with a high potential to reduce emissions at a low cost to the country.

We developed specific decarbonization scenarios by the most relevant sectors:

ELECTRICITY SECTOR. The decarbonization trajectory requires the reduction of emissions to 68 million tonnes of CO2e in 2030. On this path, the participation of natural gas (combined cycle utilities) should be reduced from 43% in 2019 to 37% in 2030. Additionally, the wind should generate 93.9 TWh (18% of total generation) in 2030, while solar PV 83.2 TWh (16% of total generation). The distributed generation should increase from 2 TWh (1% in total generation) in 2019 to 20.8 TWh in 2030 (4% of total generation).

In the decarbonization pathway for the period 2030 to 2050, natural gas combined cycles must reduce their participation from 52% in 2023 to 14% in 2050. Meanwhile, the required electricity to cope with the increasing demand must be generated in part by wind and solar PV, which could account for 27% each by 2050. This electricity system can reduce greenhouse gas emissions to 44 MtCO2e by 2050, achieving the required carbon budget.

Finally, the estimation of the marginal abatement cost curve (MACC) was crucial in the development of the decarbonization and baseline scenario (Figure ii). As observed, geothermal, wind and solar PV generation technologies have negative costs, indicating that the investment in these technologies can be recovered and are cost-effective. Additionally, while storage or distributed generation still have high costs, their mitigation potential could be higher as their technological development advances rapidly.

OIL AND GAS SECTOR. For the decarbonization scenario, the resulting cumulative emissions between 2019 and 2030 is 380 million tonnes of CO2e. The opportunities for Mexico's oil and gas sector decarbonization are significant, and several of the mitigation measures can also deliver substantial economic benefits. Methane fugitive emissions reductions are also fundamental for the mitigation efforts, and the existing regulations should be encouraged and enforced. In addition to this, the rational and efficient use of energy within PEMEX facilities is crucial to reduce greenhouse gas emissions, as cogeneration could provide a cost–effective solution.

TRANSPORT SECTOR. The decarbonization pathway for the transport sector is approached through the Avoid–Shift–Improve framework. The strategies included avoiding emissions through the reduction in demand for motorized travel and control rampant road transport growth with transport demand management measures. Shift to low/zero-carbon modes of transport, increasing trips efficiency for transportation systems and non-motorized travel like cycling, and walking. A comprehensive Avoid–Shift–Improve approach to decarbonization will result in more significant abatement than any focus on specific technologies. As a result, it could be possible to reduce the existing vehicle fleet by 8% and 40% in 2030 and 2050, respectively.

Actions will be needed in all three areas, from long-term land-use planning (avoid), to inducing and implementing public transportation and cycling (shift), to fueling vehicles cleanly and efficiently (improve), to decarbonize the sector. Although these opportunities are all within reach, they will require serious policy commitments and will need to overcome a legacy of dependence on and planning around carbon-intensive travel.



Scrum personnel selection criteria

We have developed scrum sessions at two levels. First, among the Mexico team. It is an interdisciplinary group in which ideas are presented, generated, discussed, discarded (if necessary) and amended/improved, all having in mind the goal of a good life by 2050 and a good life-trajectory.

At the second level, we interacted our research questions and visions on a good life with experts outside our working group. For instance, we have worked on developing a strategic partnership with the World Resources Institute Mexico (Beatriz Cárdenas) and the Department of Habitat and Urban Development at ITESO (Mónica Solórzano) for working on applicable research on societal demand for clean air, and developing local governments capacities on environmental management, including the best feasible tax instruments.

We also have worked on creating significant synergies and relationships with Mexico's core decision-makers, which we describe in section 3 of this document.





Reports from scrums in 2021

From the scums and other inputs, during 2021, we have been able to gather useful information to outline specific proposals on mitigation policies and projects.

We worked on outlining two policies: Carbon pricing and transportation policy. And we worked on two projects: Low emissions zones congestion charge zones, and progressive investment of carbon pricing revenues.¹

Scrums during 2021 have also allowed us to develop more grounded views on what is feasible; on new promising ways to face adaptation and mitigation; and on ideas and actions that either went all wrong or that had significant negative externalities.

Scrums were also useful for discussing and understanding Mexico national government's current positions on the environment, and on the real feasibility of establishing fruitful relationships with different area of Mexico's national government; as well as to explore alternatives to engage with other levels of government, such as municipal and state level governments. In specific, we have explored the possibility of working with Mexico City's government (unsuccessfully) and the municipal governments of Guadalajara and Zapopan, using ITESO as intermediary (more promising).

Regarding the work on the general equilibrium model, there are useful insights. Our current lifestyle has led us to increasingly severe overuse of the environment, leading to economic stress and social tensions that must be addressed. This makes us question future trajectories of development and use of natural resources and ecosystems, as well as of environmental capacity, such that we reduce degradation and adopt practices that may help attain a good life and a just transition. Climate change is one of the most severe problems we now face, and Mexico as all other countries, needs to find low emission trajectories to stay below the 1.5 to 2°C increase in temperature worldwide.



Other activities 2021

- During the reporting period, ICM developed the project in three lines of work: technical development, capacity building, and strengthening of coalitions and networks.
 - * Technical development: ICM began collecting information available in Mexico on decarbonization pathways and baselines. This information served as a basis for understanding the state of the art of decarbonization in Mexico and identifying the portfolio of actions needed to feed the NDC discussion. Additionally, ICM began updating the modeling and technical analysis in the electricity, transportation, oil and gas, industry, and AFOLU sectors. This technical update aims to have the most updated information to understand the behavior of the main emitting sectors. The technical analysis is also intended to understand the behavior of the sectors in a deep decarbonization trajectory to 2050, in addition to feeding the proposals and inputs for the NDC update.
 - * Capacity building: ICM convened several working sessions with academics and technical experts (one workshop), civil society (one workshop), and youth groups (three workshops). These sessions, which had an average attendance of 25-30 people, reviewed the status of each GHG emitting sector and the main mitigation actions that should make up a decarbonization pathway aligned to a 2°C and 1.5°C trajectories. The discussion in the workshops made it possible to share the most updated information with the various sectors and to trigger a process to strengthen the capacities of those sectors that need to understand decarbonization better and to enhance the technical exchange between experts.
 - * Coalition and network strengthening: the working sessions with experts, civil society, and young people helped to articulate efforts that will continue during this and the following year. Also, MSI is participating in various processes to link this project with other coalitions and networks created in Mexico to position decarbonization and resilience efforts. For example, ICM is part of the convening group of two seminars that counted with the participation of dozens of experts and organizations to identify the necessary actions to bring the public discussion focused on the Special Climate Change Program to the NDC discussion. ICM is also part of the convening group and technical advisor to a large group of organizations that are convening to join efforts to identify a decarbonization and resilience pathway to 2050 to provide information to decision-makers in the framework of the 2024 electoral process.
- During 2021, we held various meetings with the global project coordinators and with country teams. These meetings have been especially useful to learn on different experiences and to calibrate the projects methodology and expectations. A special emphasis of our meetings was on specifying the general equilibrium model. Below is the meetings' general description:
 - * (April 23) Meeting for outlining and discussing the contents of Mexico 2050 vision. With the LbD central team (Jose Garibaldi and Gilberto Arias) and the ITAM team (Juan Carlos Belausteguigoitia, Vidal Romero, and Alberto Simpser), and the general equilibrium team (Alejandra Elizondo and María Eugenia Ibarrarán).
 - * (April 28) Working meeting on the general equilibrium model's specification. Participants: Juan Carlos Belausteguigoitia, Vidal Romero, and Alejandra Elizondo.
 - * (May 31) Working meeting on the general equilibrium model's specification. Participants: Juan Carlos Belausteguigoitia, Vidal Romero, Alberto Simpser, María Eugenia Ibarrarán, Roy Boyd,

ACTIVITIES MEXICO 2021

and Alejandra Elizondo.

- * (August 13) Meeting of the ITAM team to discuss progress and further work. Participants: Juan Carlos Belausteguigoitia, Vidal Romero, and Alberto Simpser.
- * (November 17) Working meeting on the general equilibrium model's specification. Participants: Juan Carlos Belausteguigoitia, Vidal Romero, Alberto Simpser, María Eugenia Ibarrarán, and Alejandra Elizondo.
- * (November 22) Meeting to present and gather feedback on ICM's carbon budget and decarbonization scenarios. Participants: Jose Garibaldi, Juan Carlos Belausteguigoitia, Vidal Romero, Alberto Simpser, María Eugenia Ibarrarán, Alejandra Elizondo, José Carlos Fernández, Jesús Serrano, Luis Miguel González, Karla Cedano, and Marisol Rivera.
- * (December 2) 1st annual meeting of LbD's core teams.





Knowledge insights and Findings from project 2021

The year 2021 was quite useful for gathering information, thinking, and re-thinking many of the project's goals and premises. Three topics are especially useful in this respect, plus we also gather valuable insights from the general equilibrium model's first specification.

Social demand for better environment

We focus our attention on a question that we consider fundamental to answer if we are to actually bring about change: how do we incentive societal demand for a better environment? This is a topic we plan to explore in 2022 and generate concrete products.

It is an uncontroversial fact that poor environmental quality is a problem that significantly affects citizens' wellbeing. Among others, poor air quality is the first environmental risk factor causing premature deaths in the world and it is closely linked to global warming as they share significant determinants.

Poor environment quality affectations have a strong regressive component in the population. Under many circumstances, the groups more harmed are those with some biological susceptibility (kids, pregnant women, seniors, and those with chronic illnesses) that significantly increase the negative effects if they belong to vulnerable social groups, such as those in conditions of poverty.

Yet, even if we consider that there have been some steps forward in the previous decades and that there exists sufficient scientific information on the gravity of the problem, environment quality is not a priority for citizens, governments, private sectors, and societal organizations in many countries. Why?

How is (effective) societal demand for better environment created? How do groups of citizens organize for demanding better environment? How are ordinary citizens effectively motivated to contribute for a better environment? How are bottom-up solutions generated?

Political constraints

Political constraints are a major obstacle. But there are successful cases to learn from. Linked to the previous subsection on societal demand, we have been thinking and exploring how to create the right incentives for politicians and citizens.

Thinking that politics can be taken out of the equation is naïve. As long as there is any sort of redistribution, any trajectory and futures that we envision must consider politics. Otherwise, it will not allow us to create feasible visions. This is a core premise of our work.

Politicians (like most human beings) do not act against their self-interest. Thus, if we are going to have them on board to effectively reduce emissions and improve the environment, we need to understand how do we place the environment as a core interest of politicians.

Narratives

There is a need for attractive narratives that incentive societies and governments to act on improving the environment and mitigating emissions. Our 2050 vision requires significant changes on how we think about most aspects of our lives. This is no minor task.

At the beginning of the project, we did not consider this to be a core element to be addressed. But as the project is unfolding, it is clearer to us that the sort of change that Mexican society needs, should also consider



how do we "sell" our 2050 vision. It is not enough to present a plausible and desirable idea/outcome, but we need to make it desirable and understandable for people.

How much citizens and the relevant actors (mostly governments and enterprises) willing to do to get to the emissions goal, can be summarized in the following 3x3 matrix:

		Relevant actors (i.e. those with formal and informal veto power)		
		Nothing	Something	Everything
Citizens	Nothing	Emissions > 1.5-2	Emissions > 1.5-2	Emissions > 1.5-2
	Something	Emissions > 1.5-2	Emissions ? 1.5-2	Emissions ? 1.5-2
	Everything	Emissions > 1.5-2	Emissions ? 1.5-2	Emissions < 1.5-2

General equilibrium model

We gather valuable first insights from the general equilibrium model. In our first (preliminary) simulation we look at a case where carbon prices are driven up in an orderly fashion over an extended period of time. In this scenario we impose a carbon tax beginning in 2020 and gradually increase it to 300 dollars per ton of carbon by the year 2050 (the last year of our analysis). Because of the differing carbon content among fossil fuels the highest taxes are levied on coal and the lowest taxes are imposed on natural gas with crude oil and petroleum products being taxed at an intermediate rate. We then take all new revenues collected as a result of the carbon tax and return them to consumers lump sum so as to make the whole exercise revenue neutral.

In our second scenario we simulate a "disorderly" case. Here, instead of a slow gradual increase in carbon taxes, policy makers wait until 2030 to levy any effluent fees at all. They then increase carbon taxes from zero to 700 dollars per ton of carbon over the next 20 years. As before the simulation covers the period between 2020 and 2050 and the results reported are the percentage changes from the benchmark case we ran where no taxes we levied. Qualitatively our results here are similar to those in the first scenario since the taxes are levied on the same sectors as before. Quantitatively, however, the effects are much more severe. This is due to the fact that, unlike before, the taxes here are ramped up quickly and economy does not have sufficient time to dissipate the severity of the initial shock. Investment is complexly choked off in the latter years of the analysis the aggregate economy (as represented by GDP) stagnates and economic growth stalls.

The results of this initial simulation, the **orderly case**, are given in Graph 2 where, for purposes of clarity, we have calculated the impact of this tax policy on the most impacted sectors as percentage changes from the initial benchmark case. Looking first at the changes in our model's production sectors we find, not unexpectedly, the largest decreases are experienced in the fossil fuel and fossil fuel related sectors. By the end of the period studied crude oil decreases 74% from the benchmark case while coal production goes down by 100%. During that same period of time natural gas and refinery output go down by 79% and 90% percent respectively. Because of its significant input-output linkages to fossil fuel, electricity also sees significant declines. The losses we find in other sectors such as manufacturing, however, is much more modest. This is due to several factors. First, the input linkages between this sectors and fossil fuels are relatively weaker, and, when capital is driven out of relatively fossil fuel intensive sectors by a carbon tax it migrates to sectors such as manufacturing where its return is relatively higher.

20



Graph 2. Production Sectors' Changes with an orderly increase of the carbon tax



Source: Own.

The economic welfare of all agents in the economy also declines over the 30-year time period of our analysis. This decline, shown in Graph 3, is fairly modest though, and, interestingly the percentage declines in welfare are highest among the wealthiest agents. This is because the fossil fuel industries are quite capital intensive and all capital ownership is concentrated in the hands of the top 50% of the population.



Graph 3. Welfare Changes with an orderly increase of the carbon tax

Source: Own.

In the case of the **disorderly** scenario, just as before, the production sectors which decline the most are those connect to fossil fuels. By 2050 the extraction of petroleum falls by 99% as compared to the benchmark case. The same situation holds for natural gas (which declines by 99% by 2050), refinery output (which drops by 99%), and coal (whose production is also eliminated). Manufacturing declines less than fossil fuel and, as in the first case, the drop-off in services is fairly drastic, as shown in Graph 4.



$Graph \ {\bf 4.} \ {\bf Production} \ {\bf Sectors'} \ {\bf Changes} \ {\bf with} \ {\bf a} \ {\bf steep} \ {\bf increase} \ {\bf of} \ {\bf the} \ {\bf carbon} \ {\bf tax}$



Source: Own.

Aggregate welfare of the consuming agents decline but, interestingly, the welfare of the highest income agents are the least affected, as seen in Graph 5. This result, however, should be treated with caution. In our model consumer welfare is modelled as function of an agents' leisure plus their consumption. As we have stated, in response to a tax increase the capital owning agents cut their savings. Here, as opposed to the first scenario, that cutback is so severe that they almost increase their consumption. Their actual wealth plummets, however.



Graph 5. Welfare Changes with a steep increase of the carbon tax

Source: Own.

The government faces economic losses in the disorderly scenario. Given the lack of additional resources, it is impossible to simulate a revenue neutral scenario, since it would translate into increasing losses for each of the representative agents.

$Decarbonization\ scenarios$

There are two main findings in this reporting period. The first is that the objective and actions of this project are relevant to updating the technical analysis for accelerated decarbonization to stabilize Mexico's emissions on the trajectory of 1.5°C or 2°C in the least ambitious scenario. This is because the technical analyses have not been updated and published. The technical analyses and inputs are not positioned in the public discussion. They are barely being taken up by coalitions seeking to influence the NDC or the electoral process framework. The second finding is that the debate is sectorized and does not have a comprehensive approach. The energy



sector is focused on energy, industry, etc. The interaction of the sectors has not been addressed and is a fundamental element in identifying a feasible decarbonization path. Equally important is to deepen the understanding of the interaction between mitigation and adaptation and to reduce the financial and discussion imbalance between the two approaches to the climate phenomenon.





Peer review and suggestions

During 2021, we conducted a peer-review process to ICM's document on Mexico's carbon budget and decarbonization scenarios, and potential mitigation measures that could be implemented. We gather useful feedback from the participants on various dimensions:

- The political feasibility of some of the trajectories by sector.
- The assumption of linearity on some trajectories by sector.
- The sort of policies that the scenarios assume would be implemented.
- The need to consider the sort of compensations that are required by sector in order to make change feasible.

As informal peer-review processes, we presented our insights and visions at the different meetings that we conducted (described in section 3 of this document) to discuss its feasibility and the sort of impact on emissions.

During, 2022, our plan is to develop further peer review processes, once we have specific products to present.

An important element that has been recommended to our team is to increase the emphasis of our work on the positive incentives for mitigating emissions. That is, to think on the desirable aspects of a low-emissions future and also the positive aspects in the suggested trajectories. In this respect, we need to further incorporate the notion of a good life in our work.

Impacts of the project

At this point of the project, we cannot really assess our contributions' impact; mostly because so far, we have focused on creating networks of specialists and organizations and on collecting information.

We expect by 2022 to see the concrete fruits of our work in these previous months.

The project has helped lay the groundwork for better coordination of the technical analysis required for the NDC updating process in Mexico. It has also allowed ICM to contribute to strengthening coalitions and networks focused on identifying ways for accelerated decarbonization through a learning-by-doing process. The flexibility of the learning by doing approach is essential in Mexico to address a complex situation and meet the objectives proposed in the project.

The following six months will be decisive in identifying the progress level and impact of the project. The next six months will verify whether or not stakeholders have created the conditions for Mexico to submit a new and more ambitious NDC or whether the issue has been very present in the public discussion.

Conclusions and view forward

As we estate above, after the first part of the project being devoted to information gathering and developing a baseline, we expect 2022 to be quite fruitful:

• We will have the results of our general equilibrium model that estimates points and trajectories on



a baseline and different (feasible) scenarios. This exercise will shed light on the need to undertake compensatory policies simultaneously with the introduction of economic instruments, such as taxes on the carbon content of fossil fuels. Without this, the economic and social costs are very big. This, like any policy, must be designed and rectified prior to its application so that it meets the objectives for which it has been intended.

- Interacting with the general equilibrium model and other inputs, we will develop sectorial narratives that disaggregate and specify our vision of a good life.
- We will develop a draft that discusses and outlines solutions to the creation of societal demand for a better environment.
- We will present a public essay contest: "Medio Ambiente, Energía y Cambio Climático: Visiones de México en 2050". It is focused on young students that would provide a different and innovative visions of good life in 2050 and its trajectories.
- We will seek working links with authorities, local states, together with other think tanks and NGOs.
- We will conduct an open bi-monthly Seminar with the Centro de Investigaciones Interculturales, Jurídicas y Ambientales (CIIJA), to discuss social implications of energy projects and its effect on emissions and the good life.